

Summary

What is Accessibility?

Accessibility is the practice of designing and developing websites and applications such that their presentation, content and functionalities are understandable and operable by as many people as possible. Accessibility is often defined in terms of compatibility with assistive technologies, particularly those used by blind individuals that supplement or replace standard displays and input strategies. It also ensures that the default presentation is understandable and operable by as many people as possible. Finally, it includes a commitment to address accessibility problems in a timely manner and avoid the introduction of new problems during product revisions.

Why Accessibility?

An increasing number of postsecondary institutions are adding accessibility to their list of mandatory requirements when making a purchasing decision. This is due to concerns about litigation, as well as commitments to diversity and social responsibility.

The return on accessibility investment also has a much wider impact. Accessibility guidelines are closely tied to best practices for mainstream usability and increasing market share. Adhering to accessibility standards helps ensure that your product is robust and ready to respond to an ever growing range of consumer devices and platforms. Accessible products often get higher placement in search engine results because they provide more relevant information to crawlers.

How is Accessibility Achieved?

Like most other design and engineering considerations, accessibility should be considered throughout the product lifecycle. This includes, but is not necessarily limited to, the steps for planning, authoring, coding, testing, documenting, and marketing.

The body of this document provides an overview of administrative considerations related to accessibility. Several appendices provide an extensive list of resources for team members in design, technical, quality assurance, marketing, and other positions.

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About the Big Ten Academic Alliance-ITAG Vendor Group

The [Big 10 Academic Alliance](#) (formerly known as the Committee on Institutional Cooperation) is a consortium of Big Ten member universities, plus the University of Chicago. For more than half a century, these world-class research institutions have advanced their academic missions, generated unique opportunities for students and faculty, and served the common good by sharing expertise, leveraging campus resources, and collaborating on innovative programs.

The Big Ten Academic Alliance sponsors multiple committees and groups that address challenges common to its member universities and peer institutions. The Big Ten Academic Alliance Information Technology Accessibility Group (ITAG) was chartered by the CIOs of the member institutions in 2011 to identify common challenges and best practices related to the accessibility of information technology at individual Big Ten Academic Alliance member campuses. The group reports directly to the CIOs.

ITAG's goal includes identifying areas of potential collaborative opportunity. One such collaboration has been the Vendor Group, which seeks to create a common understanding of the accessibility requirements and considerations in IT purchasing processes. The Vendor Group goals are the following:

- Create a common understanding and language between vendors and university representatives, such as procurement staff and accessibility specialists
- Develop stronger relationships with vendors
- Create a cohesive initiative among institutions

Towards these ends, we have developed this Guide. However, we see this as only the beginning of a dialogue, and we welcome your feedback. Please send comments or questions to [Jane Vincent, University of Michigan, \[jbvencen@umich.edu\]\(mailto:jbvincen@umich.edu\)](#).

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Introduction

Most vendors have at least some awareness of the importance of accessibility as a design consideration. Perhaps a major client has informally inquired about whether your products are accessible, or has included compliance questions in an RFP. All postsecondary institutions are legally responsible for accessibility, and more than 30 have already been the target of accessibility-related lawsuits. Accessibility is also being added to institutions' values statements. Consequently, accessibility is becoming an increasingly significant factor in purchasing decisions.

We recognize that vendors may not be fully aware of the need for accessibility and the considerations involved, may be frustrated by varying definitions of what accessibility means, or may simply feel overwhelmed. The purpose of this document is to show the flip side: [inclusion of accessibility as part of your business plan and corporate culture will have strong positive implications](#) for both your company and your clients. These implications, as *Accessibility News* points out, may include “financial gains and cost savings...due to increased potential market share, search engine findability, and increased usability; reducing risk of legal action resulting in high legal expenses and negative image; [and] the public relations benefits of demonstrating social responsibility.”

Audience

The primary audience for this document is the administrative decision makers within software development companies. However, the Appendices contain extensive links that will be of interest to programmers, designers, legal consultants, and other contingents. In addition, the document will be relevant to any company or organization responsible for web accessibility, such as educational institutions, libraries, and governmental entities.

Current Practices of Big Ten Academic Alliance-ITAG Member Institutions

In 2014, the Big Ten Academic Alliance-ITAG Vendor Group surveyed Big Ten institutions about their accessibility policies and practices. At least 70% of respondents indicated that the following statements are true for their school:

- There is an established accessibility policy for software procurement, and some type of accessibility statement is provided in their RFPs.
- A [Voluntary Product Accessibility Template](#) (VPAT) is requested from prospective vendors.
- Accessibility is a consideration when candidate products are being evaluated.
- Vendor inability to provide accessible products has affected purchasing decisions.
- [WCAG 2.0](#) is used as an accessibility standard, and they also perform functional testing of candidate products.

Vendor Precedents

Some forward-thinking companies have been joining our postsecondary institutions to address accessibility. Check out the statements below from leading vendors Google and Instructure about why they decided to incorporate accessibility into their products, and how they made awareness part of their corporate culture. Then consider using the rest of the document to begin developing your own accessibility game plan.

Google: At Google, we believe that everyone should be able to access and enjoy the web and we're committed to making that a reality. It starts with our engineers and every new engineer that joins one of our major engineering centers is required to go through a hands-on accessibility workshop where they learn about mobile and web accessibility.



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Additionally we've launched around a dozen other internal courses for all of Google covering web accessibility, Android accessibility, iOS accessibility, assistive technology, testing techniques, user experience design and so on. It doesn't just stop with our employees -- we have also created a free online course for third party developers called ['Introduction to Web Accessibility'](#)."

Instructure (makers of Canvas): "Canvas believes that everyone should have effective access to teaching and learning activities. While we are confident that Canvas is at present largely accessible to a majority of users with disabilities, we also understand that accessibility is a continual work in progress, and it is something that must remain integral to our normal product development process. We hold ourselves accountable for ensuring that all new features are accessible prior to deployment to production environments. In addition, our Accessibility Team regularly retains independent accessibility firms, and collaborates with end users, to review and continuously improve Canvas. Our internal processes, external audits and the collaborative feedback we receive from our users, all combine to help us meet our commitment to providing an amazing experience for everyone."

Definitions

Term	What is it?	Why is it important?
Accessible/ Accessibility	Something is accessible when it is available and able to be used by people of varying abilities.	Accessibility allows people to participate fully, without barriers, in activities and experiences. Accessibility also means someone doesn't need to ask for a modification to suit their needs.
Accommodation	“ An alteration of the environment...or equipment that allows an individual with a disability to gain access to content and/or complete assigned tasks.”	Accommodations allow people with disabilities to complete their coursework, hold jobs, and interact with peers on a more level playing field.
Adaptive Technology (AT)	Technology that allows a user with a disability to access tools and content.	AT makes the environment and its content more accessible. AT allows people with disabilities to contribute.
Alt-Text and Tags	A textual alternative to non-text content (e.g., pictures and charts) in digital content.	Screen readers read this text in place of images allowing content and function of the image to be accessible.
Captioning: Closed Captions	Same as <i>open</i> captions except <i>closed</i> captions must be turned on by a user.	Same as open captions.
Captioning: Open Captions	Captions are text that redundantly conveys the same language of the media <i>plus</i> environmental sound (such as doorbells or dogs barking) and identification of who's talking, OPEN captions do not require someone to turn them on - they are “always on”.	Allow access to dialogue and other audio information to people with disabilities and others (i.e. people for whom English is not their first language, people who benefit from reading AND listening).
Captioning: Subtitles	Text along the bottom of the screen that conveys the original language in a translated (e.g., a French language film with English subtitles). Subtitles do not convey environmental information (e.g., a ringing phone, a bomb blast) and from the media.	Subtitles provide access to media in different languages.
Functional Accessibility	Providing an experience for people with disabilities that allows efficient and consistent access to content and interfaces.	Accessibility is often created according to guidelines (which is critical) and guidelines don't guarantee that something is accessible from the user perspective, <i>in practice</i> .
HTML (Hypertext Markup Language)	HTML is a standardized markup language that allows elements of the web to look and behave in various ways.	HTML is important for accessibility because it provides a standardized system that developers can use in ways that make the web more or less accessible depending on their practices and standards.

Term	What is it?	Why is it important?
Java	<p>“A general purpose programming language...that has been used to extend the functionality and interactivity of the web.”</p>	<p>The Java Accessibility API, which allows user-interface components and assistive technologies to work with each other must be used for accessibility.</p>
Responsive design	<p>Web design that minimizes the need for resizing, panning, and scrolling across a wide range of devices. Content is fluid and proportional.</p>	<p>Responsive design does not equal accessible design. Responsive design <i>might</i> make access to <i>some</i> content on <i>some</i> devices by <i>some</i> people, easier (i.e. minimizing scrolling for a person with low-vision).</p>
Screen Reader	<p>A screen reader is a piece of software that reads aloud the text in digital content such as a web page or a document. (Screen readers actually read the code, not what a sighted user sees on a screen, which is why coding standards are critical to their use.)</p>	<p>Screen readers create a more accessible environment by allowing improved access to information by people with various disabilities.</p>
Subtitles for the Deaf and Hard of Hearing (SDH)	<p>A combination of captions and subtitles. These subtitles are in the language of the media <i>and</i> provide environmental sounds and speaker identification.</p>	<p>Same as open captions.</p>
Usability	<p>“The extent to which a product can be used by specific users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”</p>	<p>Usability and accessibility overlap. Three main points of usability: effectiveness, efficiency, and satisfaction are all criteria used to judge accessibility. Increasingly and consistently, legal determinations include use by people with disabilities.</p>
W3C (World Wide Web Consortium)	<p>An international community of member organizations, W3C staff, and interested people that collaboratively establish web standards.</p>	<p>The W3C community publishes the WCAG Guidelines.</p>
WCAG (Web Content Accessibility Guidelines)	<p>Guidelines developed with broad international collaboration. WCAG provides “a single shared standard for web content accessibility”. (w3c.org)</p>	<p>WCAG Version 2.0, Level AA is the current international standard for digital accessibility. The guidelines create a common accessibility language and common accessibility expectations that can be learned, invoked, and applied to any web content (and some non-web content). Section 508 of the Rehabilitation Act was recently updated to be closely conformant with WCAG.</p>

Broad Benefits of Accessibility

Accessibility is often treated as a consideration separate from any other design feature. In reality, however, attention to accessible design often results in solutions to other issues facing modern developers. While many postsecondary institutions may cite legal or other requirements as a primary accessibility impetus, the truth is that implementing most of the standard accessibility guidelines have positive implications for your users who would not consider themselves disabled.

The list below is intended to show the frequent and productive convergence between accessibility and usability, particularly for web-based products. These examples are illustrative rather than exhaustive. As you regularly begin to consider accessibility in your product development, you will likely find many more.

- **Bring your own device (BYOD).** Over the last several years, the options for internet access devices have expanded to phones and tablets, and are likely to expand further into wearable technology and other designs that cannot yet be predicted. Interface designs for these devices have already drawn heavily on use of common assistive technologies, including features such as AutoCorrect and Zoom.

As users adopt an increasingly diverse range of devices, website design will need to become increasingly flexible. Consistently incorporating accessibility as a parallel consideration will continue to promote site usability by individuals with disabilities and will likely suggest ways to make site access more practical and comfortable for non-disabled users. The application of [universal design principles](#) early in the software development cycle can make it easier to support the software on a wide range of technologies.

- **Separation of presentation and content.** Ensuring that information can be understood regardless of how it is presented is a long-time accessibility strategy, but it has broad implications for any users who wish to set display options to conform to the device they are using, the environment they are in, or simply their idiosyncratic preferences. Conformance to standards and correct use of markup will have nearly universal benefits. For example, use of [cascading style sheets \(CSS\)](#) to control formatting across a site makes it easier for assistive technologies to work properly, but it will also greatly facilitate making site-wide changes when necessary to address compatibility with mobile devices, new browsers, etc.
- **Usability for other contingents.** Examples include the following:
 - There has been a steady increase in [Internet usage by elders](#), and this is likely to escalate as a large percentage of existing Internet users age. There are mild accessibility preferences that almost all older users will have, such as good color contrast and reasonably sized fonts. Since the Boomer contingent will be so large, and since disability incidence tends to increase within an aging population, the larger number of users with moderate to major access needs will also need to be considered.

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- [WCAG 2.0, Guideline 3.1, covers intelligibility](#). In particular, [Success Criterion 3.1.5](#) states, “When text requires reading ability more advanced than the lower secondary education level after removal of proper names and titles, supplemental content, or a version that does not require reading ability more advanced than the lower secondary education level, is available.” Although this is a Level AAA criterion, in many cases compliance will be useful to a large number of non-disabled users. These include individuals whose first language is different from the main language of the page and individuals unfamiliar with the topic that the page covers.
- Any group of users is likely to have a range of computer expertise, ranging from total inexperience to knowledge of a single OS and/or browser to a high level of sophistication. Adherence to WCAG guidelines such as 2.2 (“[Provide users enough time to read and use content](#)”) and 2.4 (“[Provide ways to help users navigate, find content, and determine where they are](#)”) will be invaluable to users who are beginning to learn technology use or who cannot or will not acquire advanced skills.
- **Use of HTML Standards.** Assistive technology functionality is often dependent on code that corresponds to specifications for a particular version of HTML. For example, sometimes code is “deprecated,” or removed and replaced with new code text when new HTML specifications are released. Code also needs to be typo-free, so that there are no missing or extraneous punctuation marks, misspellings, etc. If deprecated or incorrect code is used, assistive technology may perform incorrectly or not at all. Invalid HTML may also cause other types of malfunctions, such as incompatibility with one or more browser programs. Therefore, using easy and free online validators such as [W3C Validator](#) and addressing items in the resulting reports will have a variety of positive results beyond accessibility.

An application programming interface (API) is a set of instructions for building software and applications, and there is an API specific to accessibility. The [Appendix: Basic Remediation](#) section contains additional technical information on this API and other best practices.

- **Search Engine Optimization (SEO).** Good accessibility practices can improve your SEO. For example, the software programs that search the web for pages to include in search engine results are also expecting valid and correct code, so code validation can help with this.

Another consideration for SEO is accurate captioning of video materials. Materials which rely on auto-captioning typically contain many incorrect words, producing poor results for both users with hearing impairments and search engines. Providing your own accurate captions will make it

easier for search engines to find your content.

- **Overall usability and robustness.** Users with and without disabilities benefit from good practices such as ability to set time-out preferences, [responsive design](#) and [legible text](#). As members of the [Web Accessibility Initiative](#) have written, “In most situations, such as when designing and developing websites and applications, it is most effective to address them together.”

Higher Education Accessibility Obligations

People with disabilities are protected from discrimination by federal civil rights law; some states have additional laws; and many colleges and universities have accessibility policies. [Section 504 of the Rehabilitation Act of 1973](#) first extended civil rights protection while [Title II of the Americans with Disabilities Act \(ADA\)](#) specifically call out the obligations of institutions of higher education to provide effective resources, services and accommodations. The recent pattern of legal actions by advocacy groups, the Department of Justice, the Department of Education, and state and federal legislative bodies, clearly demonstrate that information technology and instructional materials, including that purchased from vendors, must be accessible. Newer legislation, including the [ADA Amendments Act of 2008 \(ADAAA\)](#), the [Twenty-First Century Communications and Video Accessibility Act](#), and the proposed Accessible Instructional Media-Higher Education Act (AIM-HEA), are clarifying and strengthening legal protections for people with disabilities.

Legally binding settlements made between advocacy groups or government agencies and targeted institutions include requirements that websites, applications, services and instructional materials be accessible to people with disabilities. Of immediate importance to vendors is that settlements are requiring that the purchasing process includes accessibility criteria in RFPs, as well as accessibility support and/or indemnification as part of the terms of contracts. Colleges and universities are responding rapidly to meet their obligations for compliance.

For more information about legal requirements, please see the [Laws and Regulations appendix](#).

Compatibility with Assistive Technologies

Assistive technologies (frequently abbreviated as AT) are tools that have been designed to improve the functional capabilities of individuals with disabilities. AT for use with electronic and information technologies includes hardware such as hearing aids, specially adapted switches for input, alternative keyboards, and refreshable braille displays. It also includes software such as screen magnification, screen readers, on-screen keyboards, and voice recognition software. This software may be built into the operating system or acquired from a third party developer. More information about specific types of AT is in the [Common Assistive Technologies appendix](#).

For assistive technologies to work properly, AT developers must be able to make assumptions about the environment that AT will be operated in, and design accordingly. To do this, developers rely upon other hardware and software developers to follow established practices found in technical standards. For instance, web sites and web applications should be coded according to appropriate [World Wide Web Consortium \(W3C\) specifications and guidelines](#) such as [HTML](#), [CSS](#), [WCAG](#), [WAI-ARIA](#), and [ATAG](#), and specific platforms such as [Windows](#) and [OS X](#) have their own standards.

Equitable access

For an IT product or service to be considered equitably accessible with an assistive technology, users must be able to access all of the opportunities and benefits of the product or service. They must be able to acquire the same information, successfully engage in the same interactions, and enjoy the same services with a substantially equivalent ease of use as compared to non-AT users. AT users should be able to produce the same quality of work, accomplish tasks within a reasonably efficient time frame, access key information and functionality, and avoid difficult or time consuming interactions.

AT Compatibility Testing

To help higher education institutions meet their requirement to comply with the ADA, vendors should test their products and services to ensure they are functionally compatible with commonly used assistive technologies and that individuals with disabilities can use them in a way that provides equitable access. The only sure way to test a product's functional compatibility with AT is for individuals with disabilities to try using the product.

Some WCAG and Section 508 guidelines are not specific to AT, but rather to ensuring good default design--e.g., that [good color contrast is achieved](#) between text and background. It is important to get feedback on these as well, ideally from users with low vision, users with learning disabilities, and older users.

Consider inviting designers and other project team members to observe how individuals with disabilities use their products, or include additional time outside of the testing where designers and other project team members can interact with the participants.

For recommendations on how to test, please see the [Recommended Testing Approach appendix](#).

Communicating with Postsecondary Institutions

If postsecondary institutions are starting to contact you with accessibility questions, congratulations! This can be an opportunity to find out more about what your customers want, and use that to create company accessibility policies and strategies. You can then turn established communication pathways into relationships that could lead to product endorsements, sources of feedback--and enthusiastic, loyal customers.

As a starting point, institutions are likely to ask whether you have [Voluntary Product Accessibility Templates \(VPATs\)](#). VPATs were previously related to Section 508 version 1.0 requirements. However, [new regulations updating Section 508](#) to more closely align with WCAG 2.0 will go into effect on January 18, 2018. As such, it is recommended that vendors proactively adopt [VPATs that reflect WCAG 2.0 requirements](#). [Minnesota is already requiring VPATs for WCAG 2.0](#) for purchases by state agencies and institutions.

It is generally understood that WCAG 2.0 AA requirements also apply to non-web-based technologies like mobile apps and desktop applications. To help purchasers apply principles to other technologies, the W3C has published a [technical note to map requirements to non-web information and communications technology \(ICT\)](#).

Additional questions for you to ask when communicating with postsecondary institutions might include the following:

- **What standards are you using to evaluate accessibility?** Until the Americans with Disabilities Act regulations covering web accessibility are published, institutions might be adhering to Section 508 (original or refreshed), WCAG 2.0, or a hybrid. They might also have some additional requirements, such as compatibility with specific assistive technologies. Finding out what multiple institutions expect up front will help you create a unified policy that you can publicize, rather than trying to track a diverse set of expectations.
- **How are you going to use our product?** Identifying the user's goals may help put focus on the most critical functions and aid with prioritizing any necessary fixes.
- **Do you have any feedback about the accessibility of our product?** While colleges and universities should not be relied on as free testing services, any information that they have already generated about accessibility issues will be valuable.
- **Would you be able and willing to submit problems to our issue tracking system?** Ideally, this would also include some information to help with prioritizing problems.
- **When we fix a problem that you have identified, would you be willing to help us verify the fix?**
- **What resources do you refer to for information about addressing accessibility?**
- **What assistive technology is commonly supported on your campus? Are there other assistive technologies that students tend to use on their personal devices?**
- **What is your accessibility policy?** Many institutions post their accessibility policy somewhere on line; ask for the link if available.
- **Who should be our primary accessibility contact on your campus?**



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- **What are other priorities on your campus that affect your use of our product?** For example, does the campus generally use the Windows version of the product over the Mac version, or vice versa?
- **May we refer other institutions to you?** Often, a formal or informal user group forms around accessibility support for a given product. Facilitating this will solidify your reputation as being proactive around accessibility. In addition, some colleges and universities may be just starting with implementing accessibility, and may not have a great deal of information to share beyond, “We need to use accessible products.” If you’re already communicating with institutions who are willing to serve as mentors, consider offering to put accessibility neophytes in touch with them.

Incorporating Accessibility into the Design Process

Once accessibility is adopted as a core part of your company's mission, the more complex task of incorporating accessibility into a company's processes must be undertaken. There are many different and equally valid design/development processes that are in use today. All of these processes involve multiple steps, stages, or phases. Accessibility can be incorporated into each of these distinct parts of the design process starting with the planning phase.

Requirements Planning

A core part of the design process is the development of requirements for the product that is being developed. This document generally includes multiple areas where accessibility can be incorporated, including:

- Stakeholder Identification
- Product features/Design guidelines
- Use-cases
- User profiles/Actors
- Test planning/Quality Assurance.

For specifics on these five areas, please see the [Design Requirements appendix](#).

Accessibility Remediation

Accessibility has not always been fully incorporated into product design and development cycles and therefore not all products will be accessible upon first release. As accessibility concerns are identified they should be remediated as soon as possible. It is also good practice to seek or conduct a more extensive accessibility evaluation to determine if any other concerns exist.

Once an accessibility evaluation has been completed, the next task is remediating any identified accessibility concerns. Priority should be given to correcting “showstopper” accessibility concerns. Showstoppers are concerns that prevent users with disabilities from completing key tasks within a product such as creating an account, logging in, submitting a form, and opening a menu or section of content. The second priority for accessibility retrofitting should be to provide “quick wins” by remediating accessibility concerns that have significant impact on the current functionality of the product but require minimal developer time to implement.

Showstoppers

Many showstoppers stem from problems relating to user input (e.g., keyboard) or event handling. The recommended way to retrofit these deficiencies is to verify them by using a combination of manual testing and user testing, and remediate them by consulting authoring practices and expert examples (e.g., coding samples).

Quick wins

These accessibility improvements fall into several distinct categories: well-structured content, descriptive labels for interactive elements, grouped content, accessible alternatives for non-text content, and color choice. Most of these improvements will have little impact on the visual design of a product. Further information is available in the [Basic Remediation appendix](#).

Maintaining Accessibility During Product Upgrades

Accessibility should be an ongoing part of the product life cycle. This section discusses considerations and best practices to ensure that products remain accessible as they evolve and are updated.

Anticipate roadblocks

When a product update is in the works, many factors are at play, including compatibility, security, user feedback, and project resources. Considering accessibility when planning for upgrades will avoid decreasing the product's existing accessibility, and may allow for improvements. Accessibility can be affected by changes such as the product platform, design, and compatibility with other products and services.

Consider these positive examples:

- A product is built using Adobe Flash. Work has been done to ensure that accessibility guidelines have been followed. A switch to HTML5 is being considered. Research indicates that HTML5 includes the necessary accessibility features to maintain, and even improve, the current accessibility of the product.
- A mobile app is getting a design overhaul. The design prototype includes transparent toolbars. Preliminary accessibility research indicates that these toolbars will be difficult for low vision users to work with. A feature is added to allow the user to customize the app's display to improve contrast.

Plan for accessibility

During the planning stage for an upgrade, consider what about the product will change, and how these changes will affect accessibility. For example:

- Do new graphics need to be labeled?
- Do new features need documentation?
- What accessibility features can be added?
- Can known accessibility bugs be fixed?

Test for accessibility

Pre-release testing is an excellent time to identify and address accessibility issues:

- Does the new version of the product work with assistive technologies as expected?
- Have known accessibility bugs been fixed?
- Have other bugs been introduced?

Just as a product should not be released with known security flaws, it should not be released until it meets accessibility standards.

Document Accessibility

Have new features been added? Have accessibility improvements been made? Make sure your documentation reflects these changes. If a product update has changed the way an assistive technology user will interact with the application, make sure they can readily locate instructions to help them adjust to the change. For example, if a complex keyboard shortcut has been replaced with a simpler one, the user may perceive that the product has "stopped working like it used to" until they learn about the new

shortcut. If you use words like “screen reader” and “keyboard shortcuts” in your documentation, it will help users find what they need to know. More tips are included in the [Documenting Accessibility appendix](#).

Work with Changes in Assistive Technology

Just as your product evolves to stay competitive in the market, assistive technologies improve to meet the demands of their customers. For example, version 16 of the JAWS for Windows screen reader added a simplified set of keystrokes for reading tables, allowing properly marked up tables to become accessible to a larger number of users. Nuance added some support for ARIA to Dragon Naturally Speaking version 13, which creates new possibilities for applications to support speech to text users. Keeping pace with trends in assistive technology can alert you to more accessibility potential as you improve your product.

Promoting Accessibility to Clients

Once you've gone through the process of making sure your products are maximally accessible, you'll want to let all your customers know. Below are steps to ensure accessibility concerns are met when marketing IT products to higher education institutions.

1. Work with university procurement officers to produce contracts that include the accessibility language requirements of WCAG and/or Section 508 standards. [Section 508 provides a Refresh Toolkit](#) for IT vendors to follow.
2. Complete a VPAT (Voluntary Product Accessibility Template) form and have it reviewed and certified by a third party.
3. Provide current customer referrals to institutions that can share information about their accessibility experience using the product, and make it possible for this to occur within the context of non-disclosure and other agreements.
4. Provide a product demo and/or testing opportunities for institutions to investigate products independently.
5. Disclose any noncompliance issues regarding IT product(s). If an issue for noncompliance is evident, an alternative to accommodate individuals with disabilities must be identified.
6. Any updates, new features, or version changes in a product should include any updated accessibility information. If there is a possibility of non-compliance, the completion of a new VPAT is required.
7. The vendor's website should include appropriate support documentation on your website. This documentation should be accessible by all individuals and include known accessibility concerns and up-to-date status information. This documentation must include how individuals with disabilities can use their product(s).
8. Provide a 24/7 reporting mechanism to allow all individuals the ability to communicate accessibility concerns.

Appendix: Laws and Regulations

Federal Law Affects Purchasing Decisions

Federal laws requiring equal access for people with disabilities to education and human services have a direct consequence on the purchasing processes of colleges and universities. Institutions find themselves in a very uncomfortable position relative to commercial vendors of inaccessible products, and the pressure is building to find alternatives that are accessible.

Here's the dilemma: current regulations do not cover vendors of commercial products such as publishers (textbooks), software (Google Drive), and ebook readers (Amazon Kindle); but they do cover the services provided by colleges and universities using those products. In effect, colleges and universities may have to buy inaccessible products to support their services because accessible products of equal value do not exist, while at the same time they assume the legal risks for their use. Thus, institutions are now prioritizing accessibility considerations in their purchasing decisions wherever possible.

Because of the lack of accessibility of many commercial products, people with disabilities often experience barriers when attempting to access information or transact business through information systems of colleges and universities. It is such a common experience that advocacy groups and legal firms have grown in number and sophistication to provide redress. Complaints and lawsuits may be filed against not only by individuals, but also by the Departments of Justice and Education and state groups, with far-reaching consequences.

Civil Rights Legislation for People with Disabilities

Over the last four decades, federal law has evolved to provide broad civil rights protections for people with disabilities. Universities and colleges are specifically covered under these laws. Some states, such as California and Minnesota, also have laws that limit purchases to accessible products.

Rehabilitation Act of 1973, Sections 504 and 508

An extension of the Civil Rights Act of 1964, the [Rehabilitation Act of 1973](#) prohibits discrimination on the basis of disability in federal programs and services, including colleges and universities that use federal funds (e.g., student aid). For example, the complaint against Penn State by the NFB cited violations of Section 504.

Section 508 charged the Access board to create regulations governing the accessibility of electronic information technology (EIT). These standards are used to determine whether this section of the Rehabilitation Act has been violated, and discussed in a section below.

Americans with Disabilities Act of 1990 (ADA)

An extension of the Civil Rights and Rehabilitation Acts, the [ADA](#) expands coverage of the Rehabilitation Act to persons using programs and services outside the federal government.

- Title II covers public institutions, including virtually all colleges and universities.
- Title III covers some commercial entities that are considered public accommodations. Classic examples are restaurants, movie theatres, hotels and ATMs. More recent examples cover information technology services, including the websites of Target, Peapod, and H&R Block.
- The Department of Justice is expected to issue updated regulations covering websites for Title III entities which will likely broaden coverage to many other commercial enterprises, and remove ambiguities in the current regulations. These regulations will likely be identical or close to WCAG 2.0 Level AA.

ADA Amendments Act of 2008 (ADAAA)

Until 2008, interpretation of the ADA by the Supreme Court and lower courts was moving against the original intent of Congress. In response, the [ADAAA](#) was enacted to correct and reverse a number of

Court decisions.

The ADA expands coverage of the ADA to a much larger group of people with disabilities – indeed, it expanded the definition and list of disabilities covered, even including those that are temporary or in remission. The effect is that the number of people who can file a complaint with the Office of Civil Rights is now much larger than that covered by the original ADA, thus substantially increasing risk to colleges and universities.

Regulatory and Standards Compliance

Web Accessibility

[Section 508 standards](#) were developed in order to implement Section 508 of the Rehabilitation Act. They provide technical standards to guide government agencies' procurement processes in order to comply with the law. In parallel, the World Wide Web Consortium (W3C) developed the Web Content Accessibility Guidelines (WCAG). Because of the rapid pace of innovations on the web, the current Section 508 regulations quickly became obsolete and a refreshed version was released in January 2017.

[WCAG 2.0](#) is a complete overhaul of the original WCAG recommendation, and is now the de facto international standard for websites and web applications. The Section 508 refresh harmonizes with WCAG 2.0 Level AA.

Two other documents likely to be of use are the [Authoring Tool Accessibility Guidelines 2.0](#) standards, which “provides guidelines for designing web content authoring tools that are both more accessible to authors with disabilities...and designed to enable, support, and promote the production of more accessible web content by all authors” and the [Guidance on Applying WCAG 2.0 to Non-Web Information and Communication Technologies](#) (WCAG2ICT).

Telecommunications Act Section 255

[Section 255 of the Telecommunications Act](#) applies to equipment covered by the Telecommunications Act of 1996. It requires that telecommunications equipment provided by vendors is accessible to people with disabilities and compatible with assistive technology such as hearing aids.

Communications and Video Accessibility Act (CVAA)

[The Communications and Video Accessibility Act \(CVAA\)](#) was specifically targeted at increasing protections for people with disabilities; to provide equal access to the exploding availability of new innovations in communications and information technology.

Title I of the CVAA requires that advanced communications products and services using broadband services must be accessible to people with disabilities. An example is making smartphones and phone services accessible to people who are visually impaired or blind, and to people who have hearing impairments or are deaf. The law also requires that browsers and related products on smartphones be accessible.

Title II requires video programming closed captioned on TV to be closed captioned when distributed on the internet. The act includes additional requirements for equipment to support closed captions, notably applying to mobile communications equipment like smartphones.

Appendix: Common Assistive Technologies

Screen Reading Software

Screen reading software (frequently called screen readers) is an assistive technology for individuals that are blind or visually impaired. Screen reading software typically uses synthesized speech or braille output to represent a computer's user interface (UI) with a monitor and uses keyboard interactions to substitute for the mouse. Advanced screen reading software will provide tools that assist in efficient perception of content, navigation, and operation of the operating system and applications.

For desktop operating systems the most common screen reading software used in higher education settings is JAWS by Freedom Scientific. A screen reader called VoiceOver is built into the Macintosh operating system. For mobile devices, the most commonly used screen reading software is VoiceOver on iOS devices. Other common screen reading software includes WindowEyes (Windows), NVDA (Windows), Orca (Linux) and Talkback (Android). For more information, visit their product sites:

- [JAWS by Freedom Scientific \(Windows\)](#)
- [Narrator](#) (built-in Windows utility)
- [VoiceOver \(OSX\) by Apple](#) (built-in utility)
- [VoiceOver \(iOS\) by Apple](#) (built-in utility)
- [NVDA by NV Access](#)
- [Orca \(Linux/GNOME\)](#)
- [Talkback \(Android\)](#)

Screen Magnification Software

Screen magnification software (frequently called a screen magnifier) is an assistive technology for visually impaired individuals that still have some usable sight. Besides enlarging the display's content, screen magnification software may allow the user to enlarge the mouse and text cursors, adjust the display's contrast, apply color filters, and provide basic screen reading or text-to-speech functions.

The most common screen magnification software on Windows OS based desktop computers are AiSquared's ZoomText and Freedom Scientific's MAGic. The OS X operating system includes a built in screen magnification feature called Zoom. iOS and Android devices include screen magnification features in their OSs as well.

- [ZoomText \(Windows and Mac\) by AiSquared](#)
- [MAGic \(Windows\) by Freedom Scientific](#)
- [Zoom \(OSX\) by Apple](#) (built-in utility)
- [Zoom \(iOS\) by Apple](#) (built-in utility)
- [Magnification \(Android\)](#) (built-in utility)

Voice Recognition Software

Voice recognition software supports physically impaired, visually impaired, and learning impaired individuals in entering text and controlling their device.

The most common voice recognition software is Nuance's Dragon Naturally Speaking for Windows OS based desktop computers and Dragon for Mac. iOS and Android mobile devices include voice recognition features as well:

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- [Dragon NaturallySpeaking \(Windows\)](#)
- [Dragon for Mac](#)
- [Windows Speech Recognition](#) (built-in utility)

Text to Speech Software (for Cognitive Accommodations)

Text to speech software for individuals with disabilities that affect their ability to read and comprehend text is the most frequently utilized assistive software in the higher education environment. Text-to-speech software reads aloud text from documents, web pages, and off the screen. Typically, the word or phrase being read aloud is simultaneously highlighted to aid in visual tracking. Unlike screen readers, text-to-speech software only reads what's visible.

The most common text to speech software programs used in higher education are:

- [Kurzweil 3000 \(Windows/Mac\) by Cambium](#)
- [Read&Write Gold \(Windows/Mac\) by TextHelp](#)

Built-in Device, Operating System (OS), and Browser Accessibility Features

Most current smart devices, operating systems (OS), and modern web browsers support built in versions of all of the common assistive technology listed above. Most smart devices have thousands of paid and free apps that provide a wide range of assistive features for people with disabilities. Modern web browsers allow plug-ins, add-ons, bookmarklets, and extensions that support people with disabilities. Most of these systems support the following features: High contrast mode, enlarged display fonts, page zoom, custom visual styles, and media captions. For more information consult the individual resources below:

- [Microsoft Windows Accessibility \(Ease of Access\)](#)
- [Apple Mac OS X Accessibility](#)
- [Apple iOS Accessibility](#)
- [Android OS Accessibility](#)
- [Firefox Accessibility Features](#)
- [Chrome and Google Accessibility Features](#)
- [Edge Accessibility Features](#)

Appendix: Recommended Testing Approach

Introduction

During all phases of product development or maintenance, continuous integration tests and Quality Assurance (QA) should be performed to determine the quality and functionality of the design. As part of the QA process, the product should be evaluated against recognized accessibility standards and tested by users to ensure accessibility.

QA for accessibility is done in three categories. Different groups may perform each of these types of testing at different stages in the development and QA process.

1. Automated testing
2. Manual testing with the aid of checklists
3. User testing

Automated testing may be done throughout the product cycle, while manual and user testing would be applied towards the end of the release cycle.

Automated Accessibility Checkers

Most development platforms (HTML, Windows OS, Java, etc.) provide tools that allow for automated evaluation of certain accessibility standards (Section 508, WCAG 1.0, WCAG 2.0). These tools allow developers to quickly identify whether or not their product meets a base level of accessibility based on coding standards for the chosen development platform. Not all accessibility criteria can be evaluated automatically (e.g., appropriateness of text labels). In fact, automated tools cover less than 20% of the WCAG 2.0 success criteria. A number of accessibility checkers are available in the [Automated accessibility checkers and validator tools section](#) of the Resources for Accessibility Implementation appendix.

Accessibility Checklists

Developing or utilizing accessibility checklists is a helpful way to ensure that all accessibility standards and/or criteria have been addressed during the different stages of product development and QA. Any checklist should be based off of an appropriate and recognized accessibility standards. The checklists should vary from high level goals to detailed criteria depending upon which stage of development they are used. An accurately completed checklist can be a helpful step in completing a VPAT. Some checklists covering accessibility standards, manual checks, and assistive technology testing are:

- [WebAIM WCAG 2.0 Checklist](#)
- [Wuhcag - WCAG checklist](#)
- [A11y Project Web Accessibility Checklist](#)

Manual Checks

Automated accessibility tools simply cannot test all of the accessibility criteria as many of the accessibility guidelines and standards require human judgement. In fact, many automated checkers inform user that manual checks are required. At a minimum, developers should perform manual checks for accessibility (including validating code) on their products using computers running current versions of Windows OS and Mac OS X and smart devices running current versions of iOS and Android.

User Testing

Due to the complexities and high learning curve of assistive technology, the incorporation of user testing is crucial. When possible, a large cross section of users with disabilities should be chosen for this type of testing. The pool of testers should include users with varying disabilities, operating systems, user agents (including assistive technologies), levels of technical knowledge, and devices. This will help identify accessibility concerns that may be linked to specific combinations of technology. To find testers, reach out to the local community, institutions, schools, and advocacy groups. If you can't find local resources

you can contract with consultants. Many users with disabilities are eager to work with vendors of products they utilize to help improve accessibility and support other users. Just like any other QA testers, users with disabilities expect to be fairly compensated for their efforts and travel time.

An excellent resource for learning more about planning and conducting evaluations that include participants with disabilities is [“Usability Testing” section](#) of the online book *Just Ask: Integrating Accessibility Throughout Design*. “Usability Testing” includes information on [Recruiting Participants](#) and [Screening Questions](#).

HTML Validation

Ensuring that your code is valid is an important step towards ensuring accessibility and is likely to have many other benefits, including compatibility with an increased number of browsers. Although validation reports can seem extremely long, usually fixing one piece of code will resolve issues for multiple reported errors.

Free HTML validation tools include:

- [W3C Markup Validation Service](#)
- [HTML Validator \(Firefox add-on\)](#)
- [Web Design Group HTML Validator](#)

Testing with Assistive Technologies

As much as possible, the testing should be performed by individuals with disabilities that use the assistive technology in their everyday life. For example, it can take weeks for a sighted individual not familiar with the use of a screen reader to become competent in its use. Unless the sighted individual is completely denied use of the display (display turned off), then they will not operate in the same way and with the same skill that an experienced non-sighted user would. Therefore a sighted user testing with a screen reader will make the test unrepresentative.

Interactive Accessibility, an accessibility consulting company, offers [free Assistive Technology Testing Checklists](#) for people who sign up for their newsletter.

Phase 1: Screen Reader and Keyboard Only testing

We recommend beginning compatibility testing with these three assistive technology combinations:

- The Freedom Scientific JAWS screen reader on the Windows desktop OS
- The VoiceOver screen reader on iOS mobile OS
- Keyboard Only (no mouse) testing by a sighted user on the Windows desktop OS

If the Windows OS or iOS environments are not applicable to your product or service, request guidance from a university’s accessibility professionals on which assistive technologies to test.

Freedom Scientific’s JAWS Screen Reader on the Windows Desktop OS

Setup

The Freedom Scientific JAWS screen reader and the keyboard (no mouse) with Internet Explorer (if Web based) on the most recent (or previous) version of the Windows desktop OS

Checks

- All content is read in a logical order
- All text alternatives for graphical content provides equivalent and appropriate information

- User can perform all functions without assistance from looking at the screen, using a mouse, or from others
- Each control (links, buttons, text fields, combo boxes, radio buttons, checkboxes, etc.) can be reached in a logical order
- Each control is announced with an appropriate name, role, and state information (disabled, read-only, required, etc.)
- User does not get stuck in any controls
- Test all forms and ensure error messages are accessible and apparent
- Verify headings are appropriate for the content and are of the correct level
- Test any skip to content links to ensure they navigate to the correct page content

For more information, see [WebAIM's Using JAWS to Evaluate Web Accessibility page](#).

VoiceOver on iOS

Setup

The VoiceOver screen reader on the most recent version of iOS with Safari (if Web based)

Checks

- All content is read in a logical order
- All text alternatives for graphical content provides equivalent and appropriate information
- User can perform all functions without assistance from looking at the screen or from others
- Each control (links, buttons, text fields, combo boxes, radio buttons, checkboxes, etc.) can be reached in a logical order
- Each control is announced with an appropriate name, role, and state information (disabled, read-only, required, etc.)
- User does not get stuck in any controls
- Test all forms and ensure error messages are accessible and apparent
- Verify headings are appropriate for the content and are of the correct level

For more information see [WebAIM's Using VoiceOver to Evaluate Web Accessibility page](#).

Keyboard Only on the Windows Desktop OS

This tests accessibility for users who cannot use a mouse. It's important to test this separately from use with other assistive technologies (like screen reading software) because they frequently have helpful features for providing access that are not available in standard web browsers.

Setup

Keyboard Only (no mouse) with a sighted user and either Internet Explorer or Firefox (if Web based) on the most recent version of the Windows OS

Checks

- User can perform all functions without assistance from using a mouse or from others
- Each control (links, buttons, text fields, combo boxes, radio buttons, checkboxes, etc.) can be reached in a logical order
- Each control has a visible indication when it receives focus

- Each control can be operated using standard keystrokes or instructions are provided
- Focus does not get trapped in any controls
- All content can be viewed using the keyboard without assistance from using a mouse or from others
- Test any skip to content links to ensure keyboard focus order changes appropriately

To learn more about keyboard accessibility, potential issues, how to check and keyboard accessibility solutions see the [WebAIM Keyboard Accessibility pages](#).

Phase 2: Magnification, Speech Input, and High Contrast Testing

After performing functional testing with screen reading software and with the keyboard, we recommend testing with the following:

- ZoomText Magnifier/Reader on Windows Desktop OS
- Dragon Naturally Speaking Professional on Windows Desktop OS
- Read and Write Gold on Windows or Mac Desktop OS
- High Contrast Display Mode on Windows Desktop OS

ZoomText Magnifier/Reader

Setup

Latest ZoomText Magnifier/Reader with Internet Explorer (if web based) on the latest (or previous) Windows desktop OS.

Checks

- User can perform all functions without assistance from others
- All important content and controls are visible, recognizable, and legible when the built-in color schemes are turned on
- Focus enhancement works on all controls when they receive focus
- Cursor enhancements work in all text edit fields
- All controls are announced with appropriate role, name, and state
- Zoomed display automatically follows input focus
- Important text content supports the xFont font enhancement feature
- Content is read in the correct order without duplication and that hidden content (that would be confusing or misleading) is not announced when using AppReader and DocReader

Dragon Naturally Speaking Professional

Setup

Latest Dragon Naturally Speaking Professional with Internet Explorer (if web based) on the latest (or previous) Windows desktop OS.

Checks

- User can perform all functions without assistance from using the keyboard, a mouse, or from others
- All content can be viewed using scrolling commands without using the “mouse grid” mouse emulation feature

- All controls can be navigated to and operated with speech without using the “mouse grid” mouse emulation feature
- Text can be entered, edited, and styled in any rich text input fields or text editors provided

For more information on using Dragon NaturallySpeaking to evaluate Web accessibility see [Interactive Accessibility's How to Use Assistive Technology to Comply with Section 508](#) page for checklists and command tip sheets (registration required). Note that this link refers to the older version of Section 508, but the suggestions are still useful.

Read and Write Gold

Setup

Latest version of Read and Write Gold with Internet Explorer on Windows based OSs or Safari on OS X.

Checks

- All visible content can be read aloud and is read in a logical order without any hidden content (that would be confusing or misleading) being announced
- Words are not significantly mispronounced
- Text can be selected using the mouse and then read aloud

High Contrast Display Mode on Windows Desktop OS

Setup

Latest or previous version of Windows desktop OS with High Contrast mode turned on.

Checks

- User can perform all functions without assistance from others
- All important content and controls are visible, recognizable, and legible (note: make sure to examine if buttons, icons, or any other controls that depend upon images are legible)
- Text remains legible when selected

Appendix: Design Requirements

Stakeholder Identification

When considering the major stakeholders of a product, particularly the consumers of a product, it is always good to include individual with disabilities as a subcategory of this stakeholder group. With any products that are released widely to the public and given [the growing percentage of individuals with disabilities \(15%](#) according to the World Bank) it is very likely that these individuals will use the product. Because of this likelihood, individuals with disabilities should always be considered as stakeholders. This will play a more important role in the developing of use-cases and user profiles.

Product Features/Design Guidelines

When planning the development of a new product, part of the process includes developing a set of features and core interactions. These guidelines and features should always include requirements for multiple methods for user input, specifically the keyboard (if appropriate), and interoperability with a wide diversity of user agents including assistive technology. You do not need to include requirements to be compatible with all combinations of user agents and assistive technology. However, the selection of user agents you choose should be representative of your targeted consumer population.

This part of the planning stage may also include deciding on which recognized development standards to follow during the development/coding/implementation phases. Luckily the requirements suggested above can be found in current accessibility standards such as the [Authoring Tool Accessibility Guidelines 2.0](#). Please refer to the [Regulatory and Standards Compliance section of the Laws and Regulations appendix](#) for more information.

Use-Cases/User Profiles/Actors

While identifying stakeholders during the requirements planning identifies broad categories of consumers, the use-cases, user profiles, or actors clearly define who and how the consumers will use the product. Therefore, use-cases should include scenarios that individuals with disabilities would encounter, such as a screen reader user encountering a graphics-heavy web page. In addition, user profiles/actors should include multiple personas that incorporate a wide range of common disabilities: sensory, physical, cognitive, and emotional. Examples of useful personas include the [University of British Columbia's "Using Personas" document](#) and Anne Gibson's ["An Alphabet of Accessibility Issues."](#)

Test Planning/Quality Assurance

One of the most important parts of the requirements planning phase is the test planning. Having a well thought out way to verify the product meets the defined requirements is key to developing a successful product. These testing requirements may also include the selection of standards that will help verify the product meets all design requirements. Both the [Recommended Testing Approach appendix](#) and [Compatibility with Assistive Technologies chapter](#) cover topics related to incorporating accessibility into this part of the requirements planning.

Outside Consultation and Training

One of the quickest ways to incorporate accessibility into any business process is to seek outside help. Professional consultants can help you to efficiently incorporate accessibility into the design process. Many vendors are unfamiliar with accessibility and how to incorporate it into the different facets of their organizations. Fortunately there are many organizations whose sole mission is to help companies incorporate accessibility.

Accessibility Consultation

An accessibility consultation from a product design perspective will help identify both areas of deficiencies in the current process and the most efficient practices, tools, and standards to implement into the process that will aid in the development of an accessible product. The primary artifact of an accessibility consultation is an implementation plan.



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Accessibility Training

Once a plan is developed to incorporate accessibility into the design process by the outside organization, the product owners, designers, developers, and testers need to understand how to implement their part of the plan. Accessibility consulting organizations offer a wide variety of trainings that cover user profile development, coding practices, evaluation protocols, and user testing.

For More Information

W3C Web Accessibility Initiative, [Planning and Managing Web Accessibility](#). Although the article focuses on web accessibility, its core recommendations apply to all types of development.

Appendix: Basic Remediation

Well-Structured Content

Content that is well structured provides all users with a quick understanding of the composition and key sections of a specific area of content. This can help to improve the speed and efficiency at which users navigate. Well-structured content provides enhanced assistance to users of assistive technology whose technology tools provide alternative navigation mechanisms based on the included structural elements.

Content Titles

Each page, document, frame, and interface should have a unique and descriptive title. The title of content is generally the first piece of document-specific information consumed by users when interacting with a product. The title gives them an overview of the purpose of the content they are consuming.

Section Headings

Each section of content should have a heading of appropriate level and provide a succinct description of the content that follows the heading. When the underlying technology permits, the headings should provide semantic organization for the content (e.g., an outline).

Consistency

Consistency in layout and content identification (e.g., interactive element labels) helps reduce any user's cognitive load and increases the speed at which users can navigate a product. When developing or modifying a product, developers should strive for consistency whenever possible. This includes reducing the number of different visual layouts used and enhancing consistency in the types of interactions (e.g., always placing the cancel button in a similar position across all interfaces).

Descriptive Labels for Interactive Elements

Interactive elements (links, buttons and other types of controls, menus, etc.) are an essential way that users interact with products. Most interactive elements have a visual label, but this label is not always associated with the element it describes. Providing an accessible programmatic label allows all users regardless of device or technology to understand the purpose of an interactive element. Examples of this include:

- Providing unique text-based labels for any type of link that can be understood even when read out of context (e.g., "VPAT for [Product Name] [Version]" instead of "Our Product VPAT").
- Providing both labels for individual controls, such as checkboxes and radio button, and summary labels for groupings of such controls (e.g., Group Label: "What is your gender?" [radiobutton] Label: "Male" [radiobutton] Label: "Female").

The one exception to the requirement for every interactive element to have a unique label is interactive elements which have the exact same function and are repeated in an interface (e.g., Save and Cancel buttons on both top and bottom of a page). For consistency, these interactive elements should always have the same label to avoid confusion.

Grouped Content

Grouping content both visually and programmatically provides users with an understanding of the purpose of the interrelated content and multiple means of navigation. Examples include:

Semantic Lists

Content that is organized into semantic lists (using proper list markup) provides enhanced information for users of assistive technology including the organization and length of the content blocks.

Tabular Data

All tabular data should be contained in tables that provide users with guidance on how to interpret the data. In its simplest form this consists of semantic markup that describes the organization of the data (e.g., row and column headers). If the data is more complex, multiple sets of programmatically linked

headers should be included along with a table summary or caption. If the table contains any type of interactivity, this should be contained in the summary or caption.

[Accessible Alternatives for Non-text Content](#)

Not all users have perfect or even good vision, including elders. In addition, users in rural areas or less modernized countries may have slow or spotty Internet. Therefore, providing alternatives for non-text content will allow all users regardless of ability and connection speed to access the developer intended information.

Informative Images

Images can convey many types of information that is useful, artistic, opinionated, etc. To convey this information to users, every informative image should have a text alternative description. This text should be succinct (normally between 8-10 words), yet describe the intended purpose of the image. If the purpose of the image cannot be fully described succinctly, a longer description should be provided in the surround text content, or through a separate linked document. If the image contains text all of the text should be included in the alternative, or a summary of the important text should be provided.

Decorative Images

Some images are used purely for visual decoration or layout. These images do not need a text alternative because they do not provide valuable information to the user and can increase the cognitive load on a user during navigation. These images should be designated as decorative by providing a blank description, using the appropriate method within your authoring system. There are no hard and fast rules on how to determine if an image is decorative, instead the developer should ask users where possible or should use their best judgement.

Complex Graphics

Complex graphics (charts, graphs, info graphics, maps, etc.) rarely can be described in a small amount of words. Therefore, users should be provided with a longer, linearized description of these types of non-text content. In many cases it is helpful to pair these longer descriptions with a short alternative text description or a link indicating the existence of the longer alternative.

[Multimedia](#)

Multimedia is often just a combination of a large number of images or sounds in sequence. This type of non-text content is often complex and conveys a great deal of information in a short period of time. Transcripts, synchronized captions, and audio descriptions, as appropriate, should be provided for all multimedia.

[Color Choices](#)

Users have varying levels of color perception and utilize an ever growing number of devices in varying types of environments. Making prudent color choices, particularly for text content and its background, will help all users interact with interfaces and consume content. The highest color contrast ratio should be provided that does not impact the visual design. The contrast of two colors can be evaluated by multiple tools in the Accessibility Toolbars, Validators, and Add-ons section in the Resources for Accessibility Implementation appendix. Vendors should ensure that their products work with color modification features of standard browsers, operating system utilities, and common assistive technologies. If high contrast colors impact the design and aesthetics of a product, vendors can implement a separate high contrast mode.

Accessibility API

Modern browsers create structured models from webpages in order to render web page content. The [Document Object Model](#) is the best-known example, but another is the Accessibility Tree model. The [Accessibility Tree \(AX\)](#) is the model that assistive technology directly interacts with to read the content, and notify the user of changes in the content and errors during interaction. All popular browsers render an AX. Browsers are able to create valid AX from standard HTML and ARIA (another related standard); JavaScript code must manually build the AX with valid values for the AX attributes. So, the easiest approach to accessible code is to use HTML and ARIA standards and best practices. You can enhance



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interactivity with JavaScript, but then you assume the responsibility for presenting a complete and valid Accessibility Tree through carefully crafted and tested code.

Appendix: Accessibility Documentation

It is critical to ensure that available documentation also supports accessibility. This includes both ensuring that standard documentation is accessible and documenting accessibility specific features and commands.

The format of the documentation itself should be accessible. For text documents, we recommend HTML as the most accessible format; an added benefit is that this will be easiest to maintain as product updates are released. If this is not possible, please see the Appendix for a list of resources on making maximally accessible documentation in Word, PDF, etc. The Appendix also includes resources on making video and audio documentation accessible.

Placement of links to accessibility information is also important. Place these links as close to the top of the page as possible and give them predictable names, such as “Accessibility Information,” so that interested users can discover them easily.

Write for all Users

Considering assistive technology users need not be daunting, and will likely result in documentation that is more robust and clear for a broad spectrum of users. Using clear and concise language benefits users with learning disabilities, and also provides more understandable documentation for everyone. Providing descriptive text rather than relying solely on visual diagrams is helpful to blind users, but also to those who may be referencing materials via slow connections or mobile devices. Writing instructions that focus on the controls and content of your product, rather than the user’s device, prevents your documentation from excluding specific users. For example, compare “click the mouse on the OK button” to “Activate the OK button.” The latter is inclusive of touch screen and keyboard only users, and still conveys the essential function to a mouse user.

Describe Images

Providing text descriptions of images is essential to blind and visually impaired users. Imagine being blind and trying to access a manual that goes something like this. “To access settings, click the graphic. You will then see three tabs: graphic, graphic, and graphic.”

You may choose to write thorough text that stands alone with or without a graphic. For documentation in electronic formats, you should add alternative text (using an ALT attribute) to the graphic itself. If providing cohesive text, accompanied by a graphic of the button described, an additional graphic description may be redundant. In this case, a graphic can be assigned a null attribute, so that it will not be read by screen reading technology.

Do not provide descriptions for graphics that are simply decorative, such as borders or text boxes. These graphics should also include a null attribute.

Avoid Semantic Stumbling Blocks

When making content accessible, it is important to refer to onscreen elements with proper terminology. Screen reader users, as well as those using speech to text software, may refer to an element’s type to locate it on the screen. For example, screen reader users have different commands to locate links versus buttons on a web page. If an element is technically a link, but styled to look like a button, it could easily be described as a button in documentation, and create confusion for the screen reader user.

Compatibility

If an application is optimized to work with particular versions of assistive technology products, this information should be included in the documentation. Likewise, if only particular browser and assistive technology combinations are supported, the user needs ready access to this information.

Configuration

If specific assistive technology settings, plugins, or modes must be enabled to use the product, the user should be provided with this information in an easily discoverable location, to avoid losing valuable time trying to work with the product in a suboptimal way. Examples of configuration information might include: enabling the Java access bridge, reducing screen reader speech in a self-voicing product, selecting specific screen reader cursors, or adjusting keyboard access for browsers on the Mac.

Layout and Use

If documenting a complex program or interface, a description of the program's layout should be provided. This will be of particular use to nonvisual users who rely on screen reader technology. Because screen readers can only focus on one area of the screen at a time, cause and effect relationships within a program may not be immediately clear to the user. For example, if activating a button on the toolbar causes a change in the main window of an application without moving cursor focus, a screen reader user may be unaware a change has occurred.

Describing how to carry out each function within an application would be daunting for both you and the user. Instead, focus on providing a description of the application's components. For example: "The program's main window is divided into the toolbar, text area, and status line. To cycle between these sections, use the f6 key."

Keyboard Shortcuts

Keyboard shortcuts are very helpful to some assistive technology users who do not use a mouse, as well as anyone who prefers to avoid mouse use. Both accessibility specific shortcuts and ones that are part of standard product functionality can be quite useful, but only if they are easily discoverable and readily referenced. A page or document containing a well-organized list of all the keyboard shortcuts for a product will allow a user to easily search for a specific command.

Documenting Deficits

If there are product features that do not yet include accessibility support, or features that require work-arounds to be accessible, be forthright about these issues in your accessibility documentation. As a starting point, document known issues that have been identified in your VPAT, since your end users are unlikely to reference that document, and provide work-arounds for these issues. A user will appreciate not being required to spend time attempting to use inaccessible parts of the program, or to find workarounds that are already identified.

Hidden Documentation

One technique for providing accessibility documentation within a web page or application is to create hidden text that is only visible to screen reader users. This can be an excellent way to provide real time help text about screen reader specific commands. For example, If using this technique, make sure that the hidden information is only relevant to screen reader users. Accessibility information required by speech to text users, and those using magnification or learning enhancement software should be made visible on the page.

Appendix: Resources for Accessibility Implementation

Campus Accessibility sites

- [Indiana University](#)
- [Michigan State University](#)
- [Northwestern University](#)
- [Ohio State University](#)
- [Pennsylvania State University](#)
- [Purdue University](#)
- [Rutgers University](#)
- [University of Illinois at Urbana-Champaign](#)
- [University of Iowa](#)
- [University of Michigan](#)
- [University of Minnesota](#)
- [University of Nebraska-Lincoln](#)
- [University of Wisconsin-Madison](#)
- [University of Chicago](#)
- [University of Maryland](#)

Automated accessibility checkers and validator tools

- [WebAIM WAVE](#)
- [Functional Accessibility Evaluator \(FAE\)](#)
- [SortSite Desktop](#)
- [Cyxtera ComplianceSheriff](#)
- [Deque Worldspace](#)
- [Deque aXe](#)
- [SSB Bart Group AMP \(Accessibility Management Platform\)](#)
- [Cynthia Says](#)

Accessibility Toolbars, Validators, and Add-ons

- [Web Accessibility Toolbar \(WAT\)](#)
- [Firefox Accessibility Evaluation Toolbar](#)
- [WAVE Toolbar](#)
- [Juicy Studio Accessibility Toolbar add-on for Firefox](#)
- [Firebug add-on for Firefox](#)
- [HTML Validator add-on for Firefox](#)
- [AChecker](#)
- [Jim Thatcher's Favelets](#)

Manual Testing Resources

- [3 Pillar Global Accessibility Testing Tools and Techniques](#)
- [George Mason Manual testing](#)
- [Temple University - Manual checks when testing a website for accessibility](#)

General Resources

- [WebAIM - Web Accessibility in Mind](#)
- [Berkeley: 10 Tips for Making Your Website Accessible](#)
- [Design Websites for Blind/Visually Impaired](#)
- [Improving accessibility for motor disabled users](#)

Sample Vendor Accessibility Information

- [Hewlett Packard \(HP\)](#)
- [Oracle](#)
- [Polycom](#)
- [Xerox](#)

Mobile Application Accessibility

- [Resources for Mobile Accessibility Guidelines](#)
- [Google Accessibility](#)
- [Android Making Applications Accessible](#)
- [Apple Applications Accessibility](#)
- [Accessibility Applications Programming Guide for iOS](#)
- [BlackBerry \(VPAT for BlackBerry devices provided\)](#)

Document Accessibility

- [Document Accessibility Toolbar](#)
- [EPUB for Education \(EDUPUB\)](#)
- [Microsoft Word](#)
- [PDF](#)
- [PowerPoint](#)

Accessibility Groups and Associations

- [World Wide Web Consortium \(W3C\)](#)
- [National Federation of the Blind](#)
- [International Association of Accessibility Professionals \(IAAP\)](#)
- [Information Technology Industry Council \(ITI\)](#)
- [American Foundation for the Blind](#)

Training courses

- [Interactive Accessibility: Section 508 VPAT or WCAG 2.0 certification](#)



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Accessibility Certification

- [The International Center for Disability Resources on the Internet \(ICDRI\)](#)
- [Deque, VPAT Certification](#)
- [Level Access \(formerly SSBart Group\)](#)
- [WebAIM - Accessible Web Site Certification](#)

Government standards

- [Section508.gov](#)
- [U.S. Department of Labor](#)
- [Disability.gov](#)
- [U.S. Department of State](#)
- [Social Security](#)
- [BuyAccessible.gov](#)
- [GSA - Vendor Accessibility Resource Center](#)

VPAT (Voluntary Product Accessibility) templates

- [VPAT 2.0 \(Information Technology Industry Council\)](#)
- [Minnesota.gov WCAG 2.0 VPAT](#)

Appendix: Comments from Big Ten Academic Alliance-ITAG Survey

In 2014, all Big Ten Academic Alliance member schools were surveyed about their accessibility practices when working with vendors. A summary of responses to selected questions is listed below.

How has vendor inability to provide accessible products affected your purchasing decisions?

- Vendors have not been released from beta stage. For instance, their tool will not be enabled by default to faculty in the LMS. The ATAC has been required to perform comprehensive accessibility analysis and to write best practice documentation on how to use a product or service accessibly.
- In some cases, superior accessibility supported a decision to select a specific product. In other cases, accessibility problems have been ignored. I don't know of a situation in which an otherwise preferred product was rejected because of accessibility problems.
- It frequently affects purchasing decisions, and on at least one occasion has been a deal-breaker affecting adoption of a new technology.
- We're [disability office] not the people doing the purchasing so it's hard to answer this. Our campus is in the middle of a major systems upgrade and we are all putting significant energy toward making it accessible. [We were] not part of the process from the beginning though so I'm not sure how the purchase/upgrade might have turned out if we had been.
- This depends, of course, on when we hear about the purchase. If the Web Accessibility Center and the Accessibility Analyst within the OCIO are brought in early in a process often we can have influence in a decision. We also have an "IT Accessibility Exception" procedure which is relatively new. It has been used for three products over the last year and there are other instances in the pipeline. The exception provides four things: documentation of issues with a product, a justified case for usage of a known-inaccessible or partly inaccessible product, a promised timeline for remediation of a product, and an accommodation plan that is to be in place for as long as the product remains inaccessible. The exceptions are designed to be temporary. An exception constitutes a formal agreement between the OSU ADA Coordinator's Office and the business entity that is responsible for the product on campus.
- Accessibility of products has been a factor in our purchasing decisions and/or open the door to negotiations and timetables.

To what extent is accessibility considered when purchasing technology products and services?

- It varies. [Our] central IT department frequently requires that key vendors commit to a roadmap with WCAG 2.0 AA compliance as a goal. Vendors that do not show accomplished commitment to accessibility improvements do not get past a pilot or beta stage (i.e., not turned on by default).
- It has begun to appear as a consideration among technical requirements, which often number in the dozens on major purchases. It is most often treated as a feature, but not a go/no-go test.

- Accessibility is a consideration being promoted at a level with other key concerns, such as security.
- More now than ever. People in the Purchasing unit at the University are on board and doing their part. Since people all over campus purchase things all the time, it's hard to describe the extent. We are also working with our general counsel's office with the folks who handle non-standard contracts to make sure that at least those purchases include something about accessibility.
- This is dependent on what entity is doing the purchasing and at what level. The OCIO has an accessibility plan in place that requires all purchases to be as accessible as possible. When doing an evaluation of a product we assess the legal risk accessibility problems may give and our evaluations, in addition to detailing specific and global issues, also include an assessment of the overall "health" of the product in terms of accessibility. This is the OCIO. There are also currently accessibility plans for our online and distance education (ODEE) program (campus CMS and related local and remote ed services) and for our student affairs office (Student Life). Both of those agreements include requirements for accessibility in new purchases.

Can you provide examples of when you approached vendors about the accessibility of their products? What were the results?

- It varies. Some vendors only know accessibility as, "we have 99.9% uptime", or that, "our product is the highest dollar value!". We have established extended relationships with vendors for example:
 - active in Accessibility Working Groups for an open source product (sakai)
 - funded and trained interns to work directly with the vendor
 - established an extended consulting relationship and encouraged the vendor to seek broad input on requirements (vendor formed an accessibility guidance board)
- [Company 1]: They were knowledgeable and able to discuss their strengths and weaknesses, as well as future plans. [Company 2]: they asserted great accessibility, but simple tests suggested that there are problems. We haven't yet addressed the test results with them.
- Vendors are usually interested to hear more, especially if they understand that accessibility will play a role in the purchase decisions of us or other postsecondary institutions. Their responsiveness is mixed, especially when significant redesign will be involved.
- I can think of at least one big vendor who has told us they aren't interested in working with us on accessibility because they don't have to. So we're looking for a replacement system.
- We have worked with a number of vendors on accessibility, providing detailed reports and personal consultations. Vendor response varies greatly. For example, one vendor incorporated our issues list into their development cycles, and we were invited to meet with and verify their corrective work every two weeks. There are similar cases. Other times we have given detailed feedback and have gotten little or no response.

- [We do] this frequently. Often they are appreciative and collaborate with us; we do testing for them. Often they are uncooperative

Have vendors ever asked for more information (legal, technical, etc.) about accessibility? What resources have you provided to them, or would you provide if asked?

- We provide consultation, refer the vendor to 3rd party accessibility consultants, refer them to DOE/DOJ publications (FAQ on DCL, etc.), refer them to [WebAIM](#), etc.
- This hasn't arisen. If it did, I would first send them towards [WebAIM](#), and provide names of possible consultant firms who could help them. (I'm thinking of people like [Paciello Group](#).)
- We provide information to multiple vendors on specific issues and suggested changes relevant to their products. These changes are usually accompanied by references to our own accessibility website, [WebAIM](#), or issue-specific resources.
- Yes. Generally we steer them to WC3 or WCAG. We also have our own accessibility website which provides some resources. If there's a specific case where we can look at code and provide a solution or guidance, we'll do that.
- We have offered "legal advice" informally, typically in the context of persuasion: "If you do this work now, it will help you with other government and university clients who are required to be accessible." We have given technical advice on many occasions and in a lot of detail over long periods of time. Usually, we find vendors are very appreciative – though not to the degree of paying us for the advice. (They are getting expert advice for free, which under normal circumstances would cost them consulting fees of \$150 an hour or greater. So, I suppose it is understandable why they are appreciative.)
- Yes! We won't give much technical support other than to refer them to appropriate websites, but we do test and offer feedback.

What is the main quick-win you think vendors could do to move forward on accessibility implementation?

- Seeking an accessibility consultant that understands the needs of customers that are obligated under the ADA and of users with disabilities that can:
 - review the accessibility of their product/service
 - write and certify the product accessibility documentation
 - document how their customers can use the product/service legally (EEAAPs, UDL, accommodations, etc.)
 - help the vendor develop a culture of accessibility (design, development, QA, in documentation, support, and marketing)
- Address accessibility of form fields for people using screen readers and/or keyboards for navigation.
- Awareness of resources and best practices, particularly those that can be implemented at the design phase.

- My first instinct is to say that there is NO quick win and when we have conversations about accessibility, we want to avoid framing it in terms of quick wins. There is certainly plenty of upside potential for vendors who create genuinely accessible products. I think companies that understand that may likely win the day. But I'd prefer to think about it in terms of sustainability rather than quick wins.
- Either hire and take the advice of an accessibility expert (that is, not just a single developer who dabbles, but an actual expert) or contract with and pay attention to a well-reputed accessibility consultancy (that is, not a fly-by-night, let's-troll-the-Washington-Beltway "508" shop).
- Implement human testing with screen readers in the Q/A portion of their development workflow.



Appendix: Sample Procurement Statements and Settlement Agreements

Sample Accessibility Procurement Statements

- [University of California Guidelines](#)
- [University of Illinois Statement](#)
- [NCDAA Article with recommendations and sample language](#)

Sample Settlement Agreements

- [Louisiana Tech and the Department of Justice](#)
- [University of California-Berkeley & Disability Rights Advocates](#)
- [Penn State and the National Federation of the Blind](#)
- [University of Montana and the Department of Justice](#)