



Accessibility

A Guide for Businesses and Organizations

Empowering employees, customers and partners
with accessible technology



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About this guide

Purpose of this guide

In an era when technology is redefining the workplace and creating a knowledge-based global economy that places a high value on communication, collaboration, and mobility, accessibility is increasingly essential in doing business. Accessible technology addresses the personal needs of all computer users, including those with physical disabilities, learning and language impairments, and age-related limitations, making it easier for organizations to empower employees, serve customers, and engage with partners.

This guide from Microsoft® provides information about accessibility and accessible technology to help organizations worldwide ensure that all the people they serve or engage have equal access to information and services. For organizations new to accessibility and working with people with disabilities, accessibility can sometimes seem overwhelming. To help your organization meet the needs of people with all types of abilities, this guide provides specific information about many types of impairments and some of the accessible technology solutions that help address them.

How to use this guide

Chapter 1 provides an overview of accessibility, defines accessible technology, and discusses why it is important for organizations to make accessibility an integral part of their business.

Chapter 2 is organized by the types of disabilities and the accessibility solutions available to help individuals who have disabilities. The chapter defines each type of impairment and offers examples of accessibility features and assistive technology products that are helpful in addressing and accommodating these impairments.

Chapter 3 provides more in-depth information, including an overview of accessibility features in the most recent versions of the Windows® operating system, Windows Internet Explorer®, and Microsoft Office. This chapter also includes more details about assistive technology products and resources to help you find and select assistive technology products for your employees or other users.

Chapter 4 provides guidance on planning and training for accessibility and gives an overview to the online accessibility trainings provided in CD format at the back of this guide and available online at <http://msdn.microsoft.com/accessibility>. These trainings are designed to help organizations create more accessible software products using the Windows platform.

Download

This guide is available for download on the Microsoft Accessibility website (www.microsoft.com/enable/business/).

Chapter 1: Accessibility in the workforce

Over the past three decades, innovations such as personal computers, the Internet, mobile devices, and cloud computing have revolutionized how people work, communicate, and get information. These advances, in turn, have dramatically changed the way we do business. And as technology continues to transform the workplace, demand is growing for accessible technology that can accommodate the needs and preferences of all users.

Businesses and organizations—from government agencies and universities to utilities and financial institutions—are looking for more effective ways to engage customers; to recruit, empower, and retain valuable employees; and to increase efficiency and productivity across their organizations. In today's connected world, technology is at the heart of all these initiatives. Yet to achieve those goals, organizations must make technology and its benefits accessible to the largest possible number of people—regardless of age or ability.

Accessible technology can make it easier for anyone to see, hear, and use a computer. It enables people with a wide range of abilities—including those with disabilities, age-related impairments, or temporary limitations, in addition to novice computer or web users—to adjust technology to accommodate their individual visual, dexterity, hearing, learning, and language needs and preferences or to modify their personal technology experience.

Microsoft is one of the technology industry leaders in accessibility innovation, in building products that are safer and easier to use, such as Windows 7 and Microsoft Office 2010, and in providing a platform that enables other companies to develop their own accessible technology solutions. Creating technology products that are accessible to everyone, regardless of age or ability, is an integral part of the Microsoft corporate mission: *to help people and businesses throughout the world to realize their full potential.*

This chapter introduces accessibility, defines more precisely what accessible technology is, and explains why it is important to modern businesses and organizations.

What is *accessibility*, what is *accessible technology*?

For the purpose of this guide, we define *accessible technology* as any computer technology that individuals can adjust to accommodate their vision, dexterity, hearing, cognitive, and speech needs or that businesses and organizations can use to make online information and services accessible to more people.

For many people with disabilities, *accessibility* is what makes computer use possible, but accessibility has much broader applications. Accessibility makes it easier for *anyone* to see, hear, and use a computer and to personalize their computers to meet their own needs and preferences. If technology is truly accessible, it can be adjusted to meet the needs and preferences of people with a wide range of abilities—not just those with severe disabilities.

Actually, most people who use computers also benefit from at least a few accessibility features and settings that enable them to personalize their computers and work environments, such as changing font sizes and styles, background images, colors, and computer sounds.

For businesses and organizations, accessible technology encompasses five elements:

- **Accessibility features or settings** that are built into software programs to allow users to adjust and customize product settings to meet their vision, dexterity, hearing, language, and learning needs. In Windows, for example, changing the font size and color and the mouse pointer options are accessibility settings. Windows, Office, and Internet Explorer include many accessibility features and settings that make it easier for users to see, hear, and use their computer.
- **Assistive technology products** (specialty hardware devices or software programs) that are specially designed and carefully chosen to accommodate either a specific disability or multiple disabilities. Examples include a screen magnification program for a computer user who has low vision or an ergonomic keyboard for a computer user with arthritis.
- **Web accessibility** design features that make it easier for people with certain disabilities to understand online content or to access online services. Examples include text enlargement for people with low vision and text equivalents of photos, graphics, and video files that work with assistive screen readers used by people who are blind.
- **Internal business applications**, such as intranets and internal purchasing applications, that are accessible to all employees.
- **Compatibility between assistive technology products**, the operating system, and software programs. This is critical for assistive technology products to function properly.

This guide presents accessibility features and assistive technology products that are compatible with the Windows operating system. Many of the accessibility features available in Windows 7 and Windows Vista can be found through the Ease of Access Center (located in the Control Panel). The Ease of Access Center (Figure 1-1) provides a convenient, centralized place where people can find accessibility settings and programs to help make their computers easier to use.

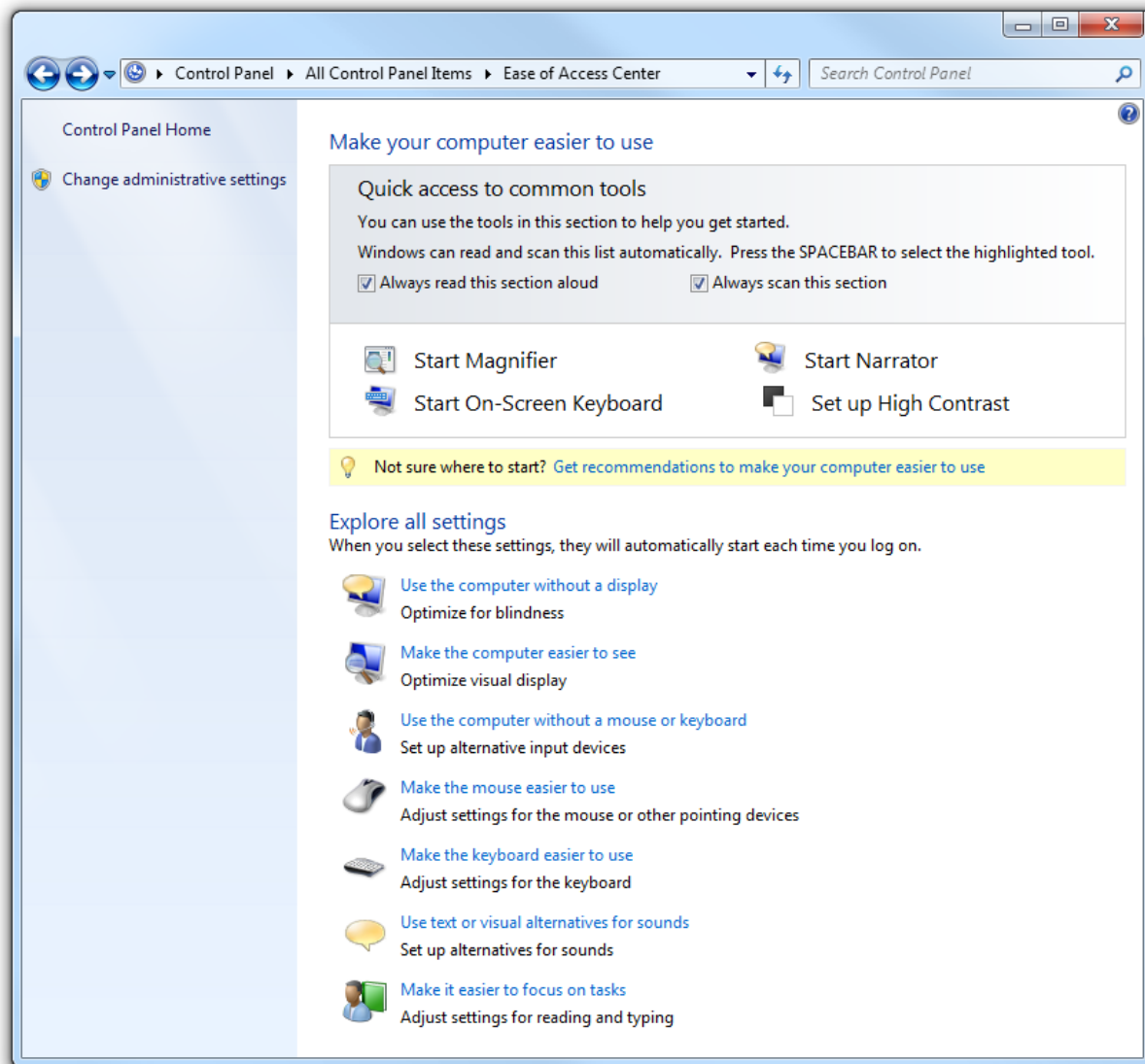


Figure 1-1 The Ease of Access Center is found in Windows 7 and Windows Vista.

The need for accessible technology in business and organizations

Accessible technology is important in the workplace for several reasons. Accessible technology helps businesses support workforce diversity, recruit from a larger pool of candidates, and enhance team collaboration and communication among all employees—including those with disabilities. For example, accessible technology can facilitate communication and collaboration between sighted and non-sighted colleagues by providing just-in-time delivery of information without the need for special printing and by enabling people who are blind or have other vision impairments to enlarge or customize fonts, choose high-contrast settings for greater visibility, or use a screen reader to access team documents.

Today, more than half of all U.S. jobs—from the front office to the factory floor—require some technology skills.¹ Simultaneously, the percentage of the workforce represented by individuals 55 years and older is increasing.² As a result of functional limitations that result from aging, these employees will require environmental modifications and/or technology accommodations.³

Accessibility can also help businesses attract new customers and interact more easily and effectively with a wider range of existing and potential customers, partners, and suppliers. Organizations that make accessibility a priority in their business can advertise job openings, requests for proposal, and other opportunities on websites that are accessible to people with vision impairments. And accessibility can help organizations increase online traffic and loyalty on their websites with design practices that are user-friendly and accessible to all users, including those with disabilities or age-related impairments.

Companies today are marketing many goods and services online. Governments and other organizations are offering more and more information and benefits over the Internet—sometimes exclusively. And just as the Internet has created a worldwide marketplace where even small businesses can compete on a global scale, web-enabled mobile devices have put a shopping cart in nearly every purse and pocket. Consumers today compare products, make purchases, book travel, and pay bills online while exchanging instant messages or emails with salespeople and customer service representatives—from any place and at any time.

Accessibility helps everyone

Another powerful consideration for making accessibility a part of any large business or organization is the sheer number of people around the world who need accessible technology, could benefit from using it, or choose to use accessible technology for a more comfortable or convenient computing experience.

In the United States alone, about one in five residents (54.4 million people) reported having some level of disability in 2005, according to a U.S. Census Bureau report that was released in December 2008 (the most current information available when this guide was published), but that doesn't tell the whole story. A two-part study commissioned by Microsoft and conducted by Forrester Research in 2003 and 2004 found that more than half (57 percent) of computer users in the United States between the ages of 18 and 64 could likely benefit from accessible and assistive technology due to mild-to-moderate difficulties or impairments that interfere with their ability to use a computer or to perform routine tasks.

Most of these users did not identify themselves as having a disability or impairment, but the Forrester Research study found that among computer users:

- One in four experiences a visual difficulty.
- One in four experiences pain in their wrists or hands.
- One in five experiences hearing difficulty.

¹ Bay Ledger News Zone, February 24, 2009. AFP American Edition

² Occupational Outlook Handbook, 2010-11 Edition. Overview of the 2008-18 Projections; US Bureau of Labor Statistics; www.bls.gov/oco/oco2003.htm

³ Chappell NL, Cooke HA. 2011. Age Related Disabilities - Aging and Quality of Life. In: JH Stone, M Blouin, editors. International Encyclopedia of Rehabilitation. Available online: <http://cirrie.buffalo.edu/encyclopedia/en/article/189/>

Accessibility and aging

As the global population continues to grow older and the number of age-related impairments (such as low vision or arthritis) increases, so does the need for accessible and assistive technology. People today are living and working longer, and lower birth rates in developed nations since the mid-1960s mean that there are fewer younger workers in such countries to replace those who do retire. For example:

- Japan's population is aging faster than that of any other country in the world. By 2020, about 30 percent of the population will be older than 65. That figure is expected to climb to 37 percent by 2040.⁴
- By 2018, more than one in five U.S. workers will be older than 55—an increase of more than 33 percent over 2008 when that age group accounted for only 18 percent of the U.S. labor force.⁵
- By 2050, an estimated 45 percent of the working-age population in the European Union will be over age 65.⁶

Many people with age-related disabilities develop those impairments during their working lives. That trend is bound to increase as the global workforce grows older and more workers begin to experience age-related limitations that may interfere with their job performance or even force them to retire. Accessible and assistive technology can help businesses and organizations recruit and retain experienced employees and can help older workers keep their jobs and remain at peak productivity for as long as they choose to work.

In addition to the aging populations in many countries increasing the need for accessible technology among employees and customers, many nations are extending civil rights for people with disabilities to encompass accessibility and digital inclusion. Some governments are requiring procurement officials to purchase the most accessible products available, creating economic incentives for businesses to build accessible technology products.

Perhaps most important, organizations that make accessibility a priority are sending a clear message to employees and customers that their needs matter. And that can breed satisfaction and loyalty.

⁴ <http://www.stat.go.jp/english/data/handbook/c02cont.htm> Acquired February 10, 2011.

⁵ <http://www.bls.gov/oco/oco2003.htm> Acquired February 10, 2011.

⁶ <http://www.un.org/esa/population/publications/ReplMigED/EU.pdf> Acquired February 10, 2011.

Chapter 2: Impairment types and technology solutions

This chapter defines *disability* and outlines the different types of impairments that people experience, including vision, mobility and dexterity, hearing, language, learning, and age-related limitations. Specific examples of accessible technology solutions are matched to each type of impairment.

Defining *disability* and *impairments*

What is *disability*? A quick Internet search on that question is likely to return thousands of matches. Each person who tries to answer the question does so from a particular perspective and bias shaped by their own experience.

Disabilities and impairments can be mild or severe, permanent or temporary. Some people are born with disabilities, but the majority of disabilities are the result of an injury, accident, illness, or some other condition. And disabilities can change during the course of a person's life, often growing worse as people age. No matter how we define disability or impairment, it is relevant in this discussion because we are talking about accessible technology solutions for different types of impairments.

Before determining how accessible technology can benefit your customers and employees, it helps to understand the different types of impairments and how they affect computer use and access to online information.

The next sections include descriptions of different impairment types and suggested accessibility features and assistive technology products for:

- Vision impairments.
- Mobility and dexterity impairments.
- Hearing impairments and deafness.
- Learning impairments.
- Language impairments.
- Age-related limitations.

Vision impairments

Among computer users in the United States alone, approximately one in four (27 percent) has a vision impairment that affects his or her computer use. There are many ways for people with vision difficulties to modify their computer display and its appearance to make it easier to see or to receive information through sound or touch.

Did you know?

Visual acuity is expressed as a fraction. The top number refers to the distance you stand from the vision chart, which is usually 20 feet. So 20/200 vision indicates that the line you read correctly at 20 feet could be read by a person with normal vision at 200 feet.

Vision impairments include:

- **Low vision.** People with low vision do not have clear vision even with the use of eyeglasses, contact lenses, or intraocular lens implants. There are many ways to adjust and personalize the appearance of Windows to make it easier for someone with a vision impairment to see what is on the computer screen. For people with vision impairments and low vision, the computer monitor, appearance, text and icon size, and resolution should all be modified to make text and images more legible and easier to see. For those who still have difficulty seeing things on the screen, sound and touch options are available through Windows and compatible assistive technology products to make computing possible. On the following pages, you'll find options in Windows that can increase clarity and legibility on the screen to make the computer easier to see.
- **Colorblindness.** People who are colorblind have difficulty seeing particular colors or distinguishing between certain color combinations. Computer programs that allow users to choose the display's color combinations and to adjust screen contrast are helpful for people who are colorblind. Individuals with a variety of vision impairments often find it easier to read white text on a black background instead of black on white. Windows lets you use a High Contrast setting or select your own color schemes so you can find the colors that are easiest for you to see when you read.
- **Blindness.** Blindness occurs in a variety of degrees, and many people who are considered blind still have some measure of sight. In the United States, for example, a person whose level of sight is equal to or less than 20/200—even with corrective glasses or lenses—is considered "legally blind." A person who is completely sightless is considered "blind." Many diseases and conditions may contribute to (or cause) blindness, including cataracts, cerebral palsy, diabetes, glaucoma, and multiple sclerosis. Accidents, diabetes, and macular degeneration account for most blindness in the United States. Worldwide, according to the World Health Organization, the number of people blinded by infectious diseases has been greatly reduced, but age-related impairment is increasing. Cataracts remain the leading cause of blindness globally.

People who are blind can interact with a computer through screen readers, keyboards, Braille devices, and audio/voice rather than with a traditional monitor and mouse. The use of sophisticated assistive technology provides for both computer input and output and is critical for people who are blind.

People who are both deaf and blind can also use computers with the help of assistive technology products. For someone who is both deaf and blind, captioning and other sound options are of no use, but Braille assistive technology products are critical. People who are both deaf and blind can use computers by using refreshable Braille displays and Braille embossers, which are discussed in more detail in the following sections.

Accessibility features in Windows


Windows makes it easy to find options that are helpful for people who have difficulty seeing the screen or for those who are blind and need to use the computer without a display. In the following pages, you will find information on accessibility features in Windows 7 and Windows Vista: Make the computer easier to see, Use the computer without a display (or monitor), and Keyboard shortcuts.

If you don't know whether you could benefit from accessibility or which accessibility features would be most helpful, fill out the questionnaire in the Ease of Access Center in Windows 7 and Windows Vista. The questionnaire poses a series of questions about your personal experience with everyday tasks, such as watching television or using a pen or pencil. Windows can use your answers to those questions to suggest settings you may find useful.

Make the computer easier to see

For people who have vision impairments and low vision, start by using the **Make the computer easier to see** page in the Ease of Access Center found in Windows 7 and Windows Vista.

Tip

To go to the Ease of Access Center, press Windows logo key  + U.


1. In Windows 7 or Windows Vista, open the [Make the computer easier to see](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Make the computer easier to see**.
2. On the **Make the computer easier to see** page, you can select the options that you want to use:
 - **Choose a High Contrast theme.** This option allows you to set a high-contrast color scheme that heightens the color contrast of some text and images on your computer screen, making those items more distinct and easier to identify.
 - **Turn on or off High Contrast when LEFT ALT+LEFT SHIFT+PRINT SCREEN is pressed.** This option allows you to toggle a high-contrast theme on or off by pressing Left Alt+Left Shift+Print Screen keys.
 - **Turn on Narrator.** This option sets Narrator to run when you log on to your computer. Narrator reads on-screen text aloud and describes some on-screen events (such as the appearance of error messages) while you're using the computer. For more information about using Narrator, read [Hear text read aloud with Narrator](http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator) (<http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator>)
 - **Turn on Audio Description.** This option sets Audio Descriptions to run when you log on to your computer. Audio Descriptions describe what's happening in videos. Audio Descriptions are not included with all videos.
 - **Change the size of text and icons.** This option allows you to make text and other items on your screen appear larger, so they're easier to see. For more information, see [Make the text on your screen larger or smaller](http://windows.microsoft.com/en-us/windows7/Make-the-text-on-your-screen-larger-or-smaller) (<http://windows.microsoft.com/en-us/windows7/Make-the-text-on-your-screen-larger-or-smaller>)
 - **Turn on Magnifier.** One of the most common accessibility solutions for a computer user with low vision is a screen magnifier. Windows includes a screen magnifier program called Magnifier which enlarges portions of the screen and makes it easier to view text and images and to see the whole screen more easily. Magnifier in Windows 7 now includes full-screen mode, lens mode, and docked mode. The magnification quality is improved, and you can set the magnification level up to 16 times the original size and choose to track what you magnify by movement of your mouse, the keyboard, or text editing. For more information about using Magnifier, see [Make items on the screen appear bigger with Magnifier](http://windows.microsoft.com/en-us/windows7/Make-items-on-the-screen-appear-bigger-with-Magnifier) (<http://windows.microsoft.com/en-us/windows7/Make-items-on-the-screen-appear-bigger-with-Magnifier>)



Figure 2-1 Use Magnifier in lens mode to improve screen visibility.

- **Adjust the color and transparency of the window borders.** This option allows you to change the appearance of window borders to make them easier to see.
- **Fine tune display effects.** This option allows you to customize how certain items appear on your desktop.
- **Make the focus rectangle thicker.** This option makes the rectangle around the currently selected item in dialog boxes thicker, which makes it easier to see.
- **Set the thickness of the blinking cursor.** This option allows you to make the blinking cursor in dialog boxes and programs thicker and easier to see.
- **Turn off all unnecessary animations.** This option turns off animation effects, such as fading effects, when you close windows and other elements.
- **Remove background images.** This option turns off all unimportant, overlapped content and background images to help make the screen easier to see.


For additional information about how to use accessibility features in Windows and other Microsoft products, see the Microsoft Accessibility Tutorials available online at www.microsoft.com/enable/training/.


Use the computer without a display

For people who are blind or partially sighted, assistive technology products are critical for productive computer use. To get started, Windows has many features that enable you to use the computer without a display. For example, you can have screen text read aloud by using Narrator and you can have Windows describe screen activity to you.

People who are blind and cannot use a monitor can turn on or adjust settings to **Use the computer without a display** in the Ease of Access Center. In the following section, you'll find assistive technology products that are needed for people who are blind or partially blind.

Tip

To go to the Ease of Access Center, press Windows logo key  + U.

1. In Windows 7 or Windows Vista, open the [Use the computer without a display](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Use the computer without a display**.
2. On the **Use the computer without a display** page, select the options that you want to use:
 - **Turn on Narrator.** Windows comes with a basic screen reader called Narrator, which reads text on the screen aloud and describes some events (such as the appearance of an error message) that happen while you're using the computer. For more information about Narrator, read [Hear text read aloud with Narrator](http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator) (<http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator>).
 - **Turn on Audio Description.** This option sets Audio Description to run when you log on to Windows. Audio descriptions describe what's happening in videos.
 - **Turn off all unnecessary animations (when possible).** This option turns off animation effects, such as fading effects, when windows and other elements are closed.
 - **How long should Windows notification dialog boxes stay open?** This option sets how long notifications are displayed on the screen before they are closed.

Keyboard shortcuts

Keyboard shortcuts are combinations of two or more keys that, when pressed, can be used to perform a task that would typically require a mouse or other pointing device. Keyboard shortcuts can make it easier for people with all kinds of impairments, particularly vision impairments, to interact with their computers. Memorizing a few keyboard shortcuts makes it easier for some people who have difficulty seeing the monitor or keyboard to quickly accomplish tasks.

A list of keyboard shortcuts for Windows is available at <http://windows.microsoft.com/en-US/Windows7/Keyboard-shortcuts>.

Assistive technology products for people with vision impairments

For the operating system or an application to be accessible to someone who is blind, it must provide information about its interactions with the user so that assistive technology can then present those interactions in an alternative format. For example, if the computer provides a list box containing several selections to choose from, the assistive technology product must inform a computer user who is blind that he or she needs to choose from a list of selections. The list of selections might be spoken or presented in tactile fashion with a Braille display. A common assistive technology product used by people who are blind is a *screen reader*, a software program that presents graphics and text as speech. Computer users who are blind also may use Braille displays and Braille embossers. In fact, it is common for people who are blind to use a combination of assistive technology products.

Tip

The [Assistive Technology Product Starter Guide](#)—a table with details about specific assistive technology products, is included in Chapter 3.

Assistive technology products with different features are available to help people with vision impairments. Some assistive technology products provide a combination of features that help specific individuals. Assistive technology products that are helpful to many people with vision impairments are described in the following list.

- **Screen magnifiers** work like a magnifying glass. They enlarge a portion of the screen as the user moves the focus—increasing legibility for some users. Some screen enlargers (software or hardware) allow a user to zoom in and out on a particular area of the screen. Learn about Magnifier in [Windows 7](#) and [Windows Vista](#) and about the built-in zoom and magnify features in [Microsoft mouse and keyboard products](#). Another example of a screen magnifier program is ZoomText by Ai Squared.
- **Screen readers** are software programs that present graphics and text as speech. A screen reader is used to verbalize, or "speak," everything on the screen, including names and descriptions of control buttons, menus, text, and punctuation. An example of a screen reader is Window-Eyes.
- **Braille printers** (or embossers) transfer computer-generated text into embossed Braille output. Braille translation programs convert text scanned in or generated via standard word processing programs into Braille, which can be printed into raised Braille. The Tiger Cub Jr. is an example of a Braille printer.
- **Braille displays**, as shown in Figure 2-2, provide tactile output of information represented on the computer screen. The user reads the Braille letters with his or her fingers, and then, after a line is read, refreshes the display to read the next line. The Seika Braille Display is an example.

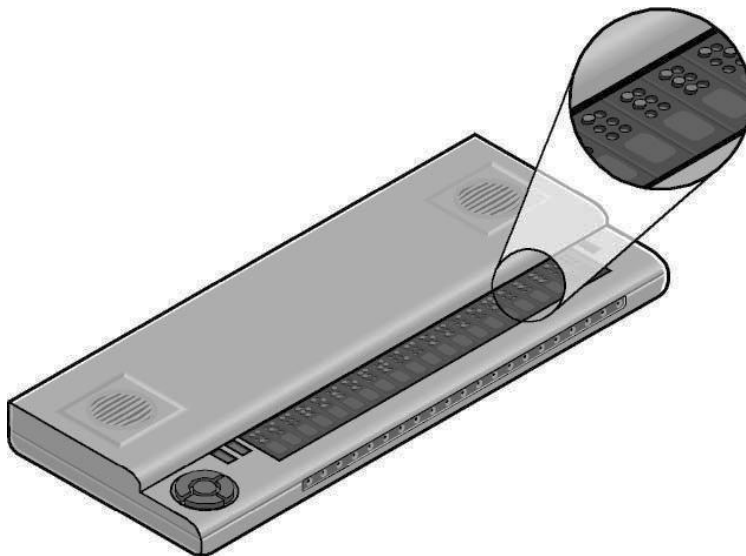


Figure 2-2 Braille displays, such as this one, can help someone who is blind read what is displayed on a computer screen.

- **Braille notetakers** enable someone who is blind to capture notes and then transfer them to a PC. Braille notetakers take advantage of refreshable Braille technology. In some cases, Braille notetakers replace or supplement a standard keyboard. An example of such a notetaker is the Eurobraille Esys.
- **Book readers.** Some people with low vision need book-reading assistance. Magnification devices are available as a desktop magnification aid (such as Desktop SenseView DSV) or as a portable magnification aid (such as SmartView Nano Magnifier). People with low vision may also use a PC configuration for book reading assistance (for example, Cicero Text Reader). Some may also use a dedicated reading device (such as the Victor Reader Wave). An individual's ability to read materials and the accommodations they will use depends on the format in which the material is available. For example, printed materials and books can be read by people with low vision with the assistance of a desktop or portable magnification aid. Someone who is blind would need to have printed material scanned and read aloud through a text-to-speech software program on the PC. Books are available in digital formats through organizations such as Bookshare (www.benetech.org) and Recording for the Blind and Dyslexic (www.rfbd.org). The most common digital format is the Digital Accessible Information System, or DAISY.

- Microsoft provides an **add-in for Microsoft Word** to convert documents to DAISY format. The Word-to-DAISY translator lets you take a document in Microsoft Office Word 2010, Word 2007, Word 2003, or Word XP and easily convert the Word document to the talking DAISY book format. This makes it easier for people to share Word documents with colleagues who need to use book readers to read documents. Learn more, and download the DAISY/Word add-in at <http://office.microsoft.com/en-us/help/HA102786941033.aspx>.

Mobility and dexterity impairments

Mobility and dexterity impairments can be caused by a wide range of common illnesses and accidents. They can also result from cerebral palsy, multiple sclerosis, loss of limbs or digits, spinal cord injuries, and repetitive stress injury, among other causes. As a result of accidents or conditions, some people may be unable to use (or may be without) arms or fingers to interact with their computers using a standard keyboard or mouse.

Others who have dexterity impairments or pain in their hands, arms, and wrist might need to adjust settings to make it more comfortable to use a keyboard or mouse. For example, some people cannot press multiple keys simultaneously (like Ctrl+Alt+Delete). Still others may strike multiple keys or repeat keys unintentionally. Some people may have use of their hands and arms but have a limited range of motion. All of these conditions can make using a standard mouse or keyboard difficult, if not impossible.

Mobility and dexterity impairments need to be individually addressed to choose the right mix of accessibility features in Windows and assistive technology hardware and software solutions.

There are many types of products available to allow people with mobility and dexterity impairments to use a computer, even if they can move only their eyes. The following section outlines accessibility features in Windows to make the mouse and keyboard more comfortable. In addition, you can set up a computer for a person who needs to use an on-screen keyboard and other alternative input options rather than a standard keyboard or mouse. Following are examples of assistive technology hardware and software products.


Accessibility features in Windows


Accessibility features built into Windows that are useful to people with mobility impairments include keyboard filters that compensate somewhat for erratic motion, tremors, slow response time, and similar conditions. For example, Sticky Keys (a feature in Windows) allows the user to enter key combinations without having to hold one key down while depressing a second. Other options allow users to adjust how quickly a letter appears on the screen when they hold down a key. In addition, Windows allows users to adjust mouse options, such as button configuration, double-click speed, pointer size, and how quickly the mouse pointer responds to movements of the mouse. Users can also increase the size of screen elements to provide a larger target, which can benefit people who have disabilities related to fine motor skills.

Make the mouse easier to use

For people who have pain or discomfort when using the mouse or who have other dexterity impairments, consider a different style of mouse (options discussed later in this section) and try changing the size of the mouse cursor and the mouse button options to make the mouse easier to use. Start by exploring the mouse options available on the **Make the mouse easier to use** page in the Ease of Access Center.


Tip

To go to the Ease of Access Center, press Windows logo key  + U.

1. In Windows 7 or Windows Vista, open the [Make the mouse easier to use](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Make the mouse easier to use**.
2. On the **Make the mouse easier to use** page, select the options that you want to use:
 - **Change the color and size of mouse pointers.** You can use these options to make the mouse pointer larger or to change the color to make it easier to see.
 - **Turn on Mouse Keys.** You can use this option to control the movement of the mouse pointer by using the numeric keypad.
 - **Activate a window by hovering over it with the mouse.** This option makes it easier to select and activate a window by pointing at it with the mouse rather than by clicking it.
 - **Prevent windows from being automatically arranged when moved to the edge of the screen.** This option prevents windows from automatically resizing and docking along the sides of your screen when you move them there.
 - You can also **change mouse settings**, including customizing the mouse in a variety of ways, such as reversing the functions of your mouse buttons, making the mouse pointer more visible, and altering the scroll wheel speed. In Windows 7 and Windows Vista, open the Mouse Control Panel by clicking **Mouse settings**.

Make the keyboard easier to use

For a person who experiences pain, discomfort, or hand tremors when using the keyboard, consider a different style of keyboard (options discussed later in this section) and make sure to adjust the keyboard controls. You can adjust these settings on the **Make the keyboard easier to use** page in the Ease of Access Center.


1. In Windows 7 or Windows Vista, open the [Make the keyboard easier to use](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Make the keyboard easier to use**.
2. On the **Make the keyboard easier to use** page, select the options that you want to use:
 - **Turn on Mouse Keys.** This option sets Mouse Keys to run when you log on to Windows. Instead of using the mouse, you can use the arrow keys on your keyboard or on the numeric keypad to move the pointer.
 - **Turn on Sticky Keys.** This option sets Sticky Keys to run when you log on to Windows. Instead of having to press three keys at once (such as when you must press the Ctrl, Alt, and Delete keys together to log on to Windows), you can use one key at a time by turning on Sticky Keys and adjusting the settings. Then, you can press a modifier key and have it remain active until another key is pressed.
 - **Turn on Toggle Keys.** This option sets Toggle Keys to run when you log on to Windows. Toggle Keys can play an alert each time you press the Caps Lock, Num Lock, or Scroll Lock keys. These alerts can help prevent the frustration of inadvertently pressing a key and not realizing it.
 - **Turn on Filter Keys.** This option sets Filter Keys to run when you log on to Windows. You can set Windows to ignore keystrokes that occur in rapid succession or keystrokes that are held down for several seconds unintentionally.
 - **Underline keyboard shortcuts and access keys.** This option makes keyboard access in dialog boxes easier by highlighting access keys for the controls in them. (For more information about keyboard shortcuts, see the section that follows).
 - **Prevent windows from being automatically arranged when moved to the edge of the screen.** This option prevents windows from automatically resizing and docking along the sides of your screen when you move them there.

Keyboard shortcuts

Keyboard shortcuts are combinations of two or more keys that, when pressed, can be used to perform a task that would typically require a mouse or other pointing device. Keyboard shortcuts can make it easier for people with all kinds of impairments to use a computer, particularly those with dexterity impairments who may find using the mouse tiring. Memorizing a few keyboard shortcuts makes it faster for people to get where they need to go.

A list of keyboard shortcuts for Windows is available at <http://windows.microsoft.com/en-US/Windows7/Keyboard-shortcuts>.

Here are a few keyboard shortcuts for the features mentioned in this section:


Press this key	To do this
Right Shift for eight seconds	Turn Filter Keys on and off
Left Alt+Left Shift+Print Screen	Turn High Contrast on or off
Left Alt+Left Shift+Num Lock	Turn Mouse Keys on or off
Shift five times	Turn Sticky Keys on or off
Num Lock for five seconds	Turn Toggle Keys on or off
Windows logo key  +U	Open the Ease of Access Center

Use the computer without the mouse or keyboard

Windows has two features that make it possible to use the computer without using a mouse or keyboard: Speech Recognition, which lets you use voice commands to navigate Windows 7 or Windows Vista, and On-Screen Keyboard, which lets you enter text by selecting keys on a visual keyboard on the screen.

You can turn on or adjust settings for these features on the **Use the computer without a mouse or keyboard** page in the Ease of Access Center.

Tip

To go to the Ease of Access Center, press Windows logo key  + U.


1. In Windows 7 or Windows Vista, open the [Use the computer without a mouse or keyboard](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Use the computer without a mouse or keyboard**.
2. Select the options that you want to use:
 - **Use On-Screen Keyboard.** On-Screen Keyboard displays a visual keyboard with all the standard keys. Instead of relying on the physical keyboard to type and enter data, you can use On-Screen Keyboard to select keys using the mouse or another pointing device. On-Screen Keyboard in Windows 7 can be resized and customized to make it easier to see and use. On-Screen Keyboard now also includes text prediction in eight languages. When text prediction is enabled, as you type, On-Screen Keyboard displays a list of words that you might be typing. For more information, see [Type without using the keyboard \(On-Screen Keyboard\)](#) (<http://windows.microsoft.com/en-us/windows7/Type-without-using-the-keyboard-On-Screen-Keyboard>).



Figure 2-3 On-Screen Keyboard in Windows 7 includes text prediction.

- **Use Speech Recognition.** Use this option to control the computer with your voice. Using a microphone, you can speak commands that the computer will understand and respond to, and you can dictate text. For more information about setting up Speech Recognition, see [Set up Speech Recognition](#) (<http://windows.microsoft.com/en-us/windows7/Set-up-Speech-Recognition>).

Assistive technology products for people with mobility and dexterity impairments

The following list describes assistive technology products used with computers by people with mobility and dexterity impairments.

- **Ergonomic keyboards and mice.** Ergonomic keyboards and mice are designed to be more comfortable than a standard keyboard and mouse. To improve the quality of your PC experience, Microsoft designers and ergonomists created industry-leading keyboard and mouse products to encourage healthier hand and wrist positions. Microsoft Natural® keyboards and mice have set the industry standard for comfort and can significantly reduce carpal tunnel syndrome symptoms. [Microsoft keyboards and mice](#) (<http://www.microsoft.com/hardware/>) also have built-in zoom and magnifier options.
- **Joysticks** can be plugged into the computer's mouse port and used to control the cursor on the screen. Joysticks benefit users who need to operate a computer with or without the use of their hands. For example, some people might operate the joystick with their feet or with the use of a cup on top of the joystick that can be manipulated with their chin. An example of a joystick is the SAM-Joystick.

- **Trackballs** look like an upside down mouse with a movable ball on top of a stationary base. An example of a trackball is shown in Figure 2-4. The ball can be rotated with a pointing device or a hand. People who have fine motor skills but lack gross motor skills can use these devices more easily and comfortably than they can use a traditional mouse. BIGtrack is an example of a trackball-style mouse that is more comfortable for many people with dexterity issues.

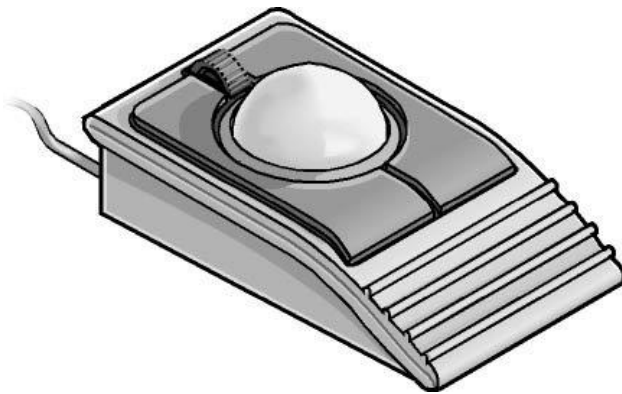


Figure 2-4 A trackball can be rotated with a pointing device or a hand.

- **On-screen keyboard programs** provide an image of a standard or modified keyboard on the computer screen. The user selects the keys with a mouse, touchscreen, trackball, joystick, switch, or electronic pointing device. On-screen keyboards often have a scanning option. With the scanning capability turned on, the individual keys on the on-screen keyboard are highlighted. When a desired key is highlighted, the user is able to select it by using a switch positioned near a body part that he or she has under voluntary control. On-Screen Keyboard is found in [Windows 7](#) and [Windows Vista](#). ScreenDoors 2000 is another on-screen keyboard product that can be helpful for some people.
- **Keyboard filters** include typing aids, such as word prediction utilities and add-on spelling checkers. These products can often be used to reduce the number of keystrokes. As an example, imagine you have to type the letter “g.” However, to type the letter, you first have to move your finger over the entire first row of your keyboard and halfway across the second row. Along the way, you might accidentally press the “R,” “P,” or “D” keys, but you only want the letter “g.” Keyboard filters enable users to quickly access the letters they need and to avoid inadvertently selecting keys they don’t want. SoothSayer Word Prediction is an example of a keyboard filter.
- **Touchscreens** are devices placed on the computer monitor (or built into it) that allow direct selection or activation of the computer by touching the screen. These devices can benefit some users with mobility impairments because they present a more accessible target. It is easier for some people to select an option directly rather than through a mouse movement or keyboard. Moving the mouse or using the keyboard for some might require greater fine motor skills than simply touching the screen to make a selection. Other users might make their selections with assistive technology, such as mouth sticks. With Windows 7 and a touchscreen monitor, you can just touch your computer screen for a more direct and natural way to work. Use your fingers to scroll, resize windows, play media, and pan and zoom.
- **Alternative PC hardware and all-access workstations.** In some cases, alternative PC hardware is needed. Some individuals with mobility impairments find it challenging to open the monitor of a laptop because the laptop latch isn’t accessible for them. Or some might need a laptop to be mounted to a wheelchair. Such assistive technology solutions are referred to as *all-access workstations*. **Alternative input devices** allow users to control their computers through means other than a standard keyboard or pointing device.

Alternative input devices include:

- **Alternative keyboards** are available in different sizes with various keypad arrangements and angles. Larger keyboards (such as the BigKeys LX) are available with enlarged keys (see Figure 2-5), which are easier to access by people with limited motor skills. Smaller keyboards are available with smaller keys (or keys placed closer together) to allow someone with a limited range of motion to reach all the keys. Many other keyboards are also available—one-hand keyboards, keyboards with keypads located at various angles, and split keyboards where the keypad is split into sections.

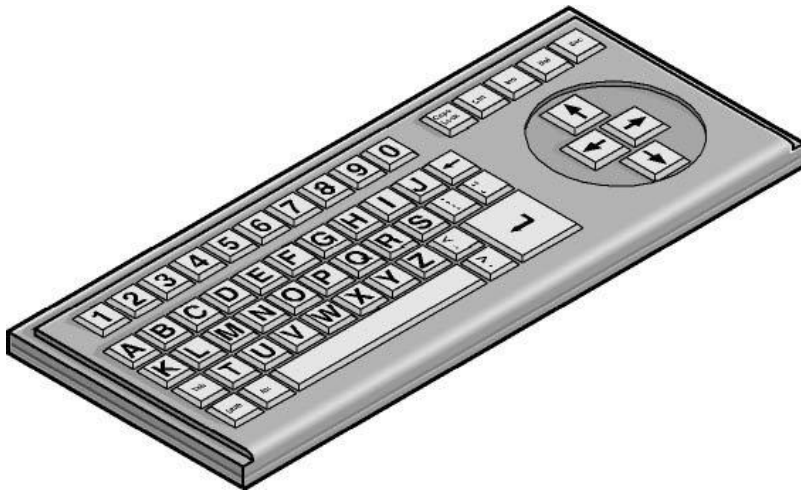


Figure 2-5 An alternative keyboard can include large keys and an “ABC” layout.

- **Electronic pointing devices** allow the user to control the cursor on the screen using ultrasound, an infrared beam, eye movements, nerve signals, or brain waves. When used with an on-screen keyboard, electronic pointing devices also allow the user to enter text or data. The assistive technology product HeadMouse Extreme is an example of a pointing device.
- **Sip-and-puff device**, shown in Figure 2-6, refers to just one of many different types of switch access. In typical configurations, a dental saliva extractor is attached to a switch. An individual uses his or her breath to activate the switch. For example, a puff generates the equivalent of a keystroke, the pressing of a key, or a mouse click. Maintaining constant “pressure” on the switch (more like sucking than sipping) is the equivalent of holding a key down. With an on-screen keyboard, the user “puffs” out the letters. Moving the cursor over a document’s title bar and “sipping” enables the user to drag items around on the screen just as you would with a mouse. This technology is often used with on-screen keyboards. The Jouse 2 is an example of a sip-and-puff device.

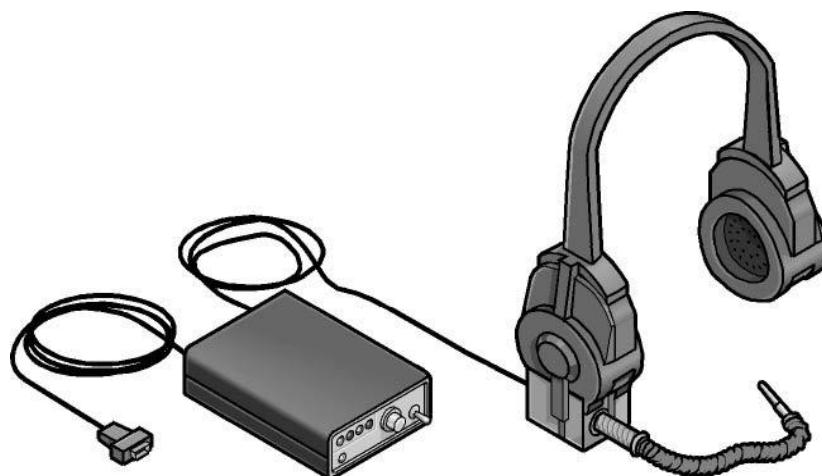


Figure 2-6. A sip-and-puff device is breath activated.

- **Wands and sticks** are typing aids used to strike keys on the keyboard. They are most commonly worn on the head, held in the mouth, strapped to the chin, or held in the hand. They are useful for people who need to operate their computers without the use of their hands or who have difficulty generating fine movements. The majority of these devices are customized for a user by adapting a pencil or a wooden dowel which can be purchased in any hardware store.

Hearing impairments and deafness

Hearing impairments encompass a range of conditions—from slight hearing loss to deafness. According to Forrester Research, an estimated one in five computer users has some form of hearing loss.

Hearing impairments include:

- **Hearing loss and hard-of-hearing.** People who have hearing loss or are hard-of-hearing may be able to hear some sound but might not be able to distinguish words. People with this type of hearing impairment can use an amplifying device to provide functional hearing. On the computer, adjusting sounds, using alternatives for sounds (such as visual indicators and captions), and headphones to eliminate background noise can be helpful options.
- **Deafness.** People who are deaf may not be able to hear any sounds or words spoken. It is helpful to adjust the computer to use visual alternatives for sounds.

Computer use among people who are both deaf and blind

Although it's not well known, people who are both deaf and blind can use computers with the aid of assistive technology. To someone who is both deaf and blind, captioning and other sound options are of no use, but Braille assistive technology products are critical. People who are both deaf and blind can use computers with assistive technology, such as refreshable Braille displays and Braille embossers.


Accessibility features in Windows

Accessibility features for those with hearing impairments include changing notifications from sound to visual notifications, volume control, and captioning. These features are available in Windows 7 and Windows Vista. Visual notifications (Sound Sentry) and captions (Show Sounds) allow users to choose to receive visual warnings and text captions, rather than sound messages, for system events, such as the arrival of a new email message.


Accessibility features helpful for people who have hearing impairments include:

- Adjust volume.
- Change computer sounds.
- Use text or visual alternatives for sounds.

Adjust volume


Although most speakers have a volume control, you can also control speaker volume using Windows. The quickest way to change the speaker volume for your computer is to click the **Speakers** button  in the notification area of the taskbar and then move the slider up or down to increase or decrease the speaker volume.

Adjust overall sound volume in Windows 7 or Windows Vista

1. Open **Volume Control**: Click the **Start** button , click **Control Panel**, click **Hardware and Sound**, and then, under **Sound**, click **Adjust system volume**.
2. Under **Main Volume**, move the slider up or down to raise or lower the volume.

Change computer sounds

You can select the sounds that play when certain events occur on the screen. This is helpful for people who have trouble hearing some sounds—high or low-pitched sounds, for example, or sounds associated with other devices. To change sounds in Windows 7 or Windows Vista:

1. Open **Sound**: Click the **Start** button , and then click **Control Panel**. In the search box, type **sound**, and then click **Sound**.
2. Click the **Sounds** tab.
3. In the **Sound Scheme** list, click the sound scheme that you want to use, and then click **OK**.

To change an individual sound, select an event (under Program Events) to which you want to assign a new sound. You can click **Test** to hear each sound.

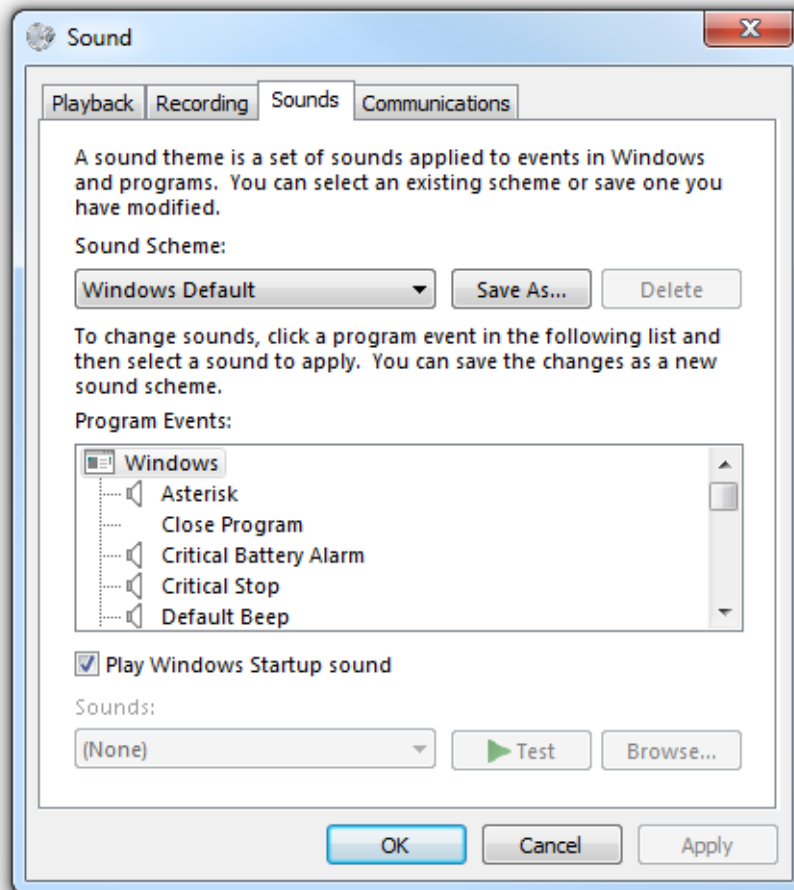



Figure 2-7 The Windows operating system offers many sound options.

Use text or visual alternatives to sounds

Windows provides settings for using visual cues to replace sounds in many programs. You can adjust these settings on the **Use text or visual alternatives for sounds** page in the Ease of Access Center.

1. In Windows 7 or Windows Vista, open the [Use text or visual alternatives for sounds](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Use text or visual alternatives for sounds**.
2. On the **Use text or visual alternatives for sounds** page, select the options that you want to use:
 - **Turn on visual notifications for sounds (sound sentry)**. This option sets sound notifications to run when you log on to Windows. Sound notifications replace system sounds with visual cues, such as a flash on the screen, so that system alerts are noticeable even when they're not heard. You can also choose how you want sound notifications to warn you.
 - **Turn on text captions for spoken dialog (when available)**. This option causes Windows to display text captions in place of sounds to indicate that activity is happening on your computer (for example, when a document starts or finishes printing).

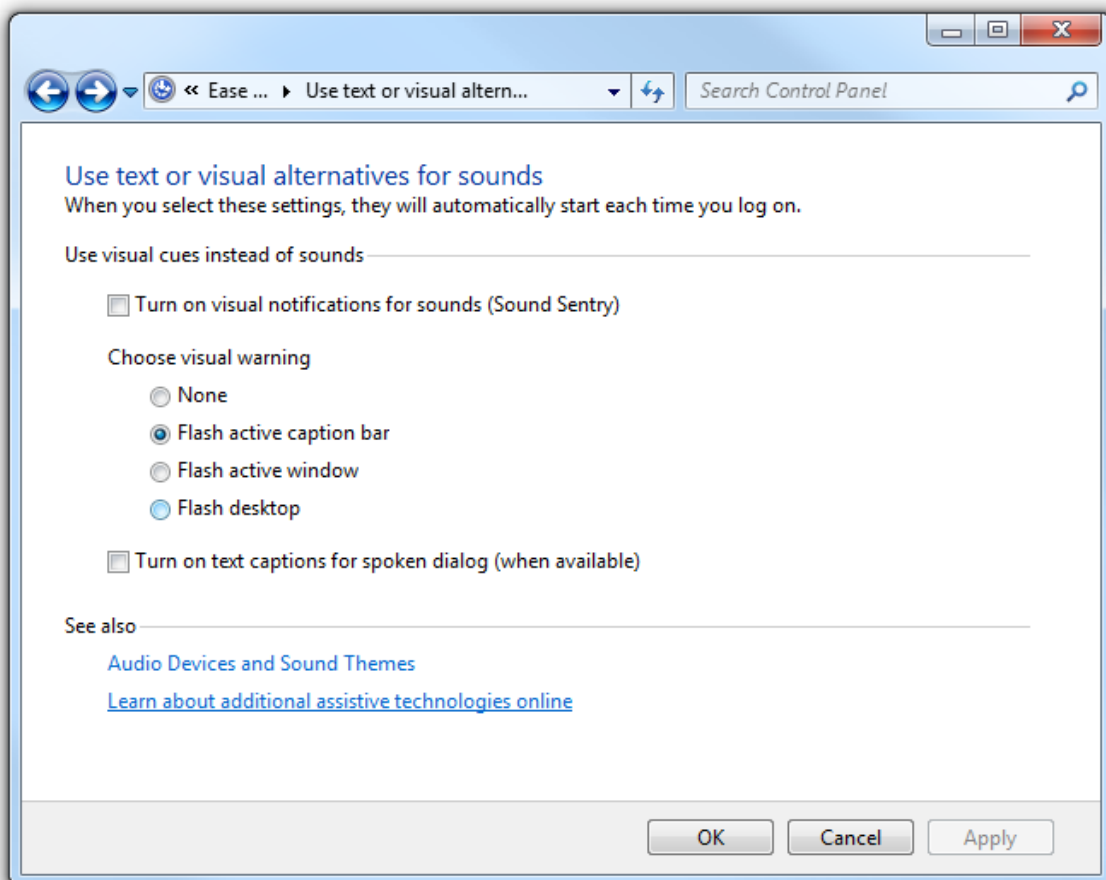


Figure 2-8 For visual cues, go to the **Use text or visual alternatives for sounds** page in the Ease of Access Center.

Assistive technology products for people with hearing impairments

Individuals with hearing impairments may need a sign-language interpreter or other accessibility solutions to be able to communicate actively in the workplace.

Personal listening devices and personal amplifying products can also be helpful for people who still have some hearing.

One product that may be useful is iCommunicator—a graphical sign-language translator that converts speech to sign language in real time to enable people who are deaf to communicate more easily with hearing people. For more information, see www.icommunicator.com.

Depending on the environment, people with hearing impairments may be able to use Microsoft Office Outlook®, Microsoft Office Communicator and other instant messaging services, and Office Live Meeting solutions for receiving text rather than spoken dialogue to communicate with colleagues or customers. A combination of speech recognition (available in Windows 7 and Windows Vista) paired with Outlook and instant messaging could be effective in helping people with hearing impairments communicate in real-time.

Language impairments

Language impairments include conditions such as aphasia (loss or impairment of the power to use or comprehend words, often as a result of brain damage), delayed speech (a symptom of cognitive impairment), and other conditions resulting in difficulties remembering, solving problems, or perceiving sensory information. For people who have these impairments, complex or inconsistent visual displays or word choices can make using computers more difficult. For most computer users, in fact, software that is designed to minimize clutter and competing objects on the screen is easier to use, more inviting, and more useful.

Some people with language impairments do not have the ability to communicate orally. These individuals can use augmentative and assistive communication devices to “speak” for them. To communicate, they either type out words and phrases that they wish to “say” or select from a series of images that, when arranged in a particular way, generate a phrase. For example, an individual could use the combination of a picture of an apple and a representation of the McDonald’s golden arches to order a hot apple pie. Pairing the picture of the arches with a picture of a car could say, “Let’s take a ride to McDonald’s.”


Accessibility features in Windows

When Windows 7 and Windows Vista were developed, there was a focus on reducing screen clutter to help individuals focus on only the things important to them. Windows 7 and Windows Vista let you eliminate shortcuts and icons from the desktop if they are not helpful. Reducing unnecessary options on the screen benefits people with language and learning impairments, in particular, because it reduces visual clutter, which can be confusing.

Other options that allow for abbreviated menus and customized toolbars, for example, also help reduce the number of competing elements on the screen. Spelling and grammar checkers are also helpful for those who commonly reverse the order of letters because of dyslexia or other learning impairments.

Make it easier to focus on reading and typing tasks

You can use the settings on the **Make it easier to focus on tasks** page in the Ease of Access Center in Windows 7 and Windows Vista to reduce the amount of information on the screen and to help people with language impairments focus on tasks.

1. In Windows 7 or Windows Vista, open the [Make it easier to focus on tasks](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Make it easier to focus on tasks**.
2. Then, select the options that are most helpful:
 - **Turn on Narrator.** This option sets Narrator to run when you log on to Windows. Narrator reads on-screen text aloud and describes some events (such as the appearance of an error message) while you're using the computer. For more information about using Narrator, read [Hear text read aloud with Narrator \(http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator\)](http://windows.microsoft.com/en-us/windows7/Hear-text-read-aloud-with-Narrator).
 - **Remove background images.** This option turns off all unimportant, overlapped content and background images to help make the screen easier to see.
 - **Turn on Sticky Keys.** This option sets Sticky Keys to run when you log on to Windows. Instead of having to press three keys at once (such as when you must press the Ctrl, Alt, and Delete keys together to log on to Windows), you can press one key at a time by turning on Sticky Keys and adjusting the settings. Then, you can press a modifier key and have it remain active until another key is pressed.
 - **Turn on Toggle Keys.** This option sets Toggle Keys to run when you log on to Windows. Toggle Keys can play an alert each time you press the Caps Lock, Num Lock, or Scroll Lock. These alerts can help prevent the frustration of inadvertently pressing a key.
 - **Turn on Filter Keys.** This option sets Filter Keys to run when you log on to Windows. You can set Windows to ignore keystrokes that occur in rapid succession or keystrokes that are held down for several seconds unintentionally.
 - **Turn off all unnecessary animations (when possible).** This option turns off animation effects, such as fading, when windows and other elements are closed.
 - **How long should Windows notification dialog boxes stay open?** With this option, you can choose how long notifications are displayed on the screen before they close.
 - **Prevent windows from being automatically arranged when moved to the edge of the screen.** This option prevents windows from automatically resizing and docking along the sides of your screen when you move them there.

Tip

Replacement for Serial Keys

Windows 7 does not include Serial Keys. In previous versions of Windows, Serial Keys provided support so that alternative input devices, such as augmentative communication devices, could be plugged into the computer's serial port. For individuals who use these devices, it is important to install an alternative solution prior to upgrading to Windows 7. Recommended solutions: [AAC Keys from AAC Institute \(www.aacinstitute.org/\)](http://www.aacinstitute.org/) and [SKEYS from Eyegaze \(www.eyegaze.com/\)](http://www.eyegaze.com/).

Assistive technology products for people with language impairments

Assistive technology products used with computers by people with language impairments are described in the following list.

- **Augmentative and assistive communication (AAC) devices** are used by individuals who cannot speak or who find speaking difficult. The user types in a word, phrase, or sentence to communicate—or selects a series of symbols or pictures on the device—and the device “speaks” aloud for the user. Often these devices are used to replace a PC keyboard. In these cases, the user is able to use one device for both communicating and for computer input. One example of an augmentative communication device is QualiSPEAK Pro.
- **Touchscreens** are devices placed on the computer monitor (or built into it) that allow direct selection or activation of the computer by touching the screen. Earlier we discussed how touchscreens benefit people with mobility impairments, but they also benefit users with language disabilities. The ability to touch the computer screen to make a selection is advantageous for people with language and learning disabilities because it is a more simple, direct, and intuitive process than making a selection using a mouse or keyboard. With Windows 7 and a touch-screen monitor, you can just touch your computer screen for a more direct and natural way to work. Use your fingers to scroll, resize windows, play media, and pan and zoom. Additional touchscreen technologies are available for Windows. The Gus Communicator PC10 Touch Screen Tablet PC is an example of an assistive technology product that can be used via touch to communicate.
- **Speech synthesizers** provide the user with information through a computer voice. Also known as *text-to-speech (TTS)*, the speech synthesizer receives information in the form of letters, numbers, and punctuation marks and then “speaks” it out loud to the user in a computer voice. Scan and Read Pro is an example of an assistive technology product that produces more natural-sounding speech synthesis.

Learning impairments

Learning impairments can range from conditions such as dyslexia and attention deficit disorder to retardation. Processing problems are the most common and have the most impact on a person’s ability to use a computer. These conditions interfere with the learning process.

Many people with these impairments are perfectly capable of learning if information is presented to them in a form and at a pace that is appropriate to them individually. Information that is presented in short, discrete units is often easier to understand. In addition, many individuals with learning disabilities learn more efficiently using their visual abilities rather than their auditory skills. Many are primarily visual or auditory learners, whereas other learners are “ambidextrous.” Control over the individual learner’s single- or multisensory experience is critical.

Did you know?

According to the International Dyslexia Association and the Learning Disabilities Association of America, about 15 percent of the population (close to one in seven people) has a learning disability.⁷

⁷ <http://www.interdys.org/FAQHowCommon.htm> Acquired February 10, 2011.

Accessibility features in Windows


The simplified interface in Windows 7 and Windows Vista benefits people with learning impairments, in addition to those with language impairments, because it helps reduce the number of competing elements on the screen. Complicated user interfaces can interfere with learning. User interface engineers found that an emphasis on a consistent user experience had the greatest positive impact on individuals with processing problems. Consider the person who can't read his own handwriting but can edit for others by using a computer. Additional computer settings, such as adjustable text and screen element sizes, speech capabilities, choice of visual or sound warnings for system events, and Internet display options, can benefit those with learning impairments.

Features in Windows and Office that might be useful for people with learning impairments include:

- Make it easier to focus on reading and typing tasks.
- Check spelling and grammar in Office programs.
- Use AutoComplete in Office 2010.

Make it easier to focus on reading and typing tasks

You can use the settings on the **Make it easier to focus on tasks** page in the Ease of Access Center in Windows 7 and Windows Vista to reduce the amount of information on the screen and to help people with learning disabilities focus on reading and typing tasks.

In Windows 7 or Windows Vista, open the [Make it easier to focus on tasks](#) page: Click the **Start** button , click **Control Panel**, click **Ease of Access**, click **Ease of Access Center**, and then click **Make it easier to focus on tasks**.

Check spelling and grammar in Office programs

In Microsoft Office 2010, the **Spelling & Grammar** feature is on the **Review** tab. Also on the **Review** tab are the Research, Thesaurus, and Translate features, which also may be helpful for people with learning disabilities.

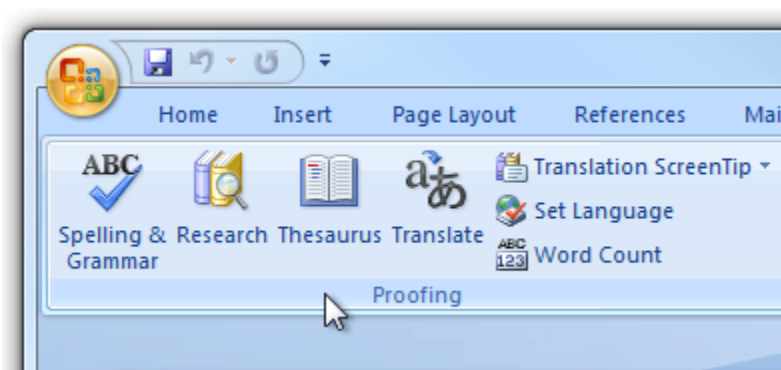


Figure 2-9 The features on the Office 2010 **Review** tab can be helpful for people with learning disabilities.

Assistive technology products for people with learning impairments

The following list includes assistive technology products used with computers by people with learning impairments:

- **Word prediction programs** allow the user to select a desired word from an on-screen list located in the prediction window. The program predicts words from the first one or two letters typed by the user. The word can then be selected from the list and inserted into the text by typing a number, clicking the mouse, or scanning with a switch. These programs help support literacy, increase written productivity and accuracy, and increase vocabulary skills through word prompting. ClaroRead Standard and TextHelp Read & Write Standard are just two examples of such programs.
- **Reading tools and learning disabilities programs** include software designed to make text-based materials more accessible for people who struggle with reading. Options can include scanning, reformatting, navigating, or speaking text out loud. These programs help people who have difficulty seeing or manipulating conventional print materials; people who are developing new literacy skills or who are learning English as a foreign language; and people who comprehend better when they hear and see text highlighted simultaneously. The Universal Reader is an example of assistive technology that can make reading easier.
- **Speech synthesizers** (also known as *text-to-speech*) speak information aloud in a computerized voice. Speech synthesizers can be helpful for people with learning, language, or vision impairments. Products, such as Scan and Read Pro, produce natural-sounding speech synthesis that can support reading skills development.
- **Speech recognition programs** allow computer navigation by voice rather than entering data by keyboard or mouse. In addition to voice, you can still use a mouse and keyboard to enter data, write text, and navigate applications. People who have difficulty typing or reading text because of a learning, language, or mobility impairment can often successfully work on a computer with the use of speech recognition. Speech Recognition is available in [Windows 7](#) and [Windows Vista](#). Some may prefer or require a more robust speech recognition program, such as Dragon NaturallySpeaking.

Age-related impairments

Age-related impairments occur as part of the natural aging process. They may include any of the various types of impairments already discussed in this guide.

As people age, they may experience vision or hearing loss, mobility or dexterity impairments, or difficulties with learning or language. For example, by the time we reach our fifties, two-thirds of us will have developed vision, hearing, or dexterity impairments that may affect our computer use, such as changes in vision that make it harder to read online text or arthritis in our hands that makes typing difficult or painful.⁸

As the age of the population increases—and more people experience the disabilities, impairments, and other functional limitations that often come with age—providing products and services that meet the needs of older people will become increasingly important. Because of accessible technology, businesses will be able to tap into an expanding market of underserved consumers, governments and other organizations will offer better access to services to more people, and consumers will have greater access to essential services and information.

⁸ Chappell NL, Cooke HA. 2011. Age Related Disabilities - Aging and Quality of Life. In: JH Stone, M Blouin, editors. International Encyclopedia of Rehabilitation. Available online: <http://cirrie.buffalo.edu/encyclopedia/en/article/189/>

Accessibility features in Windows

Many of the accessibility features in Windows 7 and Windows Vista can be helpful in addressing age-related impairments. For specific types of limitations, such as low vision, hearing loss, or dexterity impairments, consult the sections of the guide that deal specifically with those disabilities or use the Ease of Access Center in Windows 7 and Windows Vista to learn which built-in accessibility features best meet the needs of an individual.

The Ease of Access Center also includes a questionnaire that poses questions about one's experience with a variety of everyday life activities—such as watching television and writing with a pencil or pen—and makes recommendations for accessibility settings based on the answers. This can be especially helpful for people who are beginning to experience age-related limitations and who may not identify themselves as having an impairment or disability. Whether they have trouble seeing images on TV or hearing conversations in a crowded room, Windows can provide accessibility suggestions based on actual experiences rather than on impairment language or labels.

Assistive technology products for people with age-related impairments

Most age-related impairments do not require specialized assistive technology products and can be aided by customization options, such as font size, contrast, or other customization options within the operating system. If an age-related impairment becomes serious enough to warrant specialized assistive technology, the relationship to age is no longer the primary technology consideration and solutions are identified in this guide by the type of disability or impairment experienced.

Related resources:

- Computing Guide for Boomers (www.microsoft.com/enable/aging/)
- Ten tips for the awkward age of computing (www.microsoft.com/enable/aging/tips.aspx)
- Save time with quick computer shortcuts (www.microsoft.com/athome/organization/compshortcuts.aspx)
- 5 ways to make your keyboard easier to use (www.microsoft.com/athome/setup/keyboard.aspx)
- Visualize it: 5 ways to make your PC easier to see (www.microsoft.com/athome/setup/magnify.aspx)
- Always looking for your mouse pointer? (www.microsoft.com/athome/setup/cursor.aspx)
- Customize your PC (www.microsoft.com/athome/setup/customize.aspx)

Chapter 3: Selecting accessible technology

When selecting technology for your company or organization, it is important to consider accessibility features and assistive technology products that will be helpful to individuals with specific disabilities. It is also important to plan for the onset of temporary disabilities that will inevitably occur.

At Microsoft, for example, we provide ergonomic hardware and assistive technology consultation so our employees can be productive, comfortable, and injury-free at work. We are a more diverse company because of our efforts to recruit and employ top-quality people, including those who happen to have disabilities, and we recognize that our employees with disabilities make an added contribution by helping us more effectively recognize, understand, and reach a broader market for our products. Accommodating and enabling employees to perform the necessary functions of their jobs ultimately enhances our ability to develop great products and services for everyone. For more information, see [Accessibility at Microsoft \(www.microsoft.com/enable/microsoft/\)](http://www.microsoft.com/enable/microsoft/).

This chapter includes guidance on how to go about identifying accessibility solutions, details about accessibility settings in Microsoft products, a starter guide to assistive technology hardware and software, and a needs assessment tool.

Identifying the right mix of accessibility solutions

Improving the work experience can mean different things to different individuals—having a multisensory experience of audio paired with a visual representation may benefit one person, and reducing visual and auditory distractions may be better for another. There are hundreds of types of accessibility solutions available—both built-in features and assistive technology hardware and software products—so it is important to take the time to identify the right mix of accessibility solutions for each individual.

Needs assessments

Identifying the best assistive technology solution often requires an in-depth needs assessment to understand how a difficulty or impairment impacts computer use. It is important to take the time to evaluate an individual's needs through an assessment tool or to provide assistive technology consultation with an assistive technology expert before purchasing products.

Some organizations have staff trained in accessibility assessment. If your organization doesn't have such resources available, this guide includes an Assistive Technology Decision Tree tool to help you. In addition, many accessibility consultants are available through various organizations, including those listed here.

Accessibility consultants

Many assistive technology centers and occupational therapists have accessibility consultants to help individuals identify the right mix of accessibility features and products. Some centers offer computer training, and many organizations have lending libraries, so you can try a product before committing to purchase it.

In the United States

- **Microsoft Accessibility Resource Centers** (www.microsoft.com/enable/centers) are available in the United States. These centers provide expert consultation on assistive technology and accessibility features built into Microsoft products.
- **The Alliance for Technology Access** (www.ataccess.org) and the **Association of Assistive Technology Act Programs** (www.ataporg.org/) are other U.S. networks dedicated to providing information and technology support services to people with disabilities.
- **The Rehabilitation Engineering and Assistive Technology Society of North America**, known as RESNA (www.resna.org), offers certification programs for assistive technology practitioners. RESNA is another source for identifying assistive technology experts who can assist organizations in North America.

In Asia

- **Tokyo Information Technology Regional Support Center** for persons with disabilities (www.tokyo-itcenter.com/) delivers training, organizes IT support, and has an exhibition room for people with disabilities.
- **Osaka IT Station** (www.itsapoot.jp/) provides work-related training, organizes IT support, and has an exhibition room for people with disabilities.
- **National Information Society Agency (NIA), Korea** (www.nia.or.kr/koil/default.asp) is a statutory agency founded by Article 10 of the Framework Act on Informatization Promotion for the purpose of promoting informatization and to support development of related policies for national agencies and local autonomies. NIA has been making efforts to improve web accessibility in Korea, including developing web accessibility standards, operating web accessibility education and certification programs and portal sites (www.wah.or.kr), supporting development and purchase of assistive technologies, and promoting awareness on web accessibility issues through campaigns and seminars.

In Latin America

- **POETA Accessible Centers** in Latin America (www.poetaweb.org) deliver training in information and communications technology, civic education, and job readiness to thousands of at-risk youth and people with disabilities across Latin America and the Caribbean.

In Europe

- **AbilityNet** in the United Kingdom (www.abilitynet.org.uk/) helps ensure that people with disabilities in the United Kingdom, whether as individuals or through supporting organizations, have accessible IT that enables and improves their lives. AbilityNet is the leading U.K. charity for computing and disability and has a network of centers. A range of free resources is available from their website. AbilityNet also offers advice on web and software accessibility, including user testing.
- **ONCE**, the Spanish National Organization for the Blind (www.once.es) and its foundation, ONCE Foundation for Cooperation and the Social Integration of People with Disabilities in Spain (www.fundaciononce.es), provide work-related training and employment for people with disabilities. They also aim for universal accessibility, promoting the creation of universally accessible environments, products, and services.

- **Enable Ireland** (www.enableireland.ie/) works in partnership with those who use its services to achieve maximum independence, choice, and inclusion in their communities. Enable Ireland runs a national assistive technology training service specializing in electronic assistive technology, providing advice and training on assistive technology products to Enable Ireland service users and staff.
- **Charta 77/PCs without Barriers** in the Czech Republic (en.kontobariery.cz/) provides technology knowledge and support to those living with disabilities through 16 PC centers across the Czech Republic.
- **The Organization of People with Disabilities and Their Friends APEIRONS** in Latvia (www.apeirons.lv/) has a goal to integrate people with disabilities into society, in addition to creating more accepting attitudes toward them from the general public. The organization operates a lab in downtown Riga where people can take classes, learn about accessible technologies, and test various options.
- **The eCentrum project** in Poland (www.idn.org.pl/) specializes in the use of modern technologies in education and mobilization for those living with disabilities, creating e-learning and blended learning educational programs, along with desktop training at several locations throughout Poland.

In Australia

- **Vision Australia** (www.visionaustralia.org) works in partnership with Australians who are blind or have low vision to help achieve the possibilities they choose in life. Vision Australia services include assistive technology assessment, computer training, and expertise in web and software accessibility testing, training, and advice.

Online training

In addition, online training and web seminars are available for learning specific types of assistive technology products. Primary sources for online training include:

- Accessibility for Businesses and Organizations (www.microsoft.com/enable/business/).
- The Assistive Technology Industry Association (www.atia.org).
- The HP Guide to Selecting Assistive Technology (www.hp.com/hpinfo/abouthp/accessibility/atproduct.html).

Accessibility in Microsoft products

Following is a list of accessibility features of these products:

- Windows 7
- Internet Explorer 8
- Office 2010

Tip

Demos and tutorials for accessibility features can be found at www.microsoft.com/enable/.

Accessibility features are found in current and earlier versions of Microsoft products including Windows, Office, and Internet Explorer. Find more information at www.microsoft.com/enable/products/.

Accessibility in Windows 7

Windows 7 includes accessibility options and programs that make it easier to see, hear, and use your computer, including ways to personalize your PC.

Windows 7 includes significant accessibility improvements. Magnifier now includes a lens mode and full-screen mode. On-Screen Keyboard can be resized to make it easier to see and includes text prediction. Windows 7 also gives you more ways to interact with your PC by taking advantage of new strides in speech recognition and touch technology.

Find more information at www.microsoft.com/enable/products/windows7/.

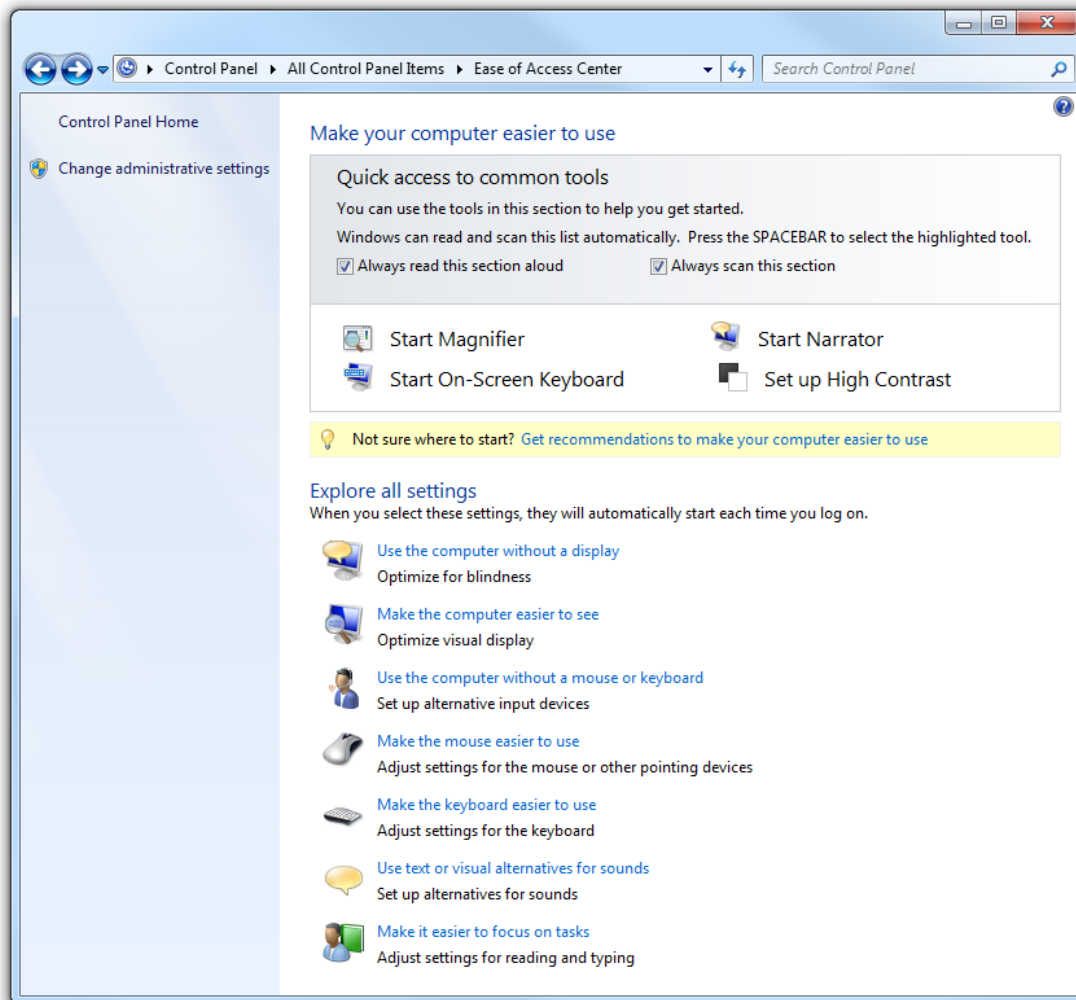



Figure 3-1 The Windows 7 Ease of Access Center gives you quick access to common tools.

Overview of accessibility features in Windows 7

Feature	Description
Ease of Access Center	<p>A central location to explore accessibility settings and programs to make your computer easier to use. The Ease of Access Center can be found in the Control Panel by selecting Windows logo key  + U and when logging on to Windows.</p> <p>The Ease of Access Center includes:</p> <ul style="list-style-type: none">▪ Quick access to common tools. Start Magnifier, On-Screen Keyboard, Narrator, and High Contrast quickly.▪ Get recommendations to make your computer easier to use. An optional questionnaire provides a personalized list of recommended settings, based on your answers to a series of questions about your eyesight, dexterity, hearing, and more. A custom list of recommended settings is provided so you can choose which options to try.▪ Explore all settings by category. Instead of looking for accessibility settings in various places, settings are organized so you can explore how to:<ul style="list-style-type: none">○ Use the computer without a display.○ Make the computer easier to see.○ Use the computer without a mouse or keyboard.○ Make the mouse easier to use.○ Make the keyboard easier to use.○ Use text or visual alternatives to sounds.○ Make it easier to focus on tasks.
Magnifier	<p>Enlarges portions of the screen, making it easier to view text and images and to see the whole screen more easily. Magnifier in Windows 7 now includes full-screen mode, lens mode, and docked mode.</p> <p>The magnification quality is improved, and you can set the magnification level up to 16 times the original size and choose to track what you magnify by movement of your mouse, the keyboard, or text editing. Options include:</p> <ul style="list-style-type: none">▪ Choose where Magnifier focuses so that it follows the movement of the mouse cursor, keyboard focus, or text editing.▪ Change the zoom level.▪ Set the zoom increment.▪ Set the lens size.▪ Turn on color inversion for better screen legibility.▪ Display the Magnifier toolbar.
Make items on the screen appear larger	<p>Make the text and other items, such as icons, on your screen easier to see by making them larger. You can do this without changing the screen resolution of your monitor or laptop screen. This allows you to increase or decrease the size of text and other items on your screen while keeping your monitor or laptop set to its optimal resolution.</p>

Feature	Description
On-Screen Keyboard	<p>Displays a visual keyboard with all the standard keys. Instead of relying on the physical keyboard to type and enter data, you can use On-Screen Keyboard to select keys by using the mouse or another pointing device.</p> <p>On-Screen Keyboard in Windows 7 can be resized and customized to make it easier to see and use. On-Screen Keyboard now also includes text prediction in eight languages. When text prediction is enabled, as you type, On-Screen Keyboard displays a list of words that you might be typing. Options include:</p> <ul style="list-style-type: none"> ▪ Change how information is entered. ▪ Set On-Screen Keyboard to use audible clicks. ▪ Use a numeric keypad. ▪ Enable text prediction.
Speech Recognition	<p>Command your PC with your voice, including the ability to dictate into almost any application. You can dictate documents and email and surf the web by saying what you see. An easy setup process and an interactive tutorial are available to familiarize you with the speech commands and to train your computer to better understand you. Options include:</p> <ul style="list-style-type: none"> ▪ Dictate text using Speech Recognition. ▪ Use the dictation scratchpad. ▪ Add or edit words in the Speech Dictionary. ▪ Use common commands.
Windows Touch	<p>Although great for a lot of tasks, using a keyboard and mouse is not always the easiest way to do things. With Windows 7, if you've got a touchscreen monitor, you can just touch your computer screen for a more direct and natural way to work. Use your fingers to scroll, resize windows, play media, and pan and zoom.</p>
Narrator	<p>Windows comes with a basic screen reader, called Narrator, which reads text on the screen aloud and describes some events (such as the appearance of an error message) that happen while you're using the computer. You can find Narrator in the Ease of Access Center. Options include:</p> <ul style="list-style-type: none"> ▪ Choose which text Narrator reads aloud. ▪ Change the Narrator voice. ▪ Start Narrator minimized.
Keyboard shortcuts	<p>Keyboard combinations of two or more keys that, when pressed, can be used to perform a task that would typically require a mouse or other pointing device. Keyboard shortcuts can make it easier to interact with your computer, helping to save you time and effort.</p>
Mouse Keys	<p>Instead of using the mouse, you can use the arrow keys on the numeric keypad to move the pointer.</p>
Sticky Keys	<p>Instead of having to press three keys at once (such as when you must press the Ctrl, Alt, and Delete keys simultaneously to log on to Windows), you can press one key at a time, when Sticky Keys is turned on.</p>

Feature	Description
Filter Keys	Ignore keystrokes that occur in rapid succession and keystrokes that are held down for several seconds unintentionally.
Visual Notifications	Replace system sounds with visual cues, such as a flash on the screen, so system alerts are announced with visual notifications instead of sounds.
Captions	Get information via animations and video that some programs use to indicate that activity is happening on your computer.

Tip

Replacement for Serial Keys

Windows 7 does not include Serial Keys. In previous versions of Windows, Serial Keys provided support so that alternative input devices, such as augmentative communication devices, could be plugged into the computer's serial port. For individuals who use these devices, it is important to install an alternative solution prior to upgrading to Windows 7. Recommended solutions: [AAC Keys from AAC Institute](http://www.aac institute.org/) (www.aac institute.org/) and [SKEYS from Eyegaze](http://www.eyegaze.com/) (www.eyegaze.com/).

Accessibility in Internet Explorer 8

The Internet is easier to see and explore with accessibility settings and features in Internet Explorer 8. Internet Explorer 8 lets you select text and move around a webpage with the keyboard, makes it easier to copy and paste text from webpages, and lets you zoom in on a webpage. Enhanced keyboard access can also be found in the toolbar buttons, search box items, address bar, and tabs. Find more information, including tutorials, for how to use these features at www.microsoft.com/enable/products/ie8/.

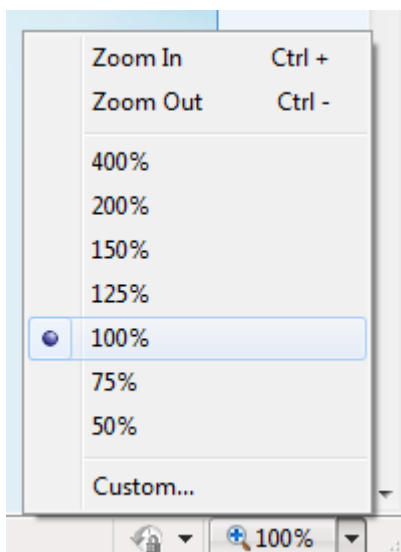


Figure 3-2 Zoom adjustment in Internet Explorer 8 can make webpages easier to see.

Overview of accessibility features in Internet Explorer 8

Feature	Description
Zoom in on a webpage	Zoom lets you enlarge or reduce the view of a webpage. Unlike changing font size, zoom enlarges or reduces everything on the page, including text and images.
Select text and move around a webpage with the keyboard	Rather than using a mouse to select text and move around within a webpage, you can use standard navigation keys on your keyboard—Home, End, Page Up, Page Down, and the Arrow keys. This feature is called <i>Caret Browsing</i> and is named after the <i>caret</i> —or cursor. This makes it easier to select, copy, and paste text to another document with a keyboard instead of a mouse.
Simplify common tasks with Accelerators	Make tasks like copying, navigating, and pasting easier by using accelerators to save time and keystrokes. Accelerators help you quickly perform tasks without navigating to other websites to get things done. Highlight text from any webpage, and then click the blue Accelerator icon that appears above your selection to obtain driving directions, translate and define words, send email content, or search.
Choose colors used on webpages	Make webpages easier to see by changing the text, background, link, and hover colors. Internet Explorer 8 supports the system link color, so High Contrast mode and color preferences you have chosen in Windows will work in Internet Explorer too.
Choose font, colors, and advance accessibility formatting options	Under Tools/Internet Options , you can choose your own font style , size , and colors for links and webpages or choose advanced accessibility formatting options that let you use your own customized style sheet.
Choose advanced settings	Make webpages easier to see and work with by adjusting accessibility settings for browsing, multimedia, printing, alternative text, and more in Tools/Internet Options .
Find text on a webpage	As you type words into the text box, the matching words are highlighted on the webpage, making it easy to quickly scroll the page and see all the instances of the words you're searching for.

Accessibility in Microsoft Office 2010

Microsoft Office 2010 makes it easier for everyone to create documents, spreadsheets, and presentations with rich content. Finding the commands you need is easier with the completely redesigned user interface. Find more information at www.microsoft.com/enable/products/office2010/.

Overview of accessibility features in Office 2010

Feature	Description
Accessibility Checker	Word 2010, Excel 2010, and PowerPoint 2010 include an Accessibility Checker that identifies areas which could be challenging for users with disabilities to view or use. With the task pane, users can fix potential content problems.
The Ribbon	The menus and toolbars in all Office 2010 programs have been replaced with the Ribbon, designed to help you quickly find the commands that you need to complete a task. To move through the ribbon with a keyboard instead of a mouse, you can press Ctrl+Right Arrow or Ctrl+Left Arrow on a Ribbon tab to move to the next or previous Ribbon group tab.
Zoom	The Zoom tool makes resizing your work area faster and easier.
Produce professional-looking results quickly and easily	Galleries simplify the process of creating great-looking documents, presentations, and spreadsheets by showing a set of potential design choices. No complex dialog boxes are needed.
Live Preview	Live Preview lets you see exactly how your gallery selection will look when it is applied.
Create diagrams and charts without a mouse	Organizational charts, process diagrams and other graphics can be created with SmartArt® graphics tools, which are completely accessible from the keyboard or assistive technology devices.
Compose documents by talking to your computer	Office 2010 works with Speech Recognition in Windows 7 so you can navigate the user interface, compose documents, open email, and more—without using a mouse or keyboard.
Create accessible portals with SharePoint Designer 2010	SharePoint Designer 2010 includes a built-in compatibility checker for common accessibility standards to help make sure websites are easy to use for everyone. More Accessible mode in SharePoint Services provides greater accessibility for custom controls.
Scroll, zoom, listen, and automate	Zoom and scroll directly with a Microsoft IntelliMouse®, and let Microsoft Narrator read text and commands aloud.
Correct Mistakes as you type	Correct capitalization and spelling as you type, plus formatting, punctuation marks, symbols, and lists.
Use Full Screen Reading view	Word 2010 includes a Full Screen Reading view that improves the resolution and display of text for reading on the screen.

Assistive Technology Product Starter Guide

The following tables provide lists of assistive technology hardware and software products by category. Specific examples of the assistive technology products are provided. The tables are by no means exhaustive or an endorsement of these products but are provided as a sampling of what is available today. These types of assistive technology products are also referenced in the Assistive Technology Decision Tree which follows.

Assistive technology: hardware products

	Vision	Mobility	Hearing	Language	Learning	Example
Amplified phone			●			Ameriphone Dialogue XL
Augmentative communication device				●		GoTalk 4+
Alternative input		●				HeadMouse Extreme and Tracker Pro
Alternative keyboard	●	●				ZoomText large-print keyboard and Orbitouch keyless keyboard
Alternative mouse or pointing device		●				BIGtrack
Braille display	●					Eurobraille Esys 12 Braille Display
Braille printer	●					Emprint SpotDot
DAISY reader	●					Victor Reader Wave
Ergonomic keyboard		●				Microsoft Wireless Laser Desktop 4000
Foot mouse		●				Footime Foot Mouse
Hands-free telephone		●				QualiPHONE*
High-resolution monitor	●					HP w1858 18.5-inch diagonal monitor
Large-button phone	●	●				Ameriphone Dialogue XL
Listening aid			●			Motiva Personal FM System
Monitor glare guard	●					Fellowes anti-glare screen
Movable numeric keypads		●				Maxim Low-Force Keypad (USB)
Notetaker	●				●	Livescribe Pulse Smartpen and GW Sense Navigation
One-handed keyboard		●				Maltron One-Handed Keyboard
Optical character recognition system	●				●	Scan and Read Pro**
Oversized or undersized keyboard		●				BigKeys LX and WinMini
Oversized monitor	●					HP w2338h 23-inch diagonal monitor
Scanner	●				●	Scan N Talk Ultra

	Vision	Mobility	Hearing	Language	Learning	Example
Screen magnifier/magnifier	●					Desktop SenseView DSV, SmartView Graduate, and ColorMouse
Switch		●		●		Big Red Twist Switch
Talking calculators	●				●	Sci-Plus 300 large display talking calculator
Touchscreens		●		●	●	Magic Touch Add-On Touch Screens
TTY			●			Compact/C
Voice synthesizer/ Speech to text	●		●	●	●	TextSpeak TS Wireless AAC Speech Generator and iCommunicator***

*Requires PC to phone line connection; **Requires flatbed scanner (such as Scan N Talk Ultra); ***Requires installation on a PC

Assistive technology: software products

	Vision	Mobility	Hearing	Language	Learning	Example
Braille translator	●					Duxbury Braille Translator
Communication aid				●		Overboard
Graphical idea trees					●	Read&Write GOLD
Macro writing software					●	ClaroRead Standard
On-screen keyboard		●				ScreenDoors and SofType
Reading aid	●					gh Player 2.2
Scanner software	●				●	Scan N Talk Ultra
Screen magnifier	●					ZoomText v9.1
Screen readers	●					Window-Eyes v7.2
Speech recognition/ Voice dictation					●	Dragon Naturally Speaking Preferred
Talking calculators	●				●	Sci-Plus 300 large-display talking calculator*
Task organizer software	●	●	●	●	●	MyLifeOrganized
Voice synthesizer/ Speech to text	●		●	●	●	TextSpeak TS Wireless AAC Speech Generator and iCommunicator
Word prediction software					●	Read&Write GOLD and ClaroRead Standard

*Includes a large-display calculator

Purchasing assistive technology

The Enablemart website (www.enablemart.com) is one source where you can purchase assistive technology products. Governments and large businesses or organizations might be eligible for volume pricing.

Assistive Technology Decision Tree

The [UnumProvident Assistive Technology Decision Tree](http://www.microsoft.com/enable/download/default.aspx#righttech) (www.microsoft.com/enable/download/default.aspx#righttech), shown in Figure 3-3, leads you through questions based on the type of impairment to identify assistive technology products that you might consider. By asking questions regarding the extent and type of impairment (including range of motion, quadriplegia, back impairment, vision impairment, hearing/auditory impairment, speech impairment, and psychological impairment), the decision tree narrows down technology that might be helpful for an individual.

Figure 3-3a Assistive Technology Decision Tree

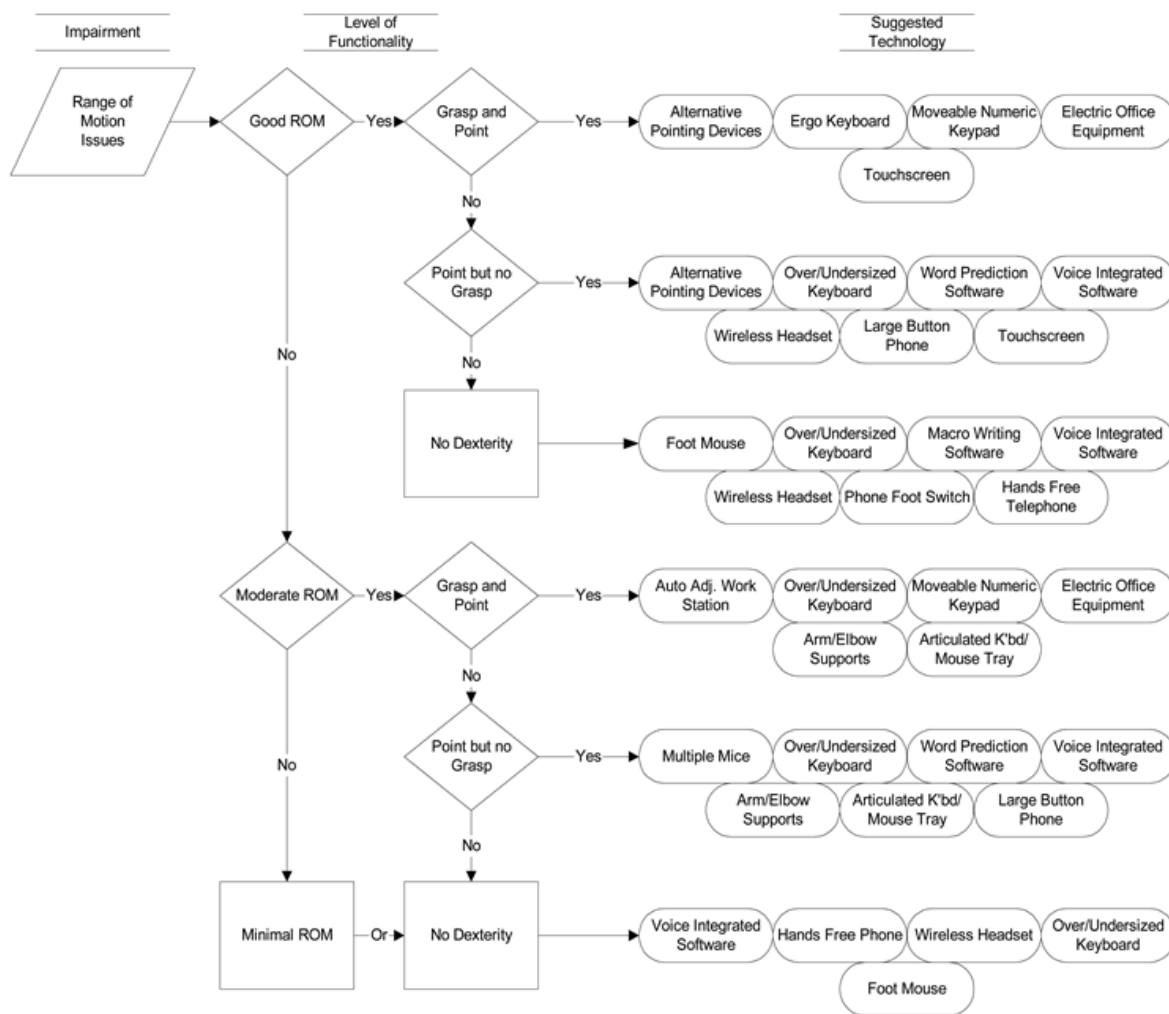


Figure 3-3b Assistive Technology Decision Tree

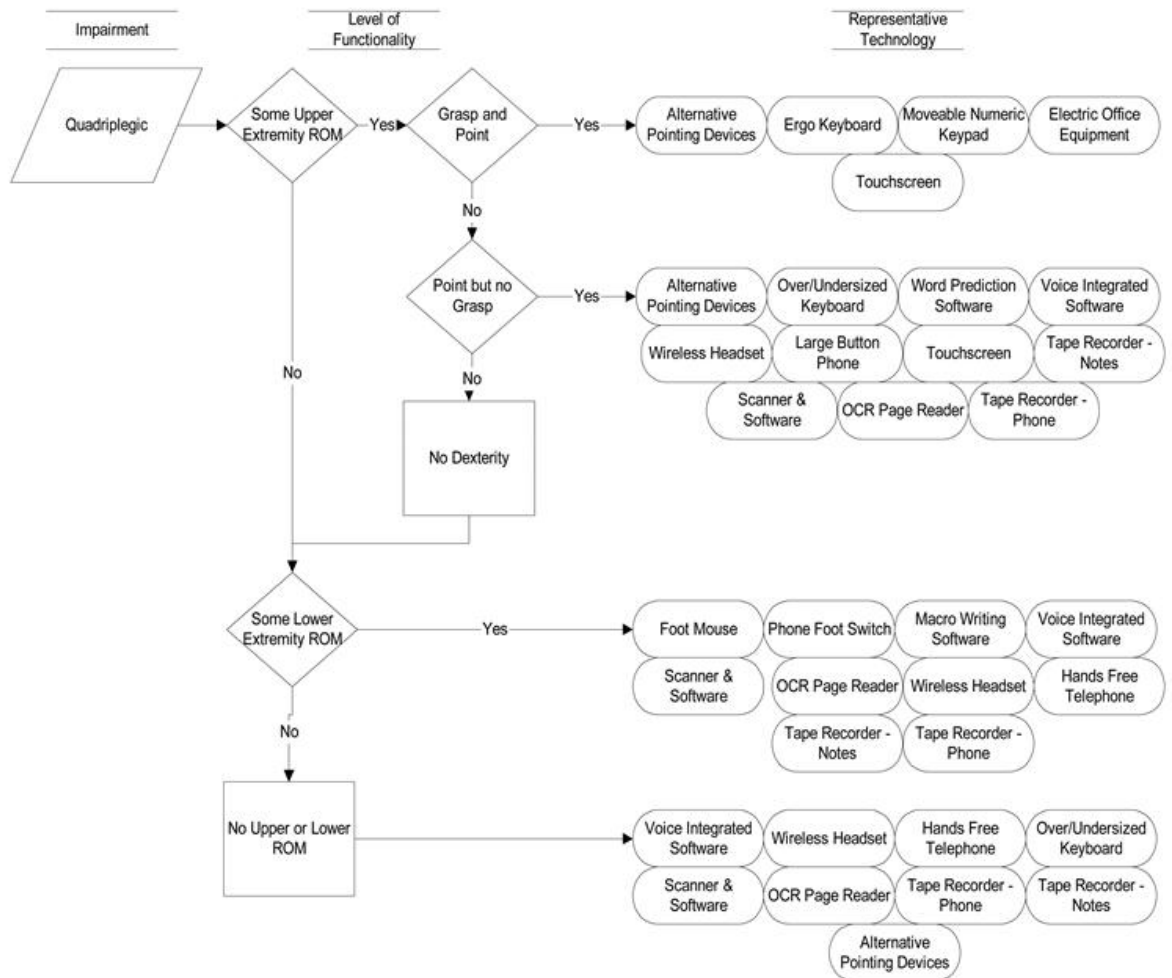


Figure 3-3c Assistive Technology Decision Tree

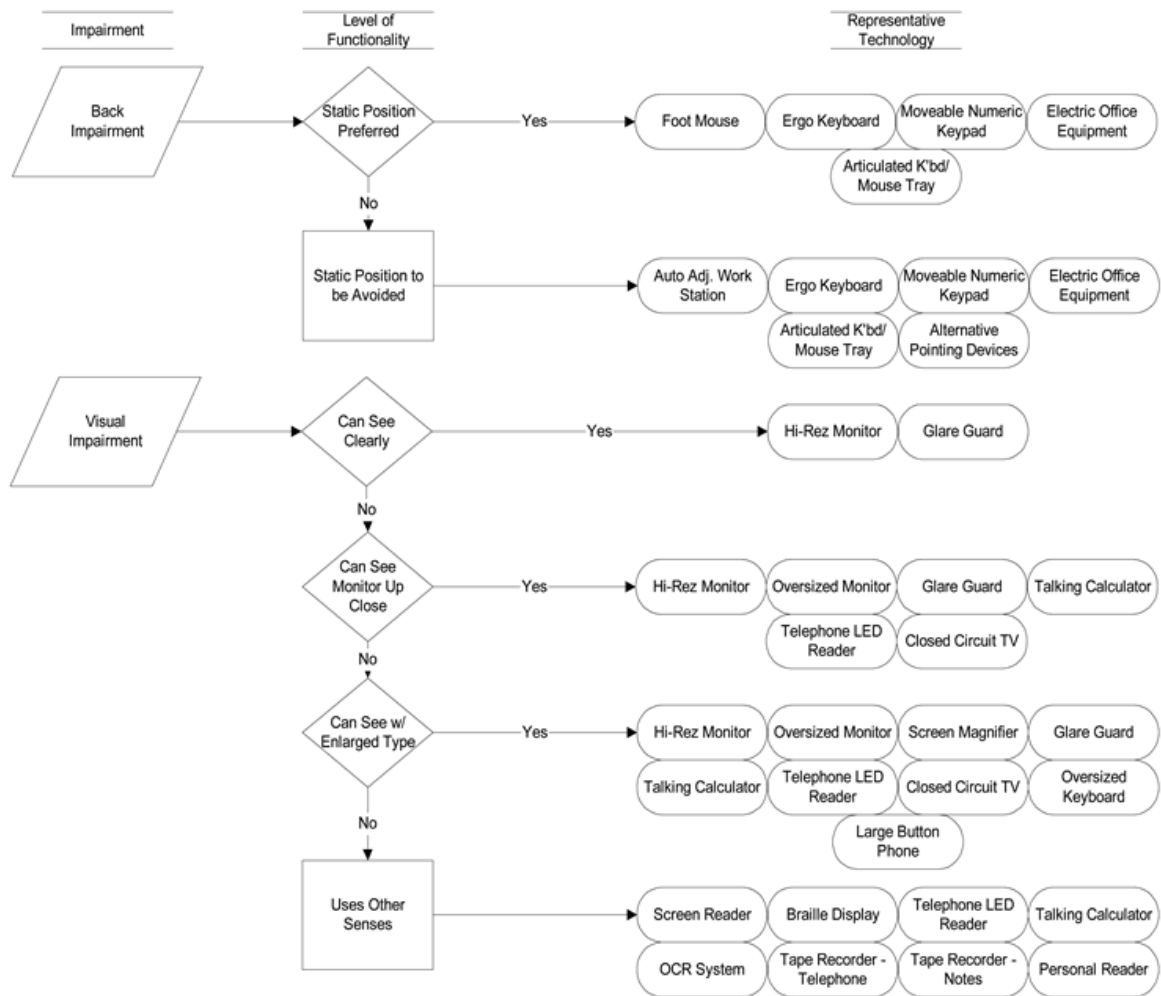
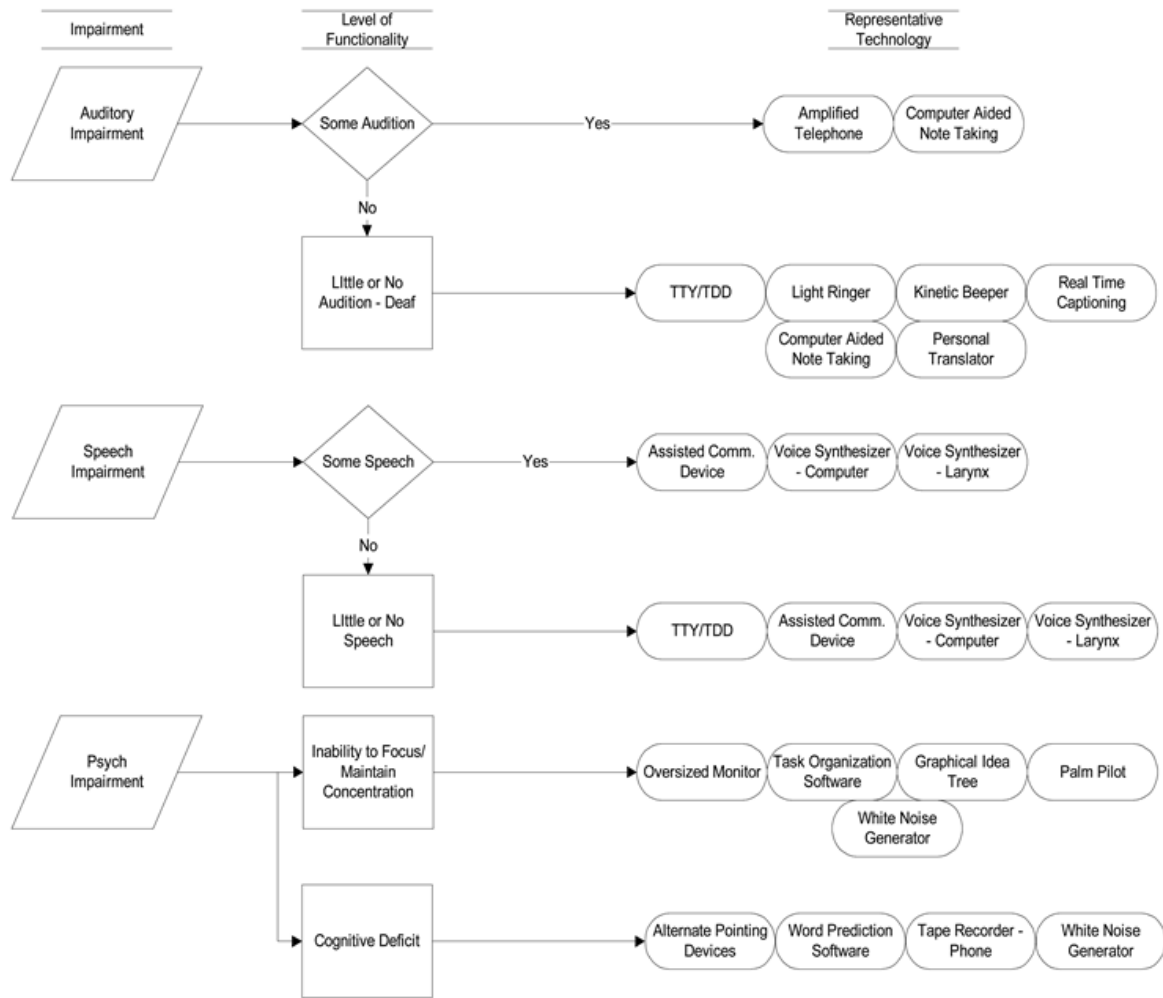


Figure 3-3d Assistive Technology Decision Tree



Chapter 4: Planning and training for accessibility

Microsoft has developed Accessibility Training Courses designed to help organizations create more accessible software products using the Windows platform. Online developer training courses are designed to help large organizations train their web development teams on how to make software applications and websites more accessible.

Developing an accessible technology plan

For organizations that want to increase the accessibility of their technology, there are a few key steps and considerations. Start by [developing an accessible technology plan](#) for your organization that enables you to integrate accessibility into your existing processes and product life cycles. The accessible technology plan should include specific steps:

- Set your accessibility goals.
- Assess your accessibility needs and current level of accessibility.
- Identify requirements.
- Lay out an implementation and execution strategy to meet your goals.

To carry out the plan, you need to:

- **Purchase accessible IT.** Lay a solid foundation for accessibility by purchasing an operating system, productivity suite, browser, and other information technology that is accessible and includes built-in features and settings for added accessibility. Accessible IT also provides a platform you can use to develop internal systems and applications that are not only accessible themselves but also compatible and interoperable with other accessible technology and assistive devices.
- **Train employees** on why building more accessible products makes good sense and how to use the accessibility features included in your internal systems. Train web developers on how to create more accessible websites to help users benefit from increased accessibility choices.
- **Make websites and internal tools accessible.** Use established guidelines and best practices to make your organization's websites and internal tools accessible to all employees.
- **Evaluate and update legacy and proprietary systems for greater accessibility.** Determine whether your current legacy and proprietary systems have built-in accessibility options, features, shortcuts and toolbars you could be using. Do employees with disabilities, impairments, or age-related limitations have trouble accessing your systems?
- **Design and develop accessible technology.** Make accessibility an integral part of your product design and development process in a programmatic way, right from the start of the product development cycle.

Accessibility training for web developers and testers

Microsoft has developed online Accessibility Training Courses designed to help organizations train their IT professionals on how to build accessible technology and improve the accessibility of their websites and in-house technologies.

The training modules (available on a CD that comes with this guide and available online at <http://msdn.microsoft.com/accessibility>) are valuable resources you can use to help inspire you to learn more about creating accessible products and thereby incorporate accessibility in a programmatic way as a part of the product development cycle.

Each training module listed contains a description of the training and the intended audience. For screen readers that do not recognize Microsoft Silverlight™, there is an alternative version of each course that presents all the information without using Silverlight. There is also a third, text-only version available on the companion CD and online at <http://msdn.microsoft.com/accessibility>.

Training module	Delivery method	Description	Target audience
Introduction to accessibility	Online Self-paced	Opportunity to hear stories of people whose lives are enhanced by accessible technology products and to understand the importance of making accessibility a systematic component of the product life cycle	Chief executive officer Chief technical officer Chief operating officer HR director IT professionals Developers Testers
General accessibility for developers	Online Self-paced	How to plan and access costs for creating accessible applications using a logical hierarchy	Developers Testers
Windows (Win 32) accessibility for developers	Online Self-paced	How to use MSAA and UIA in Win32 to create programmatic access for users of assistive technology	Developers Testers
WinForms accessibility for developers	Online Self-paced	How to use WinForms common controls to create more accessible applications	Developers Testers
Windows Presentation Foundation (WPF) accessibility for developers	Online Self-paced	How to use the WPF UI Automation application to create access for users of assistive technology	Developers Testers
Silverlight accessibility for developers	Online Self-paced	How to use WPF UI Automation to create more accessible Silverlight applications	Developers Testers
Accessible Web Applications for developers	Online Self-paced	How to use the Web to create more accessible applications	Developers Testers

Resource Materials

Along with the training course, Microsoft has developed resource materials to further raise awareness within organizations about building more accessible products and services in a programmatic way. The materials include additional resources to help developers to make their online products more accessible using the Windows operating system and a guide that specifically addresses software engineering for accessibility. The materials are available online, in a downloadable PDF format, at www.microsoft.com/enable/business/.

Deploying accessible technology

After you have purchased or developed technology, you still have to deploy it throughout your organization. To realize the greatest productivity benefits from accessible technology, train all employees so that they understand and can use the accessibility features in any technology you purchase or develop in-house.

Avoid common mistakes in deploying accessible technology, including:

- Centralized lockout of accessibility options.
 - Employees can be shut out of built-in features, such as high-contrast settings, when system administrators use group policies that do not allow them to have access to these features. (For example, an administrator may bar user access to options in the system control panel where most of the accessibility tools can be activated).
- Lack of keyboard access to all features.
 - One accessibility best practice is to make sure the keyboard is able to perform the same tasks as a mouse device. It is also important to document the keyboard user interface in the product manual and through online Help.
- Applications that do not honor system settings.
 - When set correctly, system settings indicate when applications should change their default behavior. For example, when the Show Sounds setting is on, an application that typically uses sound to convey important information should also show the information visually. By not honoring this setting, a person with hearing difficulty may not know if an audible alert has been activated.

In the training modules (available on a CD that comes with this guide and available online at <http://msdn.microsoft.com/accessibility>) you will find more direction on common developer mistakes and how to avoid them.

Finally, make sure your IT department can provide high-quality, ongoing support for employees who are relying on accessible technology, in addition to others who may want or need to use it.

In closing

Thank you for your interest in learning more about accessibility in the workforce, why it is important to your organization, and how it can help your employees, customers, and partners realize their full potential. We hope you find the Accessibility Training Course CD included in this guide, and available online at <http://msdn.microsoft.com/accessibility> helpful in creating software products that are more accessible.

Resources

Resources from Microsoft

The Microsoft mission is to enable people and businesses throughout the world to realize their full potential. Computer technology is an important and powerful tool that enables and empowers individuals of all abilities. At Microsoft, we strive to develop technology that is accessible and usable by everyone, including individuals who experience the world in different ways because of impairments, disabilities, or age-related limitations.

Microsoft Government Accessibility website www.microsoft.com/govaccessibility

Microsoft Accessibility website www.microsoft.com/enable/

- Accessibility for Businesses and Organizations <http://www.microsoft.com/enable/business/>
- Accessibility for Educators www.microsoft.com/enable/education/
- Accessibility Update newsletter www.microsoft.com/enable/news/subscribe/
- Accessibility in Microsoft products www.microsoft.com/enable/products/
- Accessibility tutorials www.microsoft.com/enable/training/
- Accessibility demos www.microsoft.com/enable/demos/
- Assistive technology products www.microsoft.com/enable/at/
- Microsoft Accessibility Resource Centers www.microsoft.com/enable/centers/
- The business value of integrating accessible technology into business organizations www.microsoft.com/enable/business/value.aspx
- Developing an accessible technology plan www.microsoft.com/enable/business/plan.aspx
- Business accessibility case studies www.microsoft.com/enable/casestudy/default.aspx

Microsoft Accessibility Developer Center <http://msdn.microsoft.com/accessibility>

- Accessibility training <http://msdn.microsoft.com/en-us/windows/bb735024.aspx>
- WPF Introduction <http://msdn.microsoft.com/en-us/library/aa663364.aspx>
- UI automation control types <http://msdn.microsoft.com/en-us/library/ms749005.aspx>
- Control pattern mapping for UI <http://msdn.microsoft.com/en-us/library/ms750574.aspx>
- UI automation control patterns <http://msdn.microsoft.com/en-us/library/ms743073.aspx>
- UI automation events http://msdn.microsoft.com/en-us/library/ms748252.aspx#Types_of_Events
- UIA verify <http://uiautomationverify.codeplex.com/>

Additional resources and events

The following organizations offer additional accessibility resources or host annual accessible technology events:

- Access Technology Higher Education Network (ATHEN) www.athenpro.org
- Assistive Technology Industry Association www.atia.org
- Australian Government Web Publishing Guide: Accessibility <http://webpublishing.agimo.gov.au/Accessibility.html>
- Illinois Center for Information Technology and Web Accessibility www.cita.uiuc.edu/
- Industry Canada: Accessible Procurement Toolkit www.apr.gc.ca/
- Knowbility www.knowbility.org
- Montgomery College, Maryland, accessibility resources www.montgomerycollege.edu/standards/webstandardstraining/
- OCAD University, Inclusive Design Research Centre <http://idrc.ocad.ca/>
- Rehabilitation Engineering and Assistive Technology Society of North America www.resna.org
- SIGACCESS: ACM Special Interest Group on Accessible Computing <http://portal.acm.org/sig.cfm?id=SP1530>
- Technology and Persons with Disabilities Conference at CSUN www.csun.edu/cod/conf/
- Techshare India <http://techshare.barrierbreak.com/>
- Trace Research and Development Center <http://trace.wisc.edu/sitehelp/>
- U.K. web accessibility basics www.webcredible.co.uk/user-friendly-resources/web-accessibility/basics.shtml
- United States Access Board www.access-board.org
- University of Australia Accessibility Resources www.unisa.edu.au/footer/accessibility/resources.asp
- W3C policies and guidelines www.w3.org/WAI/Policy/
- W4A www.w4a.info
- WebAIM www.webaim.org



This guide from Microsoft provides information about accessibility and accessible technology to help organizations worldwide ensure that everyone has equal access to information and services.

For organizations new to accessibility and working with people with disabilities, accessibility can sometimes seem overwhelming. To help your organization meet the needs of people with all types of abilities, you will find specific information about many types of impairments and some of the accessible technology solutions that address them.

This guide provides

- An understanding of accessibility and how it impacts organizations
- Definitions of impairment types and technology solutions for each type of impairment
- Guidance on choosing accessible technology solutions
- Resources for more information

www.microsoft.com/enable/business/

<http://msdn.microsoft.com/accessibility>