PROFESSIONAL WEB ACCESSIBILITY AUDITING MADE EASY

Digital Education Strategies, The Chang School
Ryerson University

LibreTexts™

Ryerson University

Professional Web Accessibility Auditing Made Easy

Digital Education Strategies, The Chang School

This text is disseminated via the Open Education Resource (OER) LibreTexts Project (https://LibreTexts.org) and like the hundreds of other texts available within this powerful platform, it is freely available for reading, printing and "consuming." Most, but not all, pages in the library have licenses that may allow individuals to make changes, save, and print this book. Carefully consult the applicable license(s) before pursuing such effects.

Instructors can adopt existing LibreTexts texts or Remix them to quickly build course-specific resources to meet the needs of their students. Unlike traditional textbooks, LibreTexts' web based origins allow powerful integration of advanced features and new technologies to support learning.

The LibreTexts mission is to unite students, faculty and scholars in a cooperative effort to develop an easy-to-use online platform for the construction, customization, and dissemination of OER content to reduce the burdens of unreasonable textbook costs to our students and society. The LibreTexts project is a multi-institutional collaborative venture to develop the next generation of open-access texts to improve postsecondary education at all levels of higher learning by developing an Open Access Resource environment. The project currently consists of 14 independently operating and interconnected libraries that are constantly being optimized by students, faculty, and outside experts to supplant conventional paper-based books. These free textbook alternatives are organized within a central environment that is both vertically (from advance to basic level) and horizontally (across different fields) integrated.

The LibreTexts libraries are Powered by MindTouch® and are supported by the Department of Education Open Textbook Pilot Project, the UC Davis Office of the Provost, the UC Davis Library, the California State University Affordable Learning Solutions Program, and Merlot. This material is based upon work supported by the National Science Foundation under Grant No. 1246120, 1525057, and 1413739.

Have questions or comments? For information about adoptions or adaptions contact info@LibreTexts.org. More information on our activities can be found via Facebook (https://facebook.com/Libretexts), Twitter (https://twitter.com/libretexts), or our blog (http://Blog.Libretexts.org).

This text was compiled on 06/14/2022

TABLE OF CONTENTS

Digital accessibility skills are in high demand, as the world becomes more aware of barriers in digital content that prevent some people from participating in a digital society. These are essential skills for web developers, and essential knowledge for organizations that want to ensure their web content is reaching the broadest audience possible.

CHAPTER OVERVIEW

1: Introduction

1.1: Introduction

Learning Outcomes

Welcome to Professional Web Accessibility Auditing Made Easy! By the time you finish reviewing the materials here, and trying the activities, you should be able to:

- Create an accessibility auditing toolkit
- Identify and apply key accessibility guidelines in WCAG 2.0/2.1
- Retrieve WCAG supporting documents when needed
- Employ web-based automated accessibility checkers
- Measure and/or assess web design elements such as colour contrast, readability, and more, using a range of publicly available test tools
- Test for accessibility using assistive technologies such as the JAWS and ChromeVox screen readers
- Use a screen reader to navigate the Web
- Apply easy manual tests to quickly assess accessibility
- Select an appropriate type of web accessibility audit and corresponding reporting strategy aimed at the audience being served
- Recognize relevant accessibility guidelines, standards, and specifications and integrate these into accessibility review strategies based on international requirements

Required Technology

In order to practice what you're learning as you follow along here, you will need to use the following software:

- Chrome web browser (and the ChromeVox screen reader, for which links and installation instructions will be provided in unit 2)
- A word processing application (e.g., Microsoft Word, OpenOffice, or Google Docs)
- A PDF reader (e.g., Adobe Reader)

Beyond What You'll Learn Here

For those who would like to go beyond what they've learned in the materials here, The Chang School has created a series of resources on web accessibility for different audiences:

- Introduction to Web Accessibility (web ebook verison)
- Digital Accessibility as a Business Practice (web ebook version)
- Web Accessibility for Developers (web ebook version)
- Understanding Document Accessibility (web ebook version)

Disclaimer

The information presented here and any related materials referred to in the content are for instructional purposes only and should not be construed as legal advice on any particular issue, including compliance with relevant laws. We specifically disclaim any liability for any loss or damage any reader may suffer as a result of the information contained.

1.2: Objectives and Activities

Objectives 

By the end of this unit, you should be able to:

- Identify the key strategies for using this learning resource.

Activities

- Begin to set up your Web Accessibility Auditing Toolkit

1.3: The Information Here Will Be Helpful To...

This is aimed at those who are responsible for implementing accessibility on an organization's website. These people tend to be **web developers** (sometimes referred to as webmasters) but may also include **web content editors** and **web designers** who are comfortable using HTML, CSS, and to some degree, JavaScript.

Web Developers

Web developers should **focus on understanding the technical** content, but also **be familiar with the general** content. That is, all of the information here will be relevant to you.

Everyone Else

If you are not a web developer, depending on your background and level of comfort with web technologies, you may choose to **skip over the technical parts**, presented within the content in blue boxes and marked as Technical. Review the Table of Contents for a full list of topics. You can focus your study on the general content, completing the activities and setting up a Web Accessibility Auditing Toolkit, and, having made your way through all the reading and activities, come away with a good understanding of the requirements for developing accessible web content.

1.4: Choosing Your Learning Path

As we mentioned earlier, depending on your role in your company or organization, different parts of the material may be more relevant to you than others. We've tried to identify the technical content in particular so you can pass over these parts if they are less relevant to you or you are trying to budget your time. To help you navigate to the information most relevant to your needs, we have colour-coded and labelled the technical content as follows. Content that does not appear in coloured boxes is aimed at everyone.

Technical: Aimed more at web development staff, typically containing HTML code samples.

Lulu's Lollipops Storyline

To support your understanding of the materials, the fictional story of an Ontario-based company, Lulu's Lollipops, has been weaved throughout the content to add a sense of realism. The story unfolds as Lulu investigates the steps involved in improving the accessibility of the Lulu's Lollipops website. In the story you will hear about Lulu's team members – people just like you who want to learn more about web accessibility. Imagine that Lulu's team have all downloaded this resource as a book. Lulu has a webmaster, who will closely follow the **Technical** information that is shared. Lulu also has a number of Customer Service Representatives, who, as part of their role in supporting clients, have a **general** interest in ensuring that the company and its website serve the needs of everyone. Visit the current **Lulu's Lollipops Website** to familiarize yourself with it. You will be conducting an accessibility audit of the site in a later unit.

Your Web Accessibility Auditing Toolkit

Throughout the content, we've also identified elements that should be added to the Web Accessibility Auditing Toolkit you will be assembling. These elements will include links to resource documents and online tools used during auditing activities, as well as software or browser plugins that you may need to install. These will be identified in a green Toolkit box like the following:

Toolkit: Provides useful tools and resources for your future reference.

Key Points

Throughout you will see important or notable information highlighted and labelled in Key Point boxes like the one that follows. These will include "must know" information, as well as less obvious considerations and interesting points.

Key Point: Must-know information and interesting points.

Try This

Try This boxes contain activities designed to get you thinking or give you firsthand experience with something you've just read about.

Try This: Something to experience.

Readings and References

Readings and References: Links to various web resources for **additional reading** on the topics being discussed.

Try This: Skip ahead to the end of the materials here and **read through the Content Recap** for a high-level summary of the topics covered.

1.5: Why Learn About Web Accessibility Auditing?

Lulu's Story Begins

Lulu's Lollipops is a thriving business, with 52 employees, based out of Hamilton, Ontario, Canada. Lulu's business is primarily web-based and has been operating for ten years selling lollipops of various shapes, sizes, colours, and flavours. A representative of a charitable organization has approached Lulu about placing a large order for lollipops that would be part of an upcoming fundraising campaign. As part of the charity's mandate, the representative has asked about the accessibility of Lulu's website to ensure that staff from different chapters of the charity can easily place orders. Lulu realizes that she has never really considered the accessibility of her website and, based on a recommendation from a friend, Lulu decides to enrol herself and a number of her team members in Web Accessibility Auditing Made Easy.

As a business owner, Lulu understands that there are some provincial guidelines she should consider as she works to accommodate the needs of her potential client (the charitable organization), but she still wonders why it makes sense to modify the website that has already served her company so well for over 10 years. Lulu and her team need to think about three important things: "curb cuts," the business case, and the AODA. Read on to learn more about these compelling factors related to investment in web accessibility. View the Lulu's Lollipops website.

Curb Cuts

Think about "curb cuts," a great example of what is often thought of as universal design. Curb cuts were originally added to streets to accommodate those in wheelchairs so they could get from the road up onto a sidewalk and vice versa. But curb cuts are helpful for many people — not just those in wheelchairs. A person pushing a baby stroller can now easily get to the sidewalk. A person riding a bike can get more easily onto the sidewalk where the bike lockups are located. An elderly person who may have difficulty stepping up on a curb or who may be using a walker now has a smooth gradient and can walk onto the sidewalk rather than climb onto it. Curb cuts were designed to help those in wheelchairs but have come to benefit many.

From a web accessibility perspective, most of the accessibility features you might add to a website will have that so-called "curb cut effect." For example, the text description one might include with an image to make the image's meaning accessible to a person who is blind also makes it possible for search engines to index the image and make it searchable. It allows a person on a slow Internet connection to turn images off and still get the same information. Or, it allows a person using a text-based browser, on a cell phone for instance, to access the same information as those using a typical visual browser. Virtually every such feature that might be put in place in web content to accommodate people with disabilities will improve access and usability for everyone else.

Key Point: Think of accommodations provided to improve web accessibility for people with disabilities as "curb cuts." They will very likely improve usability for everyone.

The Business Case for Web Accessibility

Karl Groves wrote an interesting series of articles in 2011 and 2012 that looked at the reality of business arguments for web accessibility. He points out that any argument needs to answer affirmatively at least one of the following questions:

1. Will it make us money?
2. Will it save us money?
3. Will it reduce risk?

He outlines a range of potential arguments for accessibility:

- **Improved search engine optimization:** Customers will be able to find your site more easily because search engines can index it more effectively.
- **Improved usability:** Customers will have a more satisfying experience and thus spend more on or return more often to your site.

- **Reduced website costs:** Developing to standard reduces bugs and interoperability issues, reducing development costs and problems integrating with other systems.
- **People with disabilities have buying power:** They won't spend if they have difficulty accessing your site; they will go to the competition that *does* place importance on accessibility.
- **Reduced resource utilization:** Building to standard reduces the use of resources.
- **Support for low bandwidth:** If your site takes too long to load, people will go elsewhere.
- **Social responsibility:** Customers will come if they see you doing good for the world and you think of people with disabilities as full citizens.
- **Support for aging populations:** Aging populations also have money to spend and will come to your site over the less accessible, less usable competition.
- **Reduced legal risk:** You may be sued if you prevent equal access for citizens/customers or discriminate against people with disabilities.

What accessibility really boils down to is "quality of work," as Groves states. So, in approaching web accessibility, one may be better off not thinking so much in terms of reducing the risk of being sued or losing customers because your site takes too long to load, but rather that the work you do is quality work and the website you present to your potential customers is a quality website.

Video: The Business Case for Accessibility

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1152

Readings and References:
If you'd like to learn more about business cases, here are a few references:

- Developing a Web Accessibility Business Case for Your Organization (W3C)
- Chasing the Web Accessibility Business Case (Karl Groves, 2012) part 1
- Chasing the Web Accessibility Business Case (Karl Groves, 2012) part 2
- Chasing the Web Accessibility Business Case (Karl Groves, 2012) conclusion
- 2 Seconds as the New Threshold of Acceptability for eCommerce Web Page Response Times (Akamai, 2009)
- Releasing Constraints: The Impacts of Increased Accessibility on Ontario's Economy (Summary)
- Releasing Constraints: Projecting the Economic Impacts of Increased Accessibility in Ontario (Full Report) [PDF]

AODA Background

Video: AODA Background

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1152

For those in Ontario, Canada, we'll provide occasional references to the *Accessibility for Ontarians with Disabilities Act* (AODA). If you're from outside Ontario, you might compare the AODA's web accessibility requirements with those in your local area. They will be similar in many cases, likely based on the W3C WCAG 2.0 Guidelines. The goal in Ontario is for all obligated organizations to meet the Level AA accessibility requirements of WCAG 2.0 by 2021, which, ultimately, is the goal of most international jurisdictions.

The AODA provided the motivation to create this resource, based on the MOOC course of the same name. All businesses and organizations in Ontario with more than 50 employees (and all public sector organizations) are now required by law to make their websites accessible to people with disabilities (currently at WCAG 2.0 Level A). Many businesses still don't know what needs to be done in order to comply with the new rules. This resource hopes to fill some of that need.

The AODA has its roots in the *Ontario Human Rights Code*, introduced in 1990. It essentially made it illegal to discriminate based on disability (among other forms of discrimination). The development of the AODA began in earnest in 1994 with the emergence of the *Ontarians with Disabilities Act* (ODA). Its aim was to legislate the removal and prevention of barriers that inhibit people with disabilities from participating as full members of society, improving access to employment, goods and services, and facilities. The act was secured as law in 2001.

With the election of a new government in 2003, the movement that brought us the ODA sought to strengthen the legislation. The Accessibility Standards Advisory Council was established, and the AODA was passed as law in 2005, and in July of 2011 the Integrated Accessibility Standards Regulation (IASR) brought together the five standards of the AODA, covering Information and Communication, Employment, Transportation, and Design of Public Spaces, in addition to the original Customer Service standard.

The AODA sets out to make Ontario fully accessible by **2025**, with an incremental roll-out of accessibility requirements over a period of 20 years. These requirements span a whole range of accessibility considerations — from physical spaces to customer service, the Web, and much more.

Our focus here is on access to the Web. The timeline set out in the AODA requires government and large organizations to remove all barriers in web content between 2012 and 2021. The timeline for these requirements is outlined in the table below. Any new or significantly updated information posted to the Web must comply with the given level of accessibility by the given date. This includes both Internet and intranet sites. Any content developed prior to January 1, 2012 is exempt.

	Level A	Level AA
Government	January 1, 2012 (except live captions and audio description)	January 1, 2016 (except live captions and audio description), January 1, 2020 (including live captions and audio description)
Designated Organizations*	Beginning January 1, 2014, **new** websites and significantly refreshed websites must meet Level A (except live captions and audio description)	January 1, 2021 (except live captions and audio description)

	Level A	Level AA
*Designated organizations means every municipality and every person or organization as outlined in the *Public Service of Ontario Act 2006* Reg. 146/10, or private companies or organizations with 50 or more employees, in Ontario.		

For more about the AODA you can review the following references:

Readings and References:

- History of the *Ontarians with Disabilities Act*. (ODA) (David Lepofsky)
- Integrated Accessibility Standards Regulation
- Reg. 146/10: PUBLIC BODIES AND COMMISSION PUBLIC BODIES – DEFINITIONS

1.6: Activity- Start Your Web Accessibility Auditing Toolkit

The Toolkit you will assemble will be made up of various tools and resources you can use when assessing web content. It will include links to documents, tools, and examples you can refer to as needed while auditing.

For the first activity, **create a folder in your browser's bookmarks/favourites area** called "Accessibility Toolkit." You will add the tools and resources introduced here to this folder.

Remember that suggestions for your Toolkit throughout the content will be highlighted in green and labelled "Toolkit."

CHAPTER OVERVIEW

2: Aspects of Web Accessibility Auditing

2.1: Aspects of Web Accessibility Auditing

In this unit, in order to provide a foundation for your studies and activities, we identify and explain the key considerations and aspects of web accessibility review work. This overview will include topics such as:

- Types of disabilities and common barriers encountered in web content
- The tools and testing strategies used in detailed web accessibility auditing
- Thinking beyond accessibility testing
- The W3C Web Content Accessibility Guidelines (WCAG 2.0)

We will look at numerous non-technical and technical aspects of web accessibility auditing. The following sections will provide a foundation of understanding for the units that follow.

Watch the following video from the Government of Australia that summarizes web accessibility. Although the video is from Australia, its ideas are applicable globally. Visit the YouTube site for the video to find the described transcript in full.

Video: Web Accessibility

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1166

There are many ways to assess accessibility that are not technical in nature. Some of these will be introduced here and expanded on in the units that follow. These strategies simply require some thought, reflection, and ultimately, common sense.

2.2: Types of Disabilities and Barriers

Lulu is feeling very positive about the idea that her business, and the website of which she is so proud, could soon be more accessible and easier for all of her customers to use. This brings her to the predictable question of “Where do we begin?” Lulu should start by getting a firm grasp on “the big picture” in terms of what barriers people might encounter on her website and why. From there she can begin to build practical knowledge that will support her next steps. Take a look at the content that follows to better understand the foundation of information that Lulu and her team will require. In order to understand what web accessibility auditing tests for and why, it is helpful to have a basic understanding of a range of disabilities and their related barriers with respect to the consumption of web content.

Not all people with disabilities encounter barriers on the Web, and **those with different types of disabilities encounter different types of barriers**. For instance, if a person is in a wheelchair they may encounter no barriers at all in web content. A person who is blind will experience different barriers than a person with limited vision. Different types of disabilities and some of their commonly associated barriers are described here.

Watch the following video to see how students with disabilities experience the Internet.

Video: **Experiences of a Student with Disabilities**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1172

In this video, David Berman talks about types of disabilities and their associated barriers.

Video: **Web Accessibility Matters: Difficulties and Technologies: Avoiding Tradeoffs**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1172

People Who Are Blind

People who are blind tend to face many barriers in web content, given the visual nature of the Web. They will often use a screen reader to access their computer or device and may use a refreshable Braille display to convert text to Braille.

Common barriers for this group include:

- Visual content that has no text alternative
- Functional elements that cannot be controlled with a keyboard
- Overly complex or excessive amounts of content
- Inability to navigate within a page of content
- Content that is not structured
- Inconsistent navigation
- Time limits (insufficient time to complete tasks)
- Unexpected actions (e.g., redirect when an element receives focus)
- Multimedia without audio description

For a quick look at how a person who is blind might use a screen reader like JAWS to navigate the Web, watch the following video.

Video: Accessing the Web Using Screen Reading Software

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1172

People with Low Vision

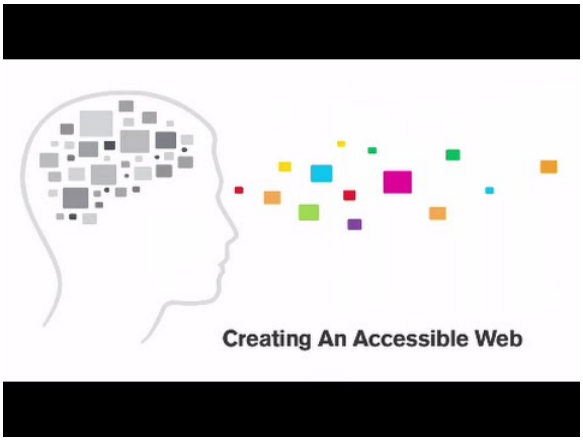
People with low vision are often able to see web content if it is magnified. They may use a screen magnification program to increase the size and contrast of the content to make it more visible. They are less likely to use a screen reader than a person who is blind, though in some cases they will. People with low vision may rely on the magnification or text customization features in their web browser, or they may install other magnification or text reading software.

Common barriers for this group include:

- Content sized with absolute measures that is not resizable
- Inconsistent navigation
- Images of text that degrade or pixelate when magnified
- Low contrast (inability to distinguish text from background)
- Time limits (insufficient time to complete tasks)
- Unexpected actions (e.g., redirect when an element receives focus)

See the following video for a description of some of the common barriers for people with low vision.

Video: Creating an Accessible Web



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1172

People Who Are Deaf or Hard of Hearing

Most people who are Deaf tend to face barriers where audio content is presented without text-based alternatives and encounter relatively few barriers on the Web otherwise. Those who are Deaf and blind will face many more barriers, including those described for people who are blind. For those who communicate with American Sign Language (ASL) or other sign languages, such as Langue des signes québécoise (LSQ), the written language of a website may produce barriers similar to those faced when reading in a second language.

Common barriers for this group include:

- Audio without a transcript
- Multimedia without captions or transcript
- Lack of ASL interpretation (for ASL/Deaf community)

People with Mobility-Related Disabilities

Mobility-related disabilities are quite varied. As mentioned earlier, one could be limited to a wheelchair for getting around and face no significant barriers in web content. Those who have limited use of their hands or who have fine motor impairments that limit their ability to target elements in web content with a mouse pointer may not use a mouse at all. Instead, they might rely on a keyboard or perhaps their voice, along with switches to control mouse clicks, to control movement through web content.

Common barriers for this group include:

- Clickable areas that are too small
- Functional elements that cannot be controlled with a keyboard
- Time limits (insufficient time to complete tasks)

People with Learning or Cognitive Disabilities

Learning and cognitive-related disabilities can be as varied as mobility-related disabilities, perhaps more so. These disabilities can range from a mild reading-related disability to very severe cognitive impairments that may result in limited use of language and difficulty processing complex information. For most of the disabilities in this range, there are some common barrier and others that only affect those with more severe cognitive disabilities.

Common barriers for this group include:

- Use of overly-complex/advanced language
- Inconsistent navigation
- Overly complex or excessive amounts of content
- Time limits (insufficient time to complete tasks)
- Unstructured content (no visible headings, sections, topics, etc.)
- Unexpected actions (e.g., redirect when an element receives focus)

More specific disability-related issues include:

- Reading: text justification (inconsistent spacing between words)
- Reading: images of text (not readable with a text reader)
- Visual: visual content with no text description
- Math: images of math equations (not readable with a math reader)

Everyone

While we generally think of barriers in terms of access for people with disabilities, there are some barriers that impact all types of users, though these are often thought of in terms of usability. Usability and accessibility go hand-in-hand. Adding accessibility features improves usability for others. Many people, including those who do not consider themselves to have a specific disability (such as those over the age of 50) may find themselves experiencing typical age-related loss of sight, hearing, or cognitive ability. Those with varying levels of colour blindness may also fall into this group.

Some of these usability issues include:

- Link text that does not describe the destination or function of the link
- Overly complex content
- Inconsistent navigation
- Low contrast
- Unstructured content

To learn more about disabilities and associated barriers, read the following:

> **Readings and References:** How People with Disabilities Use the Web

2.3: Common Sense

Gaining awareness of the potential for barriers in web content takes many forms. Perhaps you read a book to educate yourself. Maybe your workplace has sponsored training in this area. Or, you may know someone who experiences these barriers firsthand and who has shared their frustrations or insights with you. In Lulu's case, a prospective client drew her attention to the issue. No matter how you gain your awareness, it is important that breaking down the barriers becomes both common sense and common practice.

> **Key Point:** Common sense may require personal experience before it becomes common sense. Seek out ways to interact with assistive technology and those who use it.

If you've never used assistive technology yourself, or interacted with someone who does, take a moment for the video below and visit his YouTube channel The Blind Film Critic for a humorous look at being blind.

Video: How a Blind Person Uses a Computer

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1194

2.4: Things to Watch For

It is important for Lulu and her team to realize that the barriers that exist in their web content are not necessarily unique and that one thing that simplifies the job of a web accessibility auditor is that there are a relatively small number of **issues that occur over and over again**. Being aware of these common barriers means it is often possible to quickly scan through content and identify most accessibility issues. Lulu and her webmaster should become familiar with the following list of the top ten potential barriers to watch for, and you should too! It is by no means a complete list, but represents the most common accessibility problems.

1. Images without a Text Description

Images without a text description will be inaccessible to those who are blind. Text descriptions are typically added using the `"alt"` **attribute** with the HTML img element. Note that the length of alt text should be no longer than 125 characters. Screen readers will typically stop reading the text at that point. If **a longer description** is needed, there are a variety of ways to describe the image further, either in the surrounding text, in a figure caption, or using the ARIA attribute aria-describedby. ARIA will be discussed further in **Unit 8**. In each case alt would still be used to provide a brief description and refer to the longer description elsewhere.

Technical: Using the alt attribute to refer to a longer description `<img src="abelincoln.jpg" alt="Abraham Lincoln at his desk, see description below" / >`

Source: Wikimedia Commons

In the image above, Abraham Lincoln is preparing the text for the Emancipation Proclamation. Several others are seated around the desk, consulting with Lincoln on the document.

Images of text will also be inaccessible to blind users, and also potentially inaccessible to people with low vision, who may attempt to magnify the image resulting in the text often degrading to the point that it becomes unreadable. People with reading disabilities who use reading software may also have trouble with images of text as they cannot be read by the software.

There are occasions where images are strictly **decorative** or contain no useful information. In such cases the alt attribute should still be used, but its value left empty (i.e., `alt=""`). This forces a screen reader to ignore the image. If an empty alt attribute is not included, screen readers will read the file name of the image, which can interfere with comprehension of the surrounding information, or leave a screen reader user wondering if they are missing something in the image.

Key Point: Be sure all images are adequately described using text.

2. Functional Elements That Only Work with a Mouse

People who are blind are not likely to use a mouse when operating a computer (though there are some that do). Most rely exclusively on a keyboard to navigate through page features. Any element that only operates with a mouse will not be accessible to blind users. People with limited mobility may rely on a keyboard. People with low vision may also rely on **keyboard access**. “Power users” also tend to use a keyboard to navigate more than average users. Usability will be affected for all of these people when keyboard access is missing.

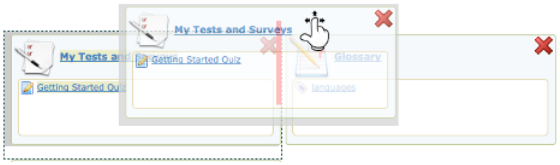


Figure: Drag and Drop elements should be controlled by keyboard, or an equivalent alternate provided

> **Key Point:** Be sure all functional elements operate with both a mouse and a keyboard.

3. Text That Looks Like a Heading, But Is Not

People who are blind and using a screen reader to navigate through web content will have a feature in the screen reader to list the headings on a page, so they can potentially jump to any one of those headings and begin reading. The list of headings also provides a good overview of the content on the page, making it easier to find specific information. When “heading-like” presentation of text is used (e.g., making the text bold and large), the structure provided by proper headings will be missing, requiring these users to navigate through the entire page to discover its content. This greatly increases the effort needed to move through web content. Always **be sure proper HTML headings are used** to represent page sections instead of styled text.

> **Technical:** Using proper headings:
>
> **Accessible:**
>
> ```
> <h1>The Last Chapter</h1>
> ```
>
> **Inaccessible:**
>
> ```
> The Last Chapter
> ```

Likewise, headings should not be used to style large bold text, where the text is not a heading or section title. This creates confusion when listening to a heading list with a screen reader.

> **Key Point:** Be sure all heading or section titles within web content are created using proper HTML heading markup (h1, h2, etc.).

4. Links That Do Not Describe the Destination or Function

Like headings, screen readers can list all of the links on a page to gather a summary of the resources that lead from it. If the link list is made up of meaningless phrases like “**click here**” or “**this link**” or “**more**”, little or no useful information is provided to the screen reader user. For most users, meaningless links like this make content more difficult to use. If you are able to see, imagine yourself coming across these links and having to read through the surrounding text to figure out where the link leads, or having to click the link to discover its destination.

Key Point: Be sure all links describe the destination of the link, or its function if it is used to open a window or pop up a dialog box, for instance.

5. Lists That Look Like Lists, But Are Not

Screen readers will recognize a properly-formatted list using HTML ordered or unordered list markup (OL or UL), announcing the list and the number of list items, and indicating one's position in the list while navigating through it. This information helps with memory and comprehension. Without the proper list markup, more effort is often required to comprehend a list of items.

Key Point: If a collection of items looks like a list, be sure HTML list markup is used to format it as a list. If the order of the items is important, an ordered list should be used; otherwise, use an unordered list.

6. Missing "Within-Page" Navigation

You have already been introduced to two potential ways to navigate within pages, using **headings and links**. There are a variety of other ways to move around within pages, such as providing "**bypass links**," often created to allow assistive technology users to skip over repetitive elements like navigation menus, and jump to an anchor further down the page. **ARIA landmarks** can also be used for this purpose, assigning specific roles to elements (e.g., banner, navigation, main) that can be listed by screen readers and directly jumped to (e.g., `<div role="main">...</div>`). Without ways to navigate within a page, screen reader users may be required to move through the content in sequence from beginning to end to find the information they are looking for, which requires a lot of unnecessary effort.

Key Point: Be sure there are ways to navigate around within web content, using headings, bypass links or landmarks, etc.

7. Poor Visibility, Contrast, or Use of Colour On Its Own

Providing good contrast between text and the background on which it appears is important for a variety of reasons. For those with low vision, or for older readers, text may become unreadable if it does not contrast well with the background. Using an image as a background can also be problematic, particularly when content resizes and text moves over various shades of dark and light, making parts of the text difficult to read.

Key Point: Be sure there is good contrast between text and background colour.

The visibility of the cursor's focus indicator is also important when navigating using a keyboard. Someone with low vision who may have the screen magnified several times may find it easier to navigate with a keyboard than a mouse. If they are unable to see where the keyboard focus is located, keyboard navigation becomes difficult or unusable.

Key Point: Be sure the cursor's focus location is easily visible when navigating by keyboard.

As an example, you may come across a feature that uses a green start button and a red stop button. Some colour blind users or those with low vision may not be able to tell the buttons apart. Adding the words "Start" to the green button, and "Stop" to the red button provides the extra indicator in addition to colour.

Key Point: When colour is used to represent meaning, be sure there is some other indicator provided to express that meaning.

8. Video with No Captions (Or Automatic Captions)

It is quite common nowadays for organizations to host their video collections with services like YouTube or Vimeo. It is important that any meaningful spoken dialogue in the videos be captioned so the content of the audio track is available to those who cannot hear it. Obviously this will include people who are Deaf, but it might also include people watching the video in a noisy environment, or watching with the sound turned down where quiet is necessary.

YouTube now provides automated captioning. It takes the audio track from the video and uses voice-recognition technology to convert the sound to text. This can be a handy feature to quickly caption a video, but video producers must not rely on automated caption to provide captions for their videos. The accuracy rate in many cases will be quite low, to the point where the captions make no sense.

The automated captions can be used as a starting point for manually-generated captions, but are not considered to be an acceptable alternative to the audio track in a video for accessibility purposes. There are a variety of free tools now available, such as YouTube's caption editor or the Amara caption editor, that make it relatively easy for anyone to create captions.

Here's an example of what can happen with automated captions.

Video: **When YouTube Automatic Closed Captioning Goes Wrong**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1196

Key Point: Ensure that all video with meaningful spoken dialogue has human-generated captions. Do not rely on automated captions.

9. Information That Updates without Reloading the Page

It is very common nowadays for parts of web pages to update automatically with new information, such as news feeds or Twitter feeds, for example. Screen readers typically take a static snapshot of a web page before they start reading, so any new information that might be added to a page after loading will generally go unnoticed. When updated content is presented on a site, it must be formatted in such a way that screen reader users are informed of the changes.

Fortunately, with the emergence of ARIA, providing the updates to screen readers is relatively simple. Developers must add a "live region" where updating information is present, using the "aria-live" attribute within the element containing the updating information.

Technical: Presenting updating information:
A live region added to a div.

```
<div aria-live="polite">updating information goes here</div>
```

Note that the value for aria-live specifies when the content of the region gets announced. The “polite” value in the example means the updates are announced when the screen reader is not reading something else. You may also use the value “assertive” which interrupts the screen reader to read the updating information. Developers can also add the aria-relevant and aria-atomic attributes to define what gets read when a live region updates: aria-relevant set to “additions” for new content, “removals” for items removed, and “all” to announce both, and aria-atomic set to “false” to announce only the changes, or “true” to announce the live region as a whole.

Key Point: Ensure that any updating information on a webpage is formatted to be discoverable by screen readers using aria-live.

10. Tables Presenting Data That Have No Row or Column Headers

When navigating through tables containing data using a screen reader, it is often necessary for screen reader users to know the column or row headers to determine the meaning of data in a table data cell, particularly for larger tables where it is difficult to track one’s location auditorily in the table. For table header cells to be readable from within a data cell (TD) they must be marked as a proper table header cell (TH).

Key Point: Be sure tables that are used to lay out data are formatted with proper headings using the HTML TH element.

Try This: Take a look at the demonstrations of accessible and inaccessible techniques used to create web content. You will revisit these demos in a later unit when we talk about screen reader testing.

For more detailed information and further reading, you may wish to review:

Readings and References:

- Web Accessibility
- Golden Rules of Accessible Web Design

⇧ Back to Top

2.5: Automated Web Accessibility Testing

"What types of testing might a web accessibility auditor do on my site, and what should my webmaster and I learn about them?" Lulu wonders. It is recommended practice to use both automated and manual testing when reviewing the accessibility of web content. Let's begin with automated testing.

There are many automated web accessibility testing tools available with **varying degrees of accuracy and coverage**. They will be introduced here in general terms, and covered in more detail in the unit Automated Testing Tools.

Using automated tools to assess web accessibility does not take much technical knowledge, but one often **must have some understanding of web accessibility** to be able to interpret the reports these tools generate.

Most automated testing tools will take a URL from a website, extract the HTML from the page at that URL, then run a collection of test algorithms to detect the presence or absence of particular features in the HTML. For example, if a checker detects an img element, it will run several tests on that element to determine if the "alt" attribute is present, whether it is empty or not, how long the value is, and so on. What they cannot do is tell whether the alt text accurately describes the image, or whether the image is an image of text. In most cases, when HTML is involved, automated checkers are good at detecting missing accessibility features and detecting the presence of features that may create barriers. When meaning is involved, automated checkers do not do well. A human will generally need to make those decisions.

Different automated accessibility checkers can do different things. Here are some examples:

- Some allow you to customize the checks or provide a list of the checks being done
- Some run scripts to ensure that any hidden HTML is also evaluated
- Some generate large reports covering entire websites; others report only on single pages
- Some monitor the accessibility of a site and send out reports when issues are identified
- Some are free, open-source applications that you can download, install and modify to suit your needs; others are proprietary and charge licensing fees

Regardless of the features automated checkers have, you cannot rely on them to find all potential barriers in web content. A human being must also be a part of the checking process and make decisions on potential issues, particularly when meaning is involved.

Key Point: No automated web accessibility checker can identify all potential barriers.

Other Types of Accessibility Testing Tools

In addition to the typical web accessibility checkers, there are a variety of other tools you can use to test specific aspects of accessibility.

Colour Contrast Checkers: Colour contrast checkers can be used to determine whether colour being used in web content provides enough contrast to be readable for those with low vision or colour blindness. These tools take two colour codes (e.g., #ffffff for white, #000000 for black) and use a contrast algorithm to produce a colour contrast ratio. Many colour testing tools can be found on the Web, others can be installed as a plugin for a browser, and still others are built into web accessibility checkers.

Readability Testing Tools: There are also a variety of readability testing tools that can be used to determine the level of education one might require to effectively understand the text in web content. These tools run a series of algorithms that take characteristics of text like the length of words, the density of longer words, the length of sentences, the number of clauses in sentences, etc., and generate a score. For public web content the recommended reading level is about grade 9, or lower-level high school.

Markup Validation Tools: Markup validation tools are also available on the Web, and they are often found in HTML authoring tools used to create content for the Web. These tools will determine whether the HTML is valid, or well-formed and compliant with a formal grammar set out in HTML specifications. These tools essentially identify broken or incorrect usage of HTML that could potentially affect assistive technologies' ability to read web content effectively.

These tools and others will be looked at in more detail in the units following.

2.6: Manual Web Accessibility Testing

In addition to the many automated tools you might use when auditing web accessibility, there are also a variety of manual tests or strategies you can employ to identify potential barriers in web content. Some of these are very simple, quick, and easily done by anyone.

> **Try This:** Place the cursor in the location/URL area of a web browser, then press the Tab key repeatedly and follow the cursor as it moves through elements on the page. Any functional elements like links, buttons, form fields, etc. that don't receive focus when "tabbing" through the page are likely going to be inaccessible to those that require keyboard access (e.g., people who are blind, some low-vision users, others with mobility impairments).

Tab key testing and other manual tests will be covered in the unit Manual Testing Strategies.

Screen Reader Testing

Another manual test strategy that should be used during web auditing is to navigate through web content with a screen reader. Screen readers are useful for identifying accessibility and usability issues. You can easily determine that an image is missing alt text, for instance, if the screen reader reads a file name, or reads nothing at all when it comes across the image. Usability issues can also be identified that automated and manual tests may not identify. For example, if a dynamic error message is injected into a page after some interaction fails, like the messages shown below each field in the login form below, you may see the message but not hear it with the screen reader. In such a case the feedback may need ARIA (discussed in Web Accessibility Initiative – Accessible Rich Internet Applications (WAI-ARIA)) added to make the message readable, which might only be confirmed by listening to a screen reader's output.

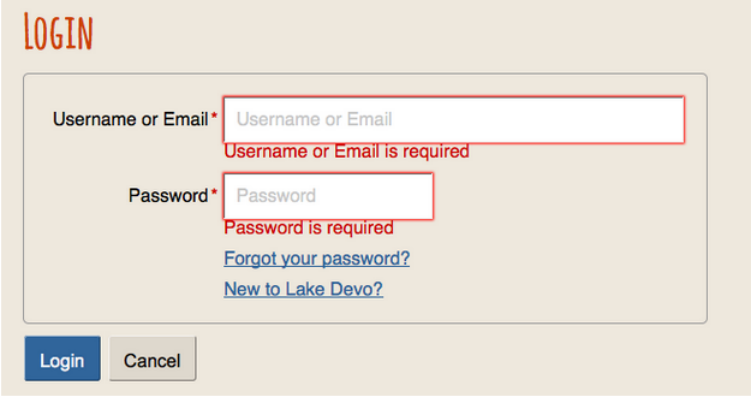


Figure: Login form with dynamically injected error messages below form fields where required information is missing

We will look at using screen readers and other assistive technologies during accessibility testing in more detail in the unit Assistive Technology Testing.

2.7: Introduction to User Testing

Though in many cases using automated and manual testing strategies is sufficient to identify and address potential accessibility issues, it can be helpful to have users with disabilities, or others such as older users, use a site in addition to the other auditing strategies. Actual users can turn up a variety of potential usability issues.

Depending on the audience a site serves, user testers might include a few different people with different accessibility needs, such as a person who is blind using a screen reader, a person with low vision using a magnifier, or perhaps a person with motor impairments using speech recognition and switches to navigate through web content.

User testing will be covered in depth in the unit User Testing.

2.8: Introduction to Code Examination and Repair

Technical: The content on this page is aimed primarily at web developers and is technical in nature.

Code Examination

While you are testing with automated tools or other manual strategies, it is often helpful and sometimes necessary to look at the HTML markup to confirm, or investigate further, potential barriers tools or strategies have turned up. All browsers have a **View Source** feature (or something equivalent) to view the HTML underlying a web page. Though using View Source is one potential way to view the HTML markup, it can be time-consuming to find specific bits of HTML associated with potential barriers that have been identified.

A better strategy for examining code is to use the **Inspect Element** feature most browsers today provide. You can typically right click on the element you want to view (such as an image), then choose “Inspect Element” to look at the HTML and CSS used to display the image. Look at the markup of the image element to see whether the alt attribute is present and what its value is, as well as what other attributes it might contain (e.g., ARIA attributes that may be present to address a potential barrier a checker has identified).

A browser’s developer tools (e.g., Chrome’s DevTools or tools in Firefox Developer Edition) provide a whole variety of information about the markup of a page in addition to being able to examine specific elements in the HTML.

Examining the code with the built-in inspector or with a plugin is a good way to find colour codes in the style sheets associated with a web page when doing colour contrast evaluation.

We will look at code examination in more detail in the section Code Examination and Repair.

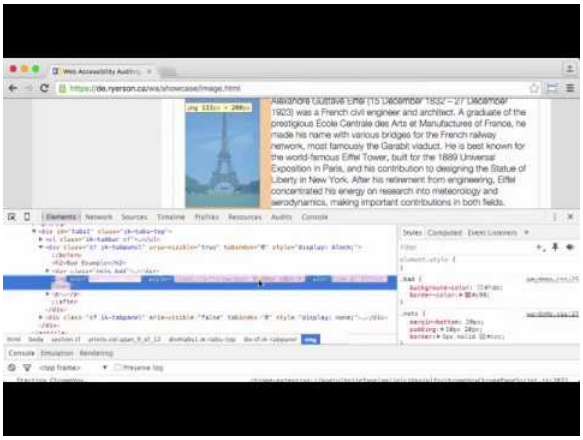
Code Repair

It is often necessary to adjust code manually while auditing, and to retest to come up with solutions to correct accessibility issues. Using the browser’s developer tools, it’s possible to dynamically adjust the HTML markup and CSS to test possible solutions, perhaps running potential fixes through a screen reader, before making recommendations. Firefox Quantum (Developer Edition), Chrome, Internet Explorer, Edge, and Safari all have tools that allow you to dynamically adjust code.

When writing web accessibility reports it can be helpful to provide small code snippets to demonstrate to developers what needs to be done to correct an issue, or at least describe the code changes in written words. Having good knowledge of HTML, CSS, and JavaScript is a prerequisite to providing solutions in your accessibility reports.

We will talk more about code repair in the section Code Examination and Repair. The video below provides an introduction to code examination and repair using a browser’s Inspect view.

Video: **Code Examination and Repair**



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1240

2.9: ChromeVox Screen Reader

We will introduce you to ChromeVox, the screen reader we will be using, early on, so you have plenty of opportunity to practice using it. It will be a key tool used in auditing the accessibility of web content, and will be used in the activity for this unit.

For day-to-day screen reader testing, ChromeVox (particularly the ChromeVox plugin for the Chrome web browser) is our screen reader of choice because of its simple installation and configuration, ability to work across computer platforms, and the fact that it's free and open source.

Technical: One reason ChromeVox works well for accessibility testing is its good support for ARIA. We will cover ARIA in greater detail in the unit Other Accessibility Standards. ARIA is still a relatively new technology, and as of late 2019, it is still being supported inconsistently across available screen readers. When developing for the Web, do use ARIA as it is intended to be used as documented in the ARIA Specification, and test it with ChromeVox.

You will still want to test with JAWS or perhaps NVDA, as these are most likely to be used by blind users. You may, however, find that what works in ChromeVox does not work with the other screen readers. So, for the time being, it may be necessary to provide workarounds when developing custom web elements, so they will work across technologies, with the assumption that these other technologies will catch up eventually.

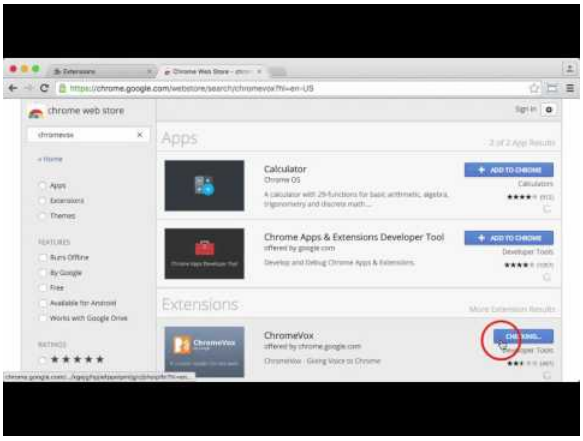
While a relatively small number of screen reader users currently use ChromeVox, it is a highly effective tool for developers when testing web content. Also, ChromeVox is tailored to work with elements of **Google Drive**, so even for users of other screen readers, ChromeVox may be preferable when compiling Google Docs, Sheets, and Slides.

Toolkit: Visit the Chrome store while using the Chrome web browser to install the ChromeVox screen reader. It will be a key element of your Toolkit.

Key Point: Though we recommend using ChromeVox for activities that follow, and as a tool that works well for screen reader testing while accessibility auditing, you are free to use other screen readers if you prefer.

The videos below will help show you how to install and begin using ChromeVox.

Video: Installing ChromeVox



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1242

Video: ChromeVox Demo

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1242

ChromeVox Testing and Associated Key Commands

Key Point: Download the ChromeVox Keyboard Commands [docx], outlined in the table below, print it, and have it beside you when completing the activity in this unit. Also be sure you have set the ChromeVox modifier key*, described in the following line, or you are going to have difficulty with the activity.

* The ChromeVox modifier key (i.e., Cvox) is set in Chrome's Settings > Extensions > ChromeVox Options, typically set to Alt or Ctrl.

Task	Task Description	Keyboard Command
Default Reading	When a webpage loads, ChromeVox will read the element that takes focus on the page. Use the Cvox + arrow keys to read through content. Listen to the spoken output and note any inconsistencies from what one might expect to hear based on what is visible on the screen.	Cvox + up and down arrows
Tab Navigation	When a page has loaded, press the Tab key to navigate through operable element of the page like links and forms. Listen to the output when these elements are in focus, and note any elements that are clickable, but not focusable with the keyboard. Also listen for hidden elements such as bypass links or other elements that are not visible but are read aloud by ChromeVox.	Tab, Shift Tab
Navigate Through Headings	Step through all the headings on a page. Note whether all headings are announced as expected. Note the heading level announced. Are they sequenced to create semantic structure (i.e., nested in the proper order)?	Cvox + L + H then up/down arrows
Navigate Through Landmarks	Step through the landmarks, key navigation points on a page. Are all areas of the page contained in a landmarked region? Note any missing Landmarks.	Cvox + L + ; (semi-colon) then up/down arrows
List Links	List the links and navigate through them using the arrow keys, listen for meaningfulness, or listen for context when links are otherwise meaningless.	Cvox + L + L then up/down arrows
Navigate Through Forms	Navigate to forms on a page, then press the Tab or F keys to listen to each of the fields. Are fields announced effectively, including required fields?	Cvox + L + F then up/down arrows
Navigate Through Tables	Navigate to Tables on a page, press Enter to go to a table, press up/down arrow keys to move through cells in sequence (left to right, top to bottom), press Ctrl + Alt + arrow to move to adjacent cells, press Ctrl-Alt and 5 on the number pad to list column and row headers where applicable. Note whether header cells are read or not. Are fieldset labels announced, where applicable?	Cvox + L + T then up/down arrows then Enter to select Table Cvox + arrow to move within table Cvox +TH to announce headers

2.10: Activity- Experience Web Content From a Different Perspective

NOTE: If you are a regular day-to-day screen reader user (i.e., you are blind or have significant vision loss and must use a screen reader) do the alternate activity below instead of this one. This first activity is for first-time, or novice, screen reader users, and those who do not use a screen reader on a regular basis.

This exercise will help you understand accessibility firsthand, by experiencing the Web as someone who is blind might experience it. If you have not already, go back to the ChromeVox section earlier in this unit, and setup ChromeVox yourself.

Be sure to review the ChromeVox Keyboard Commands [docx] before completing this activity, or have it printed off beside you for easy reference.

If you do not regularly use a screen reader, **turn off your computer monitor** while navigating through a familiar website with ChromeVox to experience what it's like to access web content by screen reader only. Note some of your thoughts and feelings on this experience as self-reflection.

Screen Reader User Alternate Activity

NOTE: This alternate activity is for people who use a screen reader on a regular basis. You are likely blind or have significant vision loss that requires you to use a screen reader to access your computer, and the Web. If you are not a regular screen reader user, do the activity above instead of this one.

The goal of the activity above is to help people who do not use a screen reader better understand the challenges of navigating the Web without being able to see what one is navigating through. If you are a regular screen reader user, you already know these challenges. Here are a few questions to consider as self-reflection about your experience:

- What screen reader(s) do you use, and for how long?
- Which web browser do you typically use, and why?
- What are some of the most common barriers you encounter on the Web?
- How would you recommend non-screen reader users use screen readers in their accessibility auditing activities?

2.11: Self-Test 1

Question 1

Which of the following are automated accessibility checkers not good at identifying? Please select all that apply.

1. missing text descriptions
2. if link text effectively describes the function or destination of the link
3. whether alt text describes an image effectively
4. whether alternatives are provided for inaccessible elements
5. if a Web page has a title or not
6. whether the title effectively describes a Web page

Question 2

Which of the following groups of people with disabilities are least likely to face barriers in Web content? People who:

1. are Deaf
2. are blind
3. use a wheelchair
4. have limited hand mobility
5. are learning disabled

Question 3

Which of the following were mentioned as key things to watch for when auditing the accessibility of Web content? Please select all that apply.

1. images without a text alternative
2. elements that work with a mouse but not with a keyboard
3. text too complex for some to understand
4. using bold large text to create headings
5. using text and background colours that do not contrast well
6. elements that flash or flicker

Answers to Self-Test 1

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

3: Introduction to WCAG

3.1: Introduction to WCAG

Now that Lulu has a better understanding of what a web accessibility audit entails and has decided with certainty to move forward with one, she is seeking a recommended resource that might allow her webmaster to familiarize herself more thoroughly with the features of accessible web content. Without a doubt, WCAG 2.0 is the resource that she is looking for. Review the content below to understand the significance and purpose of this critical element of Lulu's, and your, toolkit.

Though it is possible to conduct informal accessibility reviews with basic understanding of the types of barriers faced by people with disabilities, and knowledge of the common elements in web content that often produce barriers, a thorough, professional review requires a solid understanding of the W3C Web Content Accessibility Guidelines (WCAG 2.0 or WCAG 2.1, aka ISO/IEC 40500:2012).

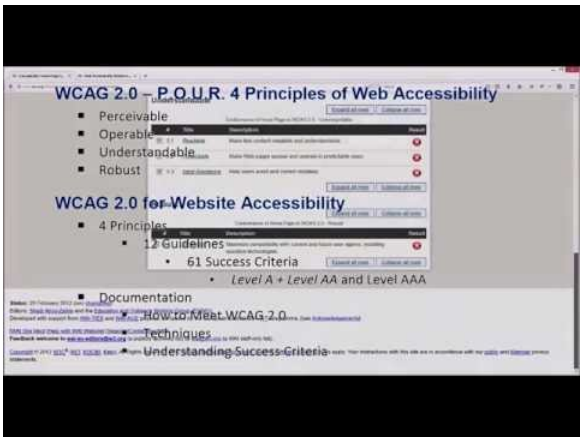
This unit will introduce you to WCAG (pronounced "wuh-kag"), which provides the basis for most international accessibility rules and legislation, along with its supporting documents. WCAG should be a key element of your Web Accessibility Auditing Toolkit. You should develop a basic understanding of WCAG to start, then use it and its supporting documents as references while conducting your audits and build upon the basics as you go about auditing web content.

Toolkit: Add the W3C **Web Content Accessibility Guidelines** (WCAG 2.1) to your Web Accessibility Auditing Toolkit. **REQUIRED READING.**

Key Point: As of June 5, 2018, **WCAG 2.1** was released, extending WCAG 2.0 with one additional guideline, and 17 new success criteria, that address accessibility across devices and for people with cognitive disabilities. Readers should refer to the newer version of the WCAG guidelines moving forward, though in many cases WCAG 2.0 remains the standard on which international legislation around web accessibility is based. WCAG 2.1 was designed so that complying with it, includes compliance with WCAG 2.0.

Watch the following video for a brief overview of WCAG 2.0.

Video: WCAG-WAI Basics



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1253

Documents Accompanying WCAG

Accompanying the WCAG specification itself are a variety of documents that expand on the guidelines. The two types of documents we would like to draw your attention to are:

- Understanding Guidelines
- How to Meet WCAG (referred to as Success Criteria)

These documents are conveniently linked next to their corresponding guideline, as shown in the figure below.

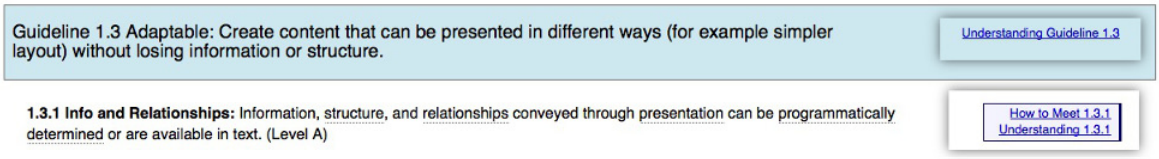


Figure: Links to supporting documents appear next to each guideline in WCAG 2.0

10 Key Guidelines

Required Reading: The 10 Key Guidelines of WCAG 2.0/2.1 have been summarized in a downloadable PDF document. Download the **10 Key Guidelines [PDF]** document, and read through it to familiarize yourself with the manner in which WCAG 2.0/2.1 addresses the most common accessibility issues.

More About WCAG

Toolkit: If you would like to explore WCAG 2.1 in greater detail than this Unit provides, bookmark the **Introduction to Web Accessibility** course.

3.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to:

- List and interpret the meaning of the four principles of web accessibility.
- List the three levels of WCAG conformance and recognize current targets that are implemented internationally.
- Examine in depth ten key WCAG Guidelines.
- Add relevant WCAG materials to your Web Accessibility Auditing Toolkit.

Activities

- Download and study WCAG 2.1 Audit Template
- Read a Completed Sample WCAG 2.0 Audit
- Update your Web Accessibility Auditing Toolkit
- Self-Test 2

3.3: The Evolution of Web Accessibility

If you are interested in knowing about the history behind WCAG, take a look at the timeline of milestones described below.

A link to an interactive elements can be found at the bottom of this page.

1995: Web Accessibility Begins

It was during the mid-1990s that web accessibility awareness began to take hold, first mentioned by Tim Berners-Lee in his keynote speech at the 1994 Second International World Wide Web conference in Chicago. The *Unified Web Site Accessibility Guidelines* were compiled shortly after that at the TRACE Centre at the University of Wisconsin-Madison in 1995. Version 8 of the *Unified Web Site Accessibility Guidelines* became the seed document for WCAG 1.0.

1999: WCAG 1.0 Released

It was not until 1999 that the first version of the Web Content Accessibility Guidelines (WCAG 1.0) was released by the W3C's Web Accessibility Initiative (WAI). This was a significant advancement in the promotion of an accessible web. With WCAG 1.0 it was possible to assess accessibility based on a standard, without the need to use applications like JAWS. That standard was also used by assistive technology (AT) developers (of screen readers, for instance) to better understand how AT should interact with content on the Web. One could then judge accessibility based on what the WCAG specification suggested should be done. But, there were problems with WCAG 1.0 that slowed its adoption. These problems would be addressed with the release of WCAG 2.0.

2008: WCAG 2.0 Released

In 2008 WCAG 2.0 was released to address the shortcomings of its predecessor. One of the significant changes included technology independence. This meant that what might previously have been associated with a barrier in HTML content was now a barrier regardless of the technology used.

For example, "include alt text with images," `"alt"` being an HTML attribute, became "include text alternatives for visual content," with no reference to the technology presenting the content. WCAG 2.0 addressed accessibility across a whole range of web technologies, including things like Flash, Java, JavaScript, and other such technologies.

A second major change was the acceptance of JavaScript in WCAG 2.0 as a legitimate web technology. With WCAG 1.0, developers had to create alternatives to JavaScript elements they may have added to create interactivity in their web content. In other words, a website needed to operate with the same functionality if JavaScript was turned off in a user's browser. This severely limited what developers could do while complying with WCAG 1.0 and became another contributing factor to the slow uptake of WCAG 1.0.

With the release of WCAG 2.0 this restriction was lifted. It is no longer a requirement to create alternatives to scripted features, though it is still a requirement to make those features accessible – certainly doable for most JavaScript interactivity we see in today's websites.

2015: HTML5 & WAI ARIA

Today we have a number of new additions to the collection of accessibility standards with the introduction of specifications such as WAI-ARIA (Accessible Rich Internet Applications). WAI-ARIA is an extension of HTML5, that allows developers to add information about roles, states, and properties to custom features they might create using JavaScript, that would have previously been inaccessible to AT users.

For example, a developer might wish to use a collection of elements to create a form. This is certainly possible with some script added, but a was never intended to be used as a form element or to be interactive for that matter. They have no role or states or properties that would indicate to an AT user they were in a form, unlike a <form> element in HTML, which has all those semantic characteristics built in by default.

ARIA now allows developers to assign a `role="form"` to a `<div>` to identify it as a form. A `<div>` used to create a checkbox could now have a `role="checkbox"` added, and `aria-checked="true"` set to have its role and state (checked or not checked) announced to AT the same way the standard HTML form elements get announced. We'll talk a bit more about WAI-ARIA in unit 8, but for now know that it is perhaps the most significant accessibility technology to emerge in recent years.

2018: WCAG 2.1 and Project Silver

When WCAG 2.0 was introduced in 2008, the iPhone had only just been released the year before, and it would not be until 2009 that it would be usable by blind individuals. WCAG 2.0 provided little guidance on developing accessible content to be accessed through mobile devices.

WCAG 2.1 is intended to fill that gap, producing guidelines to help developers comply with accessibility guidelines when developing mobile web and responsive designs for web content, among other things. WCAG 2.1 was released in June of 2018, adding one new guideline, and 17 new success criteria.

Recent Article by Scott Hollier, on changes in WCAG 2.1: WCAG 2.1: Reflections on the New Guidelines and Success Criteria.

In parallel with WCAG 2.1, project Silver has also been launched. Silver is the code name for WCAG 3.0. The focus of Silver is on integrating accessibility standards into the emerging Internet of Things (IoT). With everything from refrigerators, to home climate control systems, to security monitoring now connecting to the Internet, Silver is being developed to ensure these emerging technologies are accessible to everyone.

Why Silver? Silver's element symbol is Ag, which represents Accessibility Guidelines.

3.4: WCAG Principles

The four guiding principles of WCAG say that web content must be Perceivable, Operable, Understandable, and Robust (POUR) in order to be accessible to people with disabilities.

1. **Perceivable** – Information and user interface components must be presentable to users in ways they can perceive.
   - This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses)
2. **Operable** – User interface components and navigation must be operable.
   - This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform)
3. **Understandable** – Information and the operation of user interface must be understandable.
   - This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding)
4. **Robust** – Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.
   - This means that users must be able to access the content as technologies advance (as technologies and user agents evolve, the content should remain accessible)

Source: Introduction to Understanding WCAG 2.0

Perceivable

For content to be perceivable it must be possible to perceive it through multiple senses. While there are a variety of ways to provide alternatives perceivable through alternate senses (e.g., audio descriptions for visual content for those who are blind, or sign language interpretation of audio content for those who are Deaf), text alternatives are generally the best choice.

Text can be converted into a variety of forms. It can be read aloud by screen reading software or converted to braille for those who are blind. It can be translated into other languages for those reading in a second language or it can be magnified without losing its sharp appearance for those with low vision. Its colour can be changed easily to make it more readable for those who are colour blind, or need high contrast.

Key Point: Plain text is the most adaptable alternate format because it can be easily converted into a variety of forms to make content perceivable across a wide range of accessibility needs.

Operable

In the context of web accessibility, operability generally means that something is functional using a keyboard. If functional items are not keyboard operable, they will be inaccessible to many users.

Developers often create features that operate with a mouse, sometimes overlooking keyboard functionality. Most people accessing the Internet do use a mouse, but many do not. A person who is blind is unlikely to use a mouse, but will instead rely almost exclusively on keyboard access. Power users, often developers or programmers, also tend to be keyboard users, so usability is lost for this group as well when keyboard access is not programmed in.

Operable can also mean functional using one's voice. Some people with severe motor impairments use voice recognition software along with switches (see figure below) to operate their computers and navigate the Web. This means there must be text associated with functional elements like graphical buttons, so one can speak the text to bring focus to an element, and those elements must be keyboard operable so a switch can be used to activate the element. Pressing a switch is much like pressing the Enter key or Spacebar on a keyboard, or clicking a mouse.

Figure: A button switch used to replicate a mouse click
Source: Wikipedia

> **Key Point:** All functional elements in web content that operate with a mouse must also operate with a keyboard.

Understandable

Understandable refers to comprehending both the content and features of a website. Content that uses more complex or advanced language than is necessary may be difficult to understand for some people with disabilities, as well as those reading in a second language, or perhaps older users with diminishing cognitive abilities. Particularly for public access sites, the reading level of the language used should be minimized, using simpler language wherever possible.

A second aspect of understanding relates to the consistency and ease of use of the navigation elements on a site, reducing the number of navigation elements, and presenting these elements consistently throughout a website. This can improve usability for many users, including those who are blind, those with cognitive or learning disabilities, and older users.

A person who is blind and using a screen reader to navigate a site will often dedicate some effort to mapping to memory the navigation structure of a site, much like one might visualize traveling from point A to point B through a building or through city streets. If the navigation structure changes, it can often lead to confusion, and to having to map the navigation structure over again. If the navigation stays consistent, it only needs to be learned once, after which cognitive effort can focus on understanding the important content of a webpage or website.

> **Key Point:** Use simple, consistent, predictable navigation elements throughout a website.

Robust

Robust, as described by W3C, means that content works well across a wide range of Web and assistive technologies. This generally means using technology to standard. Web browsers and assistive technologies base their development around standards such as HTML, and are able to interpret content that is created in a standard way. When content varies from the standard, assistive technologies often have trouble interpreting it. Not all content must comply with the standards, but when custom content is created that does not comply, a secondary standardized version should be provided so the content “degrades gracefully.” Web content that degrades gracefully is intended to function best in the most current browsers and assistive technologies, and then as older, less feature-rich technologies view it, it should degrade in a way that is still functional, but with fewer features.

> **Technical:** With the advent of WAI ARIA, it is now possible to veer from the standard, perhaps using HTML in new ways that were not initially intended. ARIA attributes can be used to describe the role, states, and properties of custom elements. For example, an HTML `<div>` element was never intended to be clickable, but with some JavaScript it is possible to add click functionality, though from an assistive technology’s perspective the `<div>` is just a container with no functionality.

A `<div>` has been used in a non-standard way in this case. ARIA can now be added to that customized `<div>` to give it a `role="button"` for instance, and made focusable adding a `tabindex` attribute, and made clickable by adding `aria-pressed` attribute to describe its state as pressed or not pressed, and so on.

There are other occasions where non-standard technologies such as embedded Flash objects or Java applets might be used. Though it is possible to make these objects somewhat accessible, they are often challenging to access and operate effectively with assistive technologies. In such cases alternatives are generally needed. Some Flash development tools, for instance, provide an option to generate an HTML version, though these tend to be static representations of what was interactive in the Flash. Where possible, HTML5, with CSS, scripting, and ARIA should be used to develop interactive content for the Web.

HTML5 and ARIA will be discussed in greater detail in unit 8[1].

Key Point: Where non-standard technologies are used, or where standard technologies are used in non-standard ways, provide standardized alternatives to allow content to degrade gracefully.

3.5: WCAG Accessibility Conformance

Lulu's webmaster has been reading through WCAG 2.0 and at times finds it overwhelming. However, if she understands the POUR principles, the 3 levels of conformance, and the success criteria associated with each guideline, she will have a solid basis upon which to build her skills in the realm of web accessibility.

To help the webmaster further frame her understanding of conformance, she should be reminded that, as an Ontario-based company, to achieve AODA compliance, Lulu's Lollipops' two main target years are 2014 (WCAG 2.0 Level A – except live captions and audio description), and 2021 (WCAG 2.0 Level AA – except live captions and audio description).

For further information regarding the specifics of AODA compliance, a link that may be of use to the Lulu's webmaster and others in similar roles is the Integrated Accessibility Standards. For further information on WCAG compliance levels, read on.

Conformance Levels

In addition to being grouped by principles, WCAG is also grouped by level of conformance. These levels are described by W3C as follows:

1. Conformance Level: One of the following levels of conformance is met in full.

- **Level A:** For Level A conformance (the minimum level of conformance), the web page satisfies [definition] all the Level A Success Criteria, or a conforming alternate version is provided.
- **Level AA:** For Level AA conformance, the web page satisfies all the Level A and Level AA Success Criteria, or a Level AA conforming alternate version is provided.
- **Level AAA:** For Level AAA conformance, the web page satisfies all the Level A, Level AA and Level AAA Success Criteria, or a Level AAA conforming alternate version is provided.

Note 1: Although conformance can only be achieved at the stated levels, authors are encouraged to report (in their claim) any progress toward meeting success criteria from all levels beyond the achieved level of conformance.

Note 2: It is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some content.

Source: Understanding Conformance

Conformance levels can be thought of in terms of their importance toward removing barriers with Level A being the most important. It is helpful to think of levels as things you must do, should do, and could do.

- **Level A:** These issues **must** be resolved or some group will not be able to access the content. The issues at this level represent significant barriers that may not be overcome with work-arounds. An example of a Level A barrier is missing alternative text to describe an image. There is little a blind person can do on their own to understand the content of an image without a text description.
- **Level AA:** These issues **should** be resolved or some group will find it difficult to access or use the content. These issues can often be circumvented with some effort, but will make using or understanding web content more effortful. An example of a Level AA barrier is not being able to follow the focus of the cursor when navigating through content with a keyboard. For a person with low vision navigating with a keyboard, or a fully able keyboard user for that matter, navigating through content can be very difficult if one cannot see where the cursor is located and is unable to tell when to press the Enter key to activate a link or button.
- **Level AAA:** These issues **could** be resolved to improve usability for all groups. Web content may be technically accessible, but usability can be improved by resolving these issues. An example of a Level AAA barrier would be presenting acronyms or abbreviations without providing their full wording. For a person who is blind, an acronym read by a screen reader may sound

like gibberish. For a fully able user who is not familiar with a short form, an acronym or abbreviation may have no useful meaning, at least not without having to search out the meaning elsewhere.

Selecting a Level of Conformance

While Level A conformance is an honourable accomplishment, and will allow most people to access the content of a website, it is generally considered “minimal conformance.” If you are working with a limited budget (or no budget) this may be an acceptable level of accessibility, but it is generally accepted that **most sites should strive for Level AA**, and perhaps conform with a few of the Level AAA success criteria (defined below).

> **Key Point:** Level AA is the generally agreed upon level of compliance websites should strive to meet.

If you are working on a new website, Level AA should be the goal from the start. Assuming the developers know what needs to be done, there is very little extra effort required to jump from Level A to Level AA. If you are working with an existing site that is receiving an accessibility retrofit, then you may want to first aim for Level A, then with time resolve all Level AA issues. Generally speaking it is less costly to build a site to be accessible from the start, than it is to build a site and retrofit it later to conform.

Level AAA conformance is unattainable for many websites. While it is possible to conform with some of the requirements at this level, they can often be counter-productive or unnecessary. Take for instance the reading level requirement (WCAG success criterion 3.1.5). Public sites will want to strive to meet this guideline, to reach the broadest audience possible by reducing the reading level, but for other sites that focus on a particular, perhaps highly-educated audience, it may be impossible or even inadvisable to comply with this requirement. Imagine an advanced course in biomechanics written at a lower-level secondary school reading level required to satisfy this guideline. If it were possible, replacing the advanced terminology and jargon with low level paraphrasing would likely make the content unusable by the intended audience.

Success Criteria and Techniques

Success criteria are essentially accessibility requirements. For example, the success criterion for an image conforming with guideline 1.1 (see below), is providing an equivalent text alternative. Note the success criterion does not specify any technology-specific solution or strategy on how that equivalent text should be provided.

Alternatives for an image can take different forms, hence the **techniques** for satisfying success criteria. For success criterion 1.1.1 possible techniques might include providing alt text, including an image caption, or describing the image in the surrounding text and referring to the description in the alt text for the image. Each of these techniques potentially satisfies the requirements or success criteria of Guideline 1.1.

You may also notice techniques are grouped into **Sufficient Techniques** and **Advisory Techniques**. Sufficient techniques are those that reliably satisfy success criteria, while an advisory technique may not reliably satisfy success criteria but may be beneficial for improving usability or improving accessibility for specific users. Developers should apply sufficient techniques to satisfy success criteria, and where feasible also apply advisory techniques to improve accessibility or usability further.

There is a third category of techniques called **Failures**. These are not techniques to satisfy success criteria, but rather techniques that introduce barriers and thus should be avoided.

Source: W3C – Understanding Techniques for WCAG Success Criteria

Other Conformance Considerations

In addition to meeting all the Level A or AA or AAA requirements before being able to claim conformance at one of these levels, there are other conformance requirements, listed here:

- **Full pages:** Conformance applies to full web pages only. It cannot apply to parts of pages.
- **Complete processes:** When a conformance claim is being made on a collection of pages that make up a web application, for instance, all pages in the collection must conform. If one were to claim “the discussion forum conforms at Level AA,” all aspects of the forum must conform, from logging in, to reading posts, to posting new messages, and so on.
- **Accessibility supported:** Techniques to implement accessibility requirements are done in a way that is supported by assistive technologies. For instance, a linked image that is clicked to open a feature that does not have alt text to describe the function of

the image, but does include text nearby that says “click the button to open the feature,” would not be accessibility supported even though the image has been described with text. The image has not been described in a way that assistive technologies can make use of. Adding alt text to the image in this case would be considered accessibility supported, because assistive technologies can read alt text. Accessibility support is a very complex issue with many grey areas. Read through “Understanding Accessibility Support” for a discussion of other things to consider when assessing accessibility support.

- **Non-interference:** When non-accessible technologies are used and accessible alternatives are provided, the inaccessible version must not interfere with access to the accessible version. For instance, an embedded Flash object may have a link to an accessible HTML version on the page following the object. If while navigating through the page by keyboard or using an assistive technology, the cursor becomes trapped in the Flash object, it is interfering with the accessible version that follows. In this case, even though an accessible version is provided, it cannot be accessed; thus, the page does not conform. If a bypass link were provided to skip over the Flash object, and users were able to back out of the object, the page would conform. Ideally, the Flash object should be created in a way that does not trap the cursor.

Making Conformance Claims

Once a website has addressed all the issues required for a certain level of conformance, it may be desirable to “claim” conformance, though there is no requirement that a claim be made in order to conform.

Basic Conformance Claim

A basic claim must include **the date** the site was judged to be conformant. Because web content tends to change over time, conformance can typically only be claimed for a specific date (with exceptions such as numbered versions of web software). The basic claim must also include **the specification** or standard the site is claiming conformance with, and must include **the level** of conformance. A basic conformance claim may look like the following:

> On January 20, 2015 this site conformed with the Web Content Accessibility Guideline 2.0 at Level AA.

A conformance claim can be more extensive than just a basic claim like that described above. It can also provide documentation about the accessibility features found on a site, so those accessing the site with assistive technologies can read about these features rather than having to discover them on their own. This documentation is often found linked prominently in the navigation elements of a website, usually near the start of a page so it is easily found by assistive technology users, and is often labelled “Accessibility” or “Accessibility Statement.”

If the conformance claim does not apply to the whole site (e.g., there may be some older content that remains inaccessible), the scope of the claim should also be specified. For instance, add to the basic claim above, “…for any content added to the site after January 1, 2012.” The claim can also list known issues, if there are areas of the site that are known to be inaccessible, perhaps because there isn’t a suitable accessible alternative to a particular technology being used. For example, “…the video conferencing area of the site remains non-conformant due to the lack of an alternative accessible conferencing system.”

3.6: 10 Key Guidelines

The Web Content Accessibility Guidelines (WCAG 2.1) include 13 guidelines, made up of 78 success criteria (or WCAG 2.0 has 12 guidelines, 61 success criteria). Not all of these guidelines are applicable to all websites, though there are some that are more frequently relevant than others.

Required Reading: Earlier in this unit, we encouraged you to become familiar with 10 Key Guidelines [PDF] that we provided in a downloadable document. If you have not already done so, please take the time now to download and read this document.

3.7: WCAG Web Auditing Review Template

Now that you have an understanding of WCAG, we will introduce you to an accessibility auditing template. You can use the template to record issues when you conduct audits, but it also acts as a checklist to help commit the guidelines to memory. For now, review the layout and elements of the Web Auditing Review Template and add it to your Web Accessibility Auditing Toolkit.

> **Toolkit:** Download the WCAG 2.1 review template[doc] and add it to your Toolkit. Create a "webaudits" file folder on your hard drive, and save it there. As you complete audits, save them to subfolders you create here to organize the audit reports you generate.

Elements of the Review Template

Title: This field should indicate the type of review, either General, Template, or Detailed (to be covered in greater detail in the unit Web Accessibility Audit Reporting) and the guideline it is based on.

Location: The URL of the homepage of the site being reviewed.

Date: The date the review was finished.

Reviewer: The name of the person(s) who completed the review.

Guideline Reference: A link to the guideline(s) the review is based upon.

Tools Used During This Review: A list of the tools used in the review, including automated checkers, browsers, browser plugins, readability test tool, colour contrast test tool, screen readers, and any other tools used. Be sure to mention version numbers if applicable.

General Comments: An overview of the result of the WCAG 2.1 Review (below), outlining the key issues, why they are issues, with brief mention of potential solutions. This section is written for a general audience, minimizing the use of technical language.

WCAG 2.1 Review: The main content of the review. This is a list of WCAG 2.1 success criteria, each one's conformance level (A, AA, AAA), the evaluation received (Pass, Fail, Pass?, Fail? N/A), and comments associated with the evaluations. These comments should identify accessibility issues relevant to the guideline, explain why an issue presents a barrier, and offer potential solutions to resolve issues. The review should be aimed at the web developers who will be resolving the issues identified and may contain technical language and sample code that can be replicated. Screenshots and other graphics can be used to enhance explanations given in the text of the comments.

There will likely be cases when borderline issues are identified, where it could be argued that some element may pass or fail the associated success criteria. In such cases "Pass?" (with the question mark) is used where the auditor is leaning toward a pass, but others might argue it fails. And, use "Fail?" where the auditor is leaning toward a fail, though others might argue it passes. One example might be a description for an image provided in an alt attribute that does not fully describe the meaningful information in the image. In such cases it is often a subjective decision by the auditor, commenting to the author of the alt text to review the text to determine whether it "adequately" describes the meaning one should take away from the image if it were being viewed. Questionable pass or fail is described more thoroughly in the example linked in the Toolkit box below.

Note that the AAA items are greyed out, as well as the two AA success criteria (1.2.4, 1.2.5) that are not required by AODA (this is relevant to Ontario-based participants). If you are auditing in a jurisdiction that requires these guidelines, you might choose to adjust the template by removing the grey for these two guidelines. Otherwise grey items are optional, though when reviewing content issues associated with these guidelines, recommendations can still be made to implement techniques associated with these guidelines to improve overall usability.

Other Notes: While not included in the template, there are occasions when a reviewer needs to comment on issues not associated with the accessibility of the site being reviewed. For instance, a reviewer might mention potential bugs that may have been identified, include information about posting an accessibility statement or provide details on next steps following the review, such as planning a follow-up review after issues are addressed, or arranging a time to address questions that arise from the report.

Appendix: While not included in the template, the Appendix should include a list of the pages sampled from the site that was reviewed.

Example of a Completed Review

In 2012 a General Review of Canvas was posted by OCAD University in Toronto, which was in the process of selecting a new LMS for the university. The review was posted publicly, so it works well as an example of what a completed review might look like.

This review looked at a series of tasks, like reading a post in the forums and posting a reply, reviewing test results and checking marks in the Gradebook, and so on (these scenarios were described in the appendices, missing from the publicly-posted review). The result of these scenarios were combined into a General Review (see the unit Web Accessibility Audit Reporting for a description of different types of reviews). Read through parts of the review to get an idea of the types of information it contains.

> **Toolkit:** Study the **Canvas Accessibility Review 2012 [doc]** for examples of the types of information that can be found in a web accessibility review. Add it to your Toolkit as a reference.

You might ask, if there are so many issues, why did we use Canvas to deliver the online course version of the content here? Following the publication of the review, Canvas did pay attention and put considerable effort into improving the accessibility of their system. In 2014, Canvas accessibility had been much improved, though with still a few areas where improvements could be made. Compared with other Learning Management Systems, the current version of Canvas fares well in terms of accessibility.

3.8: Activity- WCAG Scavenger Hunt

Now that you have been introduced to the key guidelines you'll refer to often when conducting accessibility reviews, it will be necessary for you to expand on your understanding of **WCAG 2.1** by eventually reading through the full specification (if possible, before completing the reading and activities here).

To become comfortable with WCAG 2.1 and its associated documentation, try this Scavenger Hunt challenge. Below is a list of barriers that you'll likely see on many websites. For each barrier, find a relevant guideline and match a sufficient technique (with its ID) to remove the barrier. **How to Meet WCAG 2.1** is a good reference.

Happy hunting!

Example

Barrier: Pre-recorded video does not audibly describe meaningful visual activity

Technique ID: G78: Providing a second, user-selectable, audio track that includes audio descriptions.

List of Barriers

1. Image has no text alternative
2. Video has no captions
3. Colour is used on its own to represent meaning
4. Contrast between text and background colours is insufficient (<4.5:1)
5. Form button is not keyboard operable
6. Page redirects to another before contents can be read
7. Webpage does not have a descriptive title
8. No means is provided to skip past large main menu on a webpage
9. The language of a page is not defined
10. Page redirects when a form radio button receives focus

Suggested Answers to Activity

3.9: Self-Test 2

Question 1

Which WCAG 2.0 level of conformance is considered the generally agreed upon level that organizations should aim for when addressing the accessibility of their websites?

1. Level A
2. Level AA
3. Level AAA

Question 2

Which TWO of these guidelines are considered the most important in terms of reducing the greatest number of potential barriers, according to "10 Key Guidelines" introduced in Unit 2?

1. 1.1.1 Non-Text Content
2. 2.1.1 Keyboard Accessible
3. 2.4.1 Bypass Blocks
4. 3.1.1 Language of Page
5. 3.1.5 Reading Level
6. 4.1 Parsing

Question 3

Which of the following are NOT principles of WCAG 2.0? Please select all that apply.

1. Perceivable
2. Operable
3. Understandable
4. Reproducible
5. Predictable
6. Robust

Answers to Self-Test 2

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

4: Automated Testing Tools

4.1: Automated Testing Tools

In this unit and the next, we will move from the general overview to look more closely at the necessary tools and strategies for assessing the accessibility of web content. Specifically, we will examine:

- Automated web accessibility testing tools (i.e., accessibility checkers)
- Tools for evaluating colour contrast, validating HTML markup, and determining the reading level of web content
- Assistive technologies (AT)
- Manual testing strategies

Building on the general understanding of automated review tools introduced in the unit Aspects of Web Accessibility Auditing, this unit focuses on a few specific tools that you will want to add to your toolkit. We won't cover all the potential tools you might use, but rather focus on learning how to use some of the popular tools. Feel free to explore beyond those introduced here.

The first group of tools we will look at are automated accessibility checkers. These are typically web-based tools that take a URL or a copied HTML page, scan through the HTML and run a variety of tests to determine the presence or absence of accessibility features. We will look at:

- AChecker, developed at the Inclusive Design Research Centre at OCAD University in Toronto
- The WAVE Accessibility Evaluation Tool, developed by the WebAIM group at the Center for Persons with Disabilities at Utah State University

We'll list a few others too, that you may want to investigate on your own.

After familiarizing yourself with the automated accessibility testing tools, we'll look at a few other automated tools for:

- Testing colour contrast
- Evaluating reading level
- Validating HTML markup

4.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to: 

- Practice using one or more automated web content accessibility checkers.
- Evaluate the strengths and limitations of automated web content accessibility checkers.
- Select the automated web content accessibility checker that you wish to include in your Web Accessibility Auditing Toolkit.
- Operate other tools used in accessibility testing.

Activities

- View walk-through/screencast videos of AChecker and WebAIM tools
- Test websites you are familiar with
- Test for colour contrast conformance
- Test for readability conformance
- Build your Toolkit (add bookmarks for tools introduced)
- Self-Test 3

4.3: Limitations of Automated Web Accessibility Checkers

Automated accessibility checkers are a must in your Web Accessibility Auditing Toolkit, though it is important to understand their limitations. Think of an automated accessibility checker like a spell checker in a word processor. Though a good start for identifying misspelled words, a person must still read through the text to ensure words have been used correctly (e.g., where “there” is used in place of “their”). For now, **human judgement must also be involved** for any potential barriers that involve assessing meaning. For example, automated checkers can identify ambiguous phrases like “click here” or “this link” used as link text, but a person needs to determine whether this text accurately describes the link’s destination or function. Similarly, a person must decide whether alt text or a long description for an image accurately describes the meaningful information in the image, something automated checkers cannot currently do.

You may also want to make use of multiple accessibility checkers and compare results. See the Activity at the end of this unit for an exercise comparing automated accessibility checkers.

> **Try This:** Can you think of other instances where human judgement is required to assess the full extent of a barrier in web content?

Another limitation worth noting is that automated checkers are unlikely to identify with certainty whether accessible equivalents are available for web content that has been flagged as a potential barrier. A human perspective is required to make the association between equivalent elements. However, the site provider may offer an accessible HTML version of the page as well. An automated checker would not recognize the connection between the barrier and its accessible alternative, but a person would.

4.4: AChecker Web Accessibility Checker

Toolkit: Add the public version of **AChecker Web Accessibility Checker** to your Toolkit.

In the public version, you can set up an account and do your automated accessibility testing. See below for details on downloading and installing your own version.

Overview

Fun Fact! AChecker was originally developed as an **Enabling Change project**, the same fund that supported the development of the materials here.

First released in 2005, AChecker was created with the goal of providing an accessibility checking tool that was 100% transparent, interactive, customizable, and free. AChecker makes use of the Open Accessibility Checks (OAC), which is a collection of checks based on all web accessibility guidelines available globally. Currently, there are a total of 310 OAC checks employed by AChecker.

AChecker Features

AChecker has specific features for public users, registered users, administrators, and developers. To take advantage of these features, you should first create an account on the public AChecker site, if you are not planning to install a version of your own (see below). Follow the link you added to your Toolkit above, and click “Register” to create an account. Creating an account will allow you to save your accessibility reviews, and generate an AChecker seal for sites that pass its review.

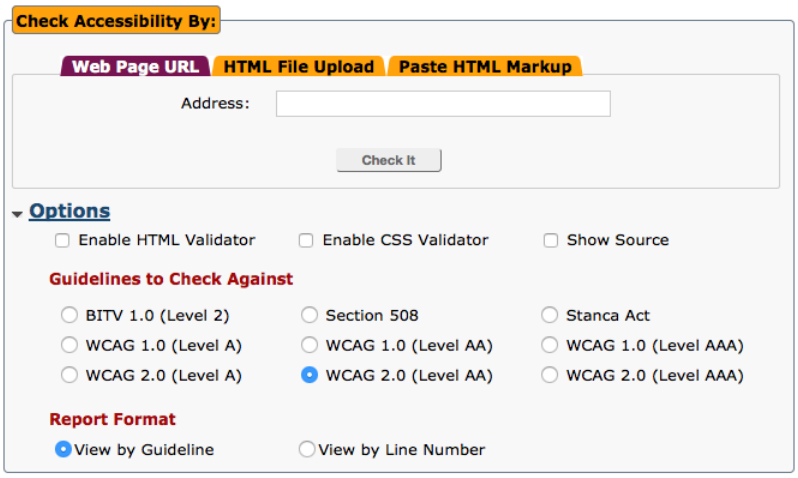
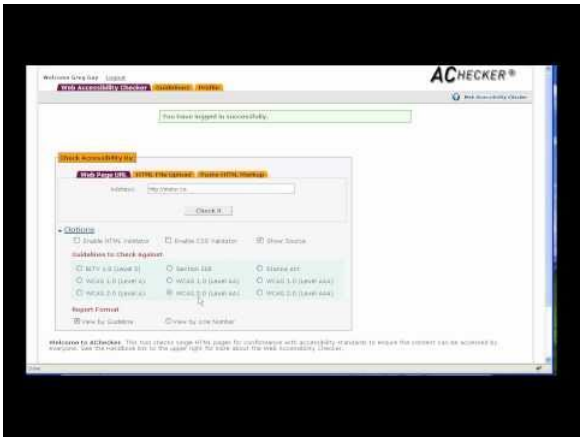


Figure: AChecker screenshot showing the main interface for conducting accessibility reviews

For more about using AChecker, watch the following video:

Video: Using AChecker to Test Web Accessibility



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1311

Set Up Your Own AChecker

Technical

Download AChecker

Installation Instructions

- Unzip the master.zip file downloaded from GitHub into a php-enabled, web-accessible directory.
- Open the installer in your browsers at http://[yourserver.com]/AChecker/install
- Follow the instructions provided by the installer.

Installing from GitHub or If You Plan to Contribute

If you are familiar with using GitHub, you can clone the most current source code from there. This version often has new features not available yet in the public site, or in the downloadable version of the software, though it may be less stable than the publicly-distributed version. If you would like to participate in AChecker's development, or you would like to add your own accessibility checks, or perhaps fix a bug you've found, working from GitHub is the way to have your work added to the public source code.

AChecker Source Code

4.5: WAVE Accessibility Evaluation Tool

Overview

Another popular free accessibility checker is WAVE, developed by WebAIM at the Center for Persons with Disabilities at Utah State University. It is a web service, similar to AChecker, though without much of the interactivity and customizability. Those who prefer a visual presentation of the issues, as opposed to the list presentation of AChecker, may find WAVE easier to use.

WAVE Features

WAVE is similar to AChecker in the following respects:

- WAVE can take a URL and assess the page it leads to
- It evaluates one page at a time

WAVE produces a report by reproducing the page that was reviewed, inserting a variety of icons into the content to identify errors (known problems) and alerts (potential problems), as well as the accessibility features that are present. Clicking on any of the icons will provide a brief description and a link to additional information.

> **Toolkit:** Add the **WAVE Chrome Extension** to your Toolkit.

4.6: Other Notable Accessibility Review Tools

Explore the links listed here to get an idea of the range of accessibility checkers currently available, and the variation in these types of tools. Add them to your Web Accessibility Auditing Toolkit if you find them useful.

Free Tools

For basic accessibility testing, you may find these free tools useful.

- Cynthia Says
- FAE (Functional Accessibility Evaluator)
- aXe (Chrome plugin)
- aXe (Firefox plugin)
- Vamola (Italian version of AChecker)

Proprietary (Fee for License)

For larger sites, or for in-depth testing across a website, these enterprise level accessibility testing tools may be helpful.

- HiSoftware Compliance Sheriff
- Siteimprove
- PowerMapper Accessibility Testing Tools
- Tenon

Even More Tools

Collections of accessibility testing tools can be found through the following resources.

- Paciello Group Accessibility Testing Tools
- W3C WAI Accessibility Evaluation Tools List

4.7: Colour Contrast Evaluation

Colour Blindness Simulations

Try This: To experience how colour blindness affects people's ability to see colour, experiment with the **Coblis – Color Blindness Simulator**.

Colour Contrast Testers

A quick search of the Internet for "colour contrast test" should turn up a variety of tools you can use to test contrast. Here, we will mention the WebAIM Color Contrast Checker, but if you prefer another, you can add it to your Toolkit.

Toolkit: Bookmark the WebAIM **Color Contrast Checker** and add it to your Toolkit.

Why Colour Contrast Is Important

You may recall from the unit Introduction to WCAG 2.0 that WCAG 2.0 Guidelines 1.4.3 and 1.4.6 address accessibility issues associated with colour contrast. These two guidelines are presented below. Note the **contrast ratios** at each level (4.5:1 & 3:1 at Level AA and 7:1 & 4.5:1 at Level AAA for smaller and larger text respectively).

1.4.3 Contrast (Minimum): The visual presentation of text and images of text has a *contrast ratio of at least 4.5:1*, except for the following (Level AA):

- **Large Text:** Large-scale text and images of large-scale text have a *contrast ratio of at least 3:1*
- **Incidental:** Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have *no contrast requirement.*
- **Logotypes:** Text that is part of a logo or brand name has *no minimum contrast requirement.*

1.4.6 Contrast (Enhanced): The visual presentation of text and images of text has a *contrast ratio of at least 7:1*, except for the following (Level AAA):

- **Large Text:** Large-scale text and images of large-scale text have a *contrast ratio of at least 4.5:1*.
- **Incidental:** Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have *no contrast requirement.*
- **Logotypes:** Text that is part of a logo or brand name has *no minimum contrast requirement.*

Some accessibility checkers will have colour contrast evaluation built into them (e.g., AChecker), but others will not.

Technical:

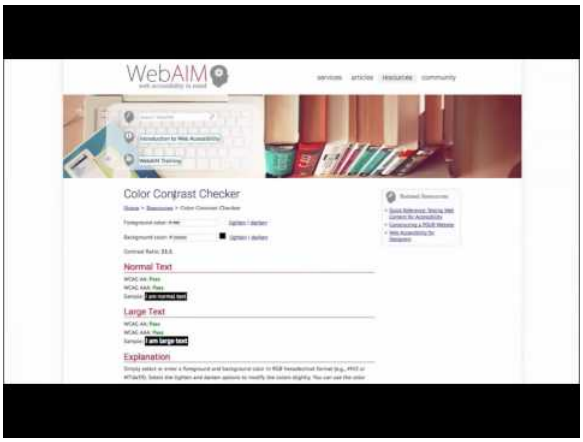
There are many colour contrast evaluators from which you may choose to support your contrast testing (see some suggestions below). Using any of these tools requires gathering the colour codes from the elements being evaluated. There are a variety of ways to find these codes, though the easiest is to use a browser's "Inspect" feature. You can inspect the colours in the right frame, as shown in the figure below.

Figure: Inspect panel showing the colour codes in the Style pane to the right

Once you've tested a few colour combinations you'll quickly develop a "feel" for good contrast, and be able to quickly scan a page and identify where contrast may not be sufficient. You can test the specific colours associated with those elements you've identified in a scan. There are tools, however, that will evaluate all the colours on a page (e.g., AChecker) – this may be preferable if you are reviewing a site that seems to have multiple contrast issues.

For a walk through the WebAIM colour contrast checker, watch the following video:

Video: Checking Colour Contrast



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1317

The Anatomy of a Colour Contrast Results Screen

In the figure below you can see the foreground colour (#007ac6) and background colour (#ffffff) codes entered into the respective fields. Below that you will see the compliance status for Normal and Large text, at Level AA and Level AAA. In this case the colours contrast well enough to pass at Level AA (4.57:1), but for smaller text the contrast ratio fails at Level AAA. Sites should aim for Level AA contrast, but if feasible try for Level AAA compliance.

Note the lighten and darken links next to the colour input field. You can click these (on the test site) to adjust the colours so they will pass, then take the resulting colour codes and replace the existing codes to adjust the colour on the site being evaluated so it complies.

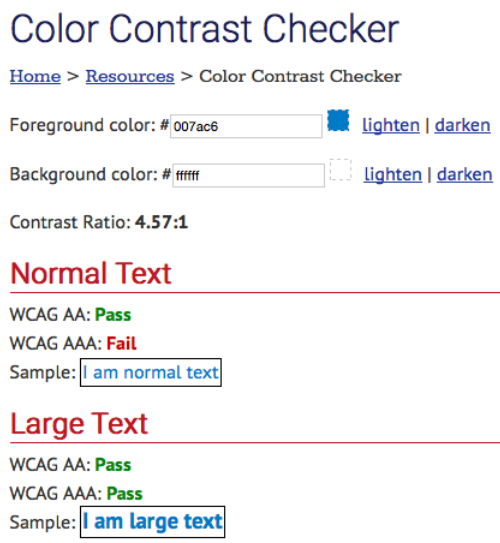


Figure: The WebAIM Colour Contrast Checker

Other Contrast Testers

Here are a few other colour contrast testers you may want to experiment with:

- Acart Communications Contrast Checker

4.8: Readability Testing

Why Is Readability Testing Important?

Web content authors should use the simplest language possible for the following reasons:

- Plain language will translate more easily for those who may wish to read the site in a different language.
- Plain language will be more accessible to those with lower levels of literacy.
- For a general audience, most readers will appreciate simpler language over the unnecessary use of complex words.

Though appropriate reading level is identified as a Level AAA requirement in WCAG 2.0, this is one Level AAA guideline that most **public sites** should aim to meet in order to reach the broadest possible audience.

The WCAG 2.0 guideline that is relevant to readability is 3.1.5:

> **3.1.5 Reading Level:** 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. (Level AAA)

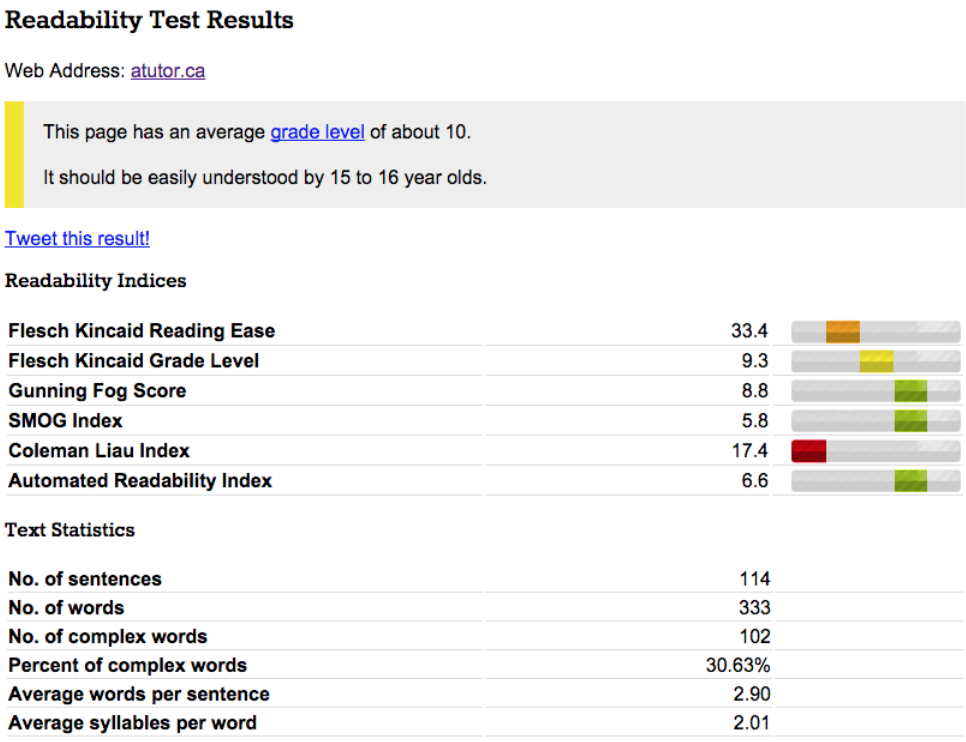
Reading Level Test Tools

Automated accessibility checkers like AChecker and WAVE do not test for readability.

You can find a variety of readability test tools by searching the Web for “readability test.” These tools run a variety of algorithms that measure things like word length, number of syllables per word, and sentence length, to come up with a readability score. We have selected one example here for you to include in your Toolkit: The Readability Test Tool.

> **Toolkit:** Bookmark **The Readability Test Tool** to add it to your Toolkit.

This tool, like most others, will allow you to enter a URL to a webpage, or paste text into a text area. The output from the test appears in the figure below. In this case the reading level is about grade 10, in the range acceptable to pass Guideline 3.1.5. The first area lists a series of readability indices, calculated using various combinations of the characteristics of the text on the page. If you visit the tool’s site, the measures for these indices are listed. Below the indices is a list of the characteristics of the text content. All of these elements are averaged to come up with an average grade level score.



Readability Test Results

Web Address: atutor.ca

This page has an average grade level of about 10.

It should be easily understood by 15 to 16 year olds.

Tweet this result!

Readability Indices

Flesch Kincaid Reading Ease	33.4
Flesch Kincaid Grade Level	9.3
Gunning Fog Score	8.8
SMOG Index	5.8
Coleman Liau Index	17.4
Automated Readability Index	6.6

Text Statistics

No. of sentences	114
No. of words	333
No. of complex words	102
Percent of complex words	30.63%
Average words per sentence	2.90
Average syllables per word	2.01

Figure: Readability Test Results from the Readability Test Tool

Other Readability Testers

- Readability Calculator
- Juicy Studio Readability Test

4.9: Markup Validation

Many HTML editing tools will have markup validation built into them, so you can test the validity of the code while creating it, but since most sites are dynamically assembled parts, these built-in validators have limited usefulness. It is necessary to validate markup after the code has been generated into a webpage using tools like the W3C's HTML Validator. This is a tool you should add to your Toolkit.

Toolkit: Bookmark the **W3C Markup Validation Service** to add it to your Toolkit.

Technical: The content that follows is intended for a technical audience.

The WCAG 2.0 Guideline that deals with markup validation is Guideline 4.1.1. Note that Parsing is a Level A requirement, so despite the fact that some "careless" code may get by without affecting accessibility, markup validation needs to be done in order to comply with WCAG 2.0. The guideline is reproduced below for your reference.

> **4.1.1 Parsing:** In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features. (Level A)
>
> *Note:* Start and end tags that are missing a critical character in their formation, such as a closing angle bracket or a mismatched attribute value quotation mark are not complete.

Why Perform Markup Validation?

Markup validation ensures that the HTML of web content is well formed, and used in a way that is compliant with the HTML specifications. It is important that HTML be clean and properly structured for the following reasons:

- Assistive technologies, such as screen readers, generally rely on the HTML to properly interpret content. Technologies will attempt to correct markup errors themselves, but there are some markup errors that will trip up assistive technologies, such as table cells that are not closed, or duplicate IDs used on a page.
- Clean markup is a sign of quality work, and validating HTML should be something developers do consistently.
- Clean markup ensures that barriers are not introduced inadvertently because of broken code.

When to Perform Markup Validation?

Markup validation should be done as early as possible in the web accessibility auditing process. It can help rule out apparent barriers when testing content with assistive technologies, so it is helpful to validate the HTML before doing any screen reader testing. We'll talk more about screen reader testing in the section Screen Reader Testing.

Notable Constraints of Markup Validation

In reality it can be difficult to achieve 100% validation, and sometimes it may be necessary to let markup errors go. Below are some examples of situations that might require a developer's and/or auditor's judgement.

ARIA in an XHTML document: Developers may wish to use **ARIA in an XHTML document**, which will fail validation because ARIA is not a part of the XHTML specification (it's part of HTML5). Using ARIA in XHTML can enhance accessibility, so as an auditor you may choose to ignore these validation errors.

HTML5 Elements: If HTML5 elements such as `nav` are being used to create a navigation bar, validation will produce warnings if the ARIA `role="navigation"` is used in that element. The `nav` element is supposed to already have a role of navigation built in. In reality, though, there is still inconsistent support for the `nav` element, so developers will often add `role="navigation"` as a fallback for technologies that do not identify `nav` correctly. From an accessibility perspective, it does not hurt to have the redundant roles in HTML5 elements.

External Services: Another common validation issue occurs when developers use external services within markup that injects third party HTML into the code of a site. Google ads from Adwords, for instance, tend to introduce validation errors, though these errors have no bearing on accessibility.

In all of the above cases, judgement is needed to decide whether the invalid markup creates a potential barrier or not, and whether these errors should be reported in a web accessibility audit. Such errors can cause a site to fail at Level A, which can have legal implications in jurisdictions that require Level A compliance. They can also have implications for auditors who choose to ignore these errors and pass a site at Level A, despite the HTML not validating.

> **Key Point:** If a site is given Level A compliance with any of these validation errors present, an explanation must be provided in the audit report.

How Validators Work

Much like the automated accessibility checkers, it is possible to have the validator assess markup via URL, file upload, or by pasting in HTML. Note that the HTML must be a full HTML document, with all the necessary components including a DOCTYPE declaration, an opening HTML element, a HEAD element and Title, as well as opening and closing BODY elements and a closing HTML element at the end of the document.

When running the validator there are a variety of settings that can be adjusted, though the default settings are usually sufficient. One option you may want to enable is "**Show Source**" which prints out the HTML of the page, making it easier to identify exactly where issues occur in the page. This option and others are shown in the screenshot of the W3C Validator that follows. The W3C Validator will also identify some accessibility issues, such as images missing alt text or use of duplicate IDs within the content.

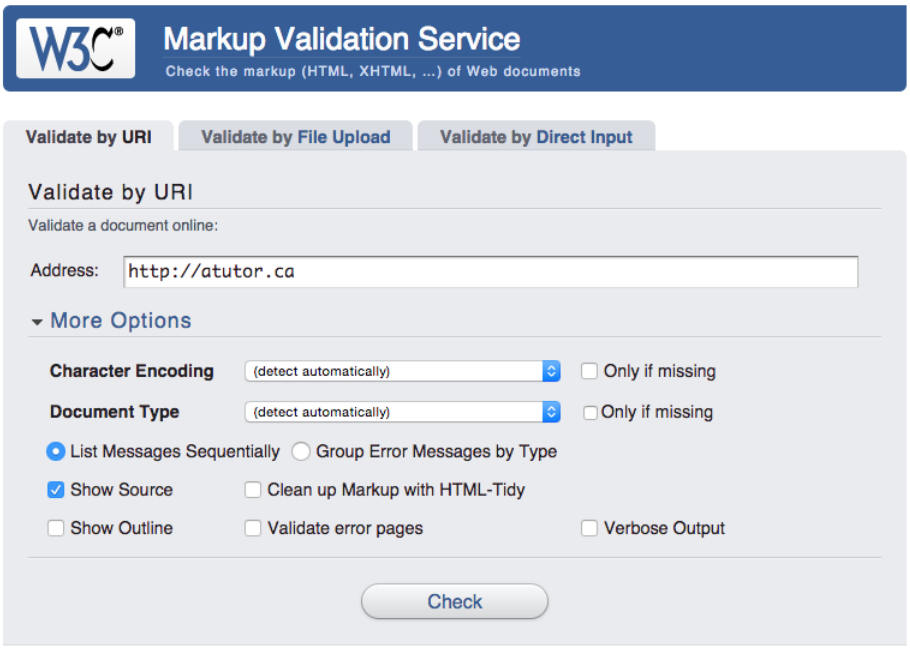


Figure: The W3C Markup Validation Service opening screen, with various options displayed

⇧ Back to Top

4.10: Activity- Compare AChecker and WAVE

If you have had an opportunity to begin experimenting with the AChecker and/or WAVE automated accessibility review tools, consider these questions for self-reflection:

- What advantages/disadvantages have you found for each of these tools?
- What features do you find most useful?
- How do they compare in the reports they generate? Do you get the same result? If not, how do they differ?
- If you have used other accessibility checkers not listed in the course, how do they compare to WAVE and AChecker?

4.11: Self-Test 3

Question 1

Please follow the directions below and then select all applicable options:

- **Open a new browser window.**
- **Launch one of the one of the colour contrast testing tools presented in Unit 3.**
- **Once you have opened the tool, enter each pair of colour identifiers (foreground, background) listed below in the appropriate fields pair, and identify which ones provide sufficient contrast to pass Guideline 1.4.3. Assume the foreground text is a 12 point font.**
- **Select all pairs below that pass Guideline 1.4.3.**

1. 0000ff, ffffff
2. 9a9aff, efefef
3. 9a9aff, 7a4fef
4. 000000, 8f6bf1
5. 5c5c5c, 63f1af
6. 4c4c4c, 11c973
7. 4d4d4d, c9a1c1

Question 2

Please follow the directions below and then select the correct option:

- **Open a new browser window.**
- **Launch the readability test tool.**
- **Once you have opened the tool, evaluate the following block of text (do not include the quotes surrounding the paragraph).**
- **Determine the overall reading grade level required to effectively understand the paragraph.**
- **Select the average grade level range from the list below.**

"Though reading level is a Level AAA requirement in WCAG, this is one Level AAA guideline that most public sites should aim for to reach the broadest possible audience. Generally speaking Web content authors should use the simplest language possible (within reason). Simple text will translate more easily for those who may wish to read the site in a different language. It will be more accessible to those with lower levels of education, or for those reading in a second language. And for a general audience, most readers will appreciate simpler language over unnecessary use of "big" words. Being able to explain things in simple language for most, is a more intelligent use of language than loading it with jargon, complex terminology, and unnecessarily complicated words and sentences."

1. 6 to 7
2. 8 to 9
3. 10 to 11
4. 12 to 13
5. 14 to 15
6. 16 to 17
7. 18 to 19

Question 3

Please follow the directions below and then select the correct option:

- **Launch AChecker**
- **Launch WAVE**
- **In each checking tool, enter the following Web page: Web Accessibility Auditing Showcase: Images**
- **Identify the number of "Known" problems flagged by each tool.**
- **What is the difference between the number of known problems identified in AChecker and the number of errors identified by WAVE?**

- **Select the correct answer from the options below.**

1. none
2. one
3. two
4. three
5. four
6. five

Question 4

Based on the evaluations that you did in the Question 3, which of the following issues did both checkers identify? Please select all that apply.

1. missing form label
2. headings used improperly
3. image missing alt text
4. colour contrast is insufficient
5. link text may not be meaningful
6. duplicate IDs were found
7. image may contain text that is not in the alt text

Answers to Self-Test 3

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

5: Manual Testing Strategies

5.1: Introduction to Manual Testing Strategies

In addition to automated testing and testing with assistive technologies (AT), manual testing is an important part of web accessibility auditing. A number of simple manual tests will be introduced so you can quickly get a general sense of the accessibility of a website and identify key issues with just a cursory scan. For the developers taking this course, more complex manual testing will also be introduced, involving the examination of source code and dynamically tweaking code to test potential solutions.

The manual testing strategies discussed in this module include:

- Tab Key Navigation Test
- “Select All” Test
- Code Examination and Repair
- Media Review

5.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to:

- Use manual accessibility tests to quickly identify potential barriers.
- Identify a variety of tools that can assist with web accessibility auditing.
- Identify potential barriers in multimedia content.
- Utilize basic code examination strategies to identify and confirm potential accessibility barriers.
- Implement code changes in live webpages to test potential solutions to accessibility barriers.

Activities

- Install and explore browser add-on tools
- Reflect on your preferences, pros and cons, and other possible tools for manual testing
- Self-Test 4

5.3: Tab Key Navigation Test

The Tab Key Navigation test is often used with the “Select All” test (discussed on the next page) to confirm whether items that were not selected are keyboard operable, but this test can also be used on its own. Place the cursor at the very start of the HTML content (sometimes tricky), or in the browser’s location field or address bar, then press the Tab key repeatedly and watch as the cursor moves through the content of the page. Make the following observations:

1. Are you able to see the cursor’s area of focus as you move through elements of the page? If not, this will violate Guideline 2.4.7 Focus Visible (Level AA). When reporting on the issue, recommend adding a focus indicator so it is possible to visually follow the cursor as it moves through the page.
2. As you navigate with the Tab key through elements on the page, do all functional elements such as links, buttons or forms receive focus? If not, those elements that do not receive focus are going to be inaccessible to some people, violating Guideline 2.1.1 Keyboard (Level A).

> **Technical:** These elements are often custom features built with non-standard HTML and JavaScript. In such cases you can recommend the use of standard HTML where possible or suggest the developer add keyboard focus for the element by adding `tabindex="0"` to the HTML, and add keyboard events, in addition to the existing mouse events, to the programming that controls the functionality of the feature.

3. When navigating with the Tab key through elements of the page, is the path followed through these elements the standard left to right, top to bottom sequence? If the cursor’s focus jumps around, moving to places on the page outside where you might logically expect the cursor to go by viewing the layout of elements on the page, it may violate Guideline 2.4.3 Focus Order (Level A). By default the focus order will be standard, so in cases where the order is irregular, it is because the developer has purposely changed the order. You may recommend removing the irregular tab sequence or adjusting it to follow a more meaningful path.
4. While navigating with the Tab key through menus, and other features that one can operate with a mouse, do these features also operate with a keyboard? If they do not, they will be inaccessible to those who use only a keyboard to move through web content. In the figure below, the submenus that drop down when one of the main navigation elements is clicked cannot be opened with a keypress. These types of menus may use the arrow keys to open and navigate through submenus, or they may operate using the Tab key. Arrow keys are preferred, though Tab key navigation will satisfy the success criteria associated with keyboard operability.

For drop down menus like those described in #4 above, also watch for Tab key navigation moving through the items in the submenus, but the submenus not visibly opening. This will be confusing for low vision keyboard users who are following the focus indicator to keep track of where they are within the page.

Figure: Scenario in which the menus only function with a mouse click (see Lulu’s Lollipops)

5.4: “Select All” Test

The “Select All” test can help identify elements in web content that are not keyboard accessible. The key command for “Select All” in Windows is Ctrl-A, and for Mac is Command-A.

How to Perform a “Select All” Test

After pressing the “select all” key command for the operating system you are using to select the content of a webpage, scan over the page looking for elements that are not selected. In the two screenshots below, the first has nothing yet selected, and the second is the result of pressing the “select all” key combination.

Compare “Before Select All” above, with “After Select All” below and notice the elements that do not have the blue background colour in the latter version.

Before Select All

Figure: Screenshot prior to selecting to compare with the screenshot below

After Select All

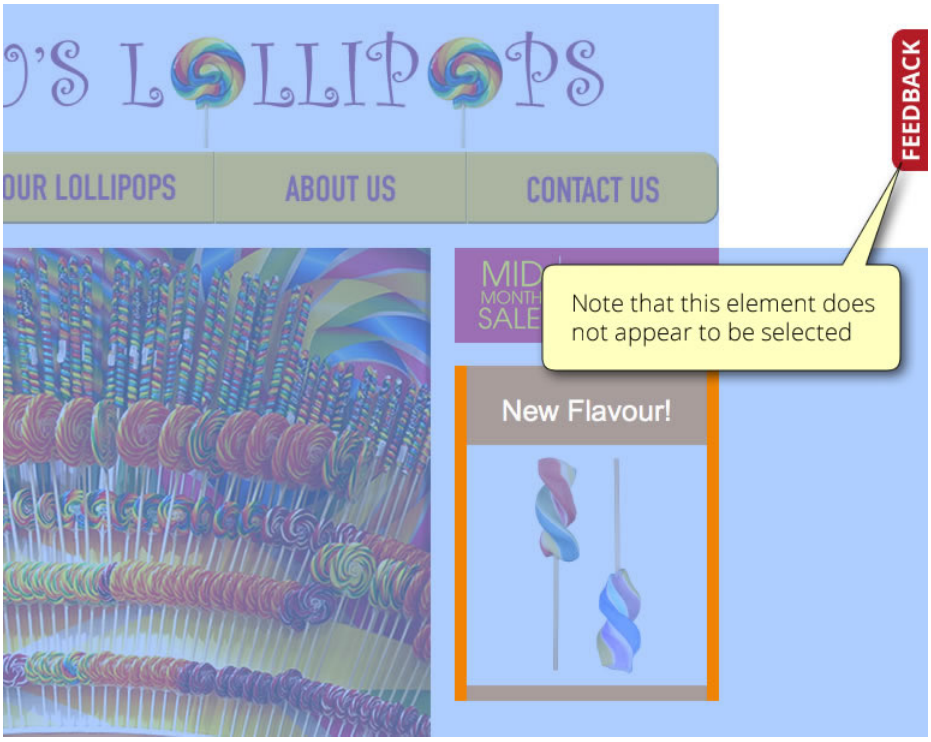


Figure: Screenshot after selecting showing elements that do not appear to be selected

In the second screenshot, the Feedback tab located on the right does not appear to be selected and is missing the blue background colour that appears when other elements are selected. That tab should be investigated further to see if it is keyboard operable. The appearance of not being selected does not necessarily mean such elements are not keyboard operable, but warrants further testing. This testing can be done by using the Tab Key Navigation test described on the previous page. Using Tab key navigation you can confirm that the Feedback tab on the right is indeed not keyboard operable. It may then be appropriate to identify the tab as a potential barrier when reporting on the site. Do search the screen for other ways to get to the Feedback form. There may be an accessible alternative elsewhere on the page, in which case it may be acceptable for the Feedback tab to be inaccessible, as long as the alternative is relatively easy to access.

5.5: Code Examination and Repair

Technical: The content on this page is intended for a technical audience.

Toolkit: If your preferred browser is Firefox, you may wish to install **Firefox for Developers**, with extended developer tools. You can also use the standard **Inspect Element** tool found in most browsers' context menu by right clicking on an element and selecting it from the menu.

Once you have discovered a potential barrier, you can identify where the problem is occurring in the HTML markup. In the screenshot below, the feedback tab (1) on the right of the screen is examined by right clicking and choosing "Inspect Element with Firebug"" (2). **Note:** Firebug is now deprecated, but you can do the same thing with selecting "Inspect Element" from the menu. You will notice the code associated with the feature is highlighted in the code window (3) to the lower left. Click on the Edit button (4) to edit that HTML to test possible solutions.

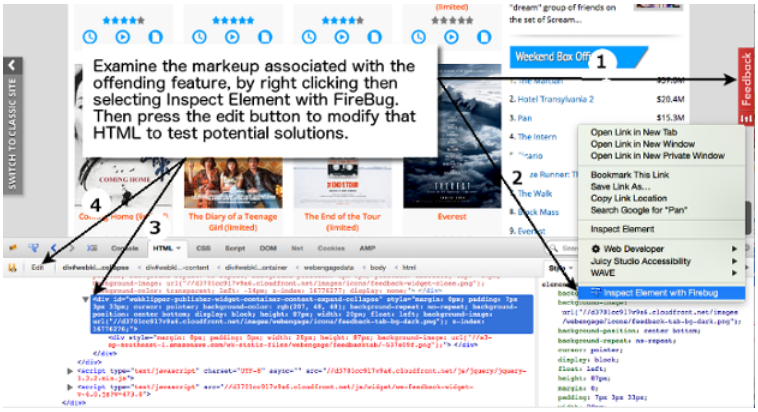


Figure: Steps to examine and modify code to test potential accessibility solutions

In the case above, the Tab Key Navigation test revealed that the Feedback tab would not receive focus, thus could not be operated with a keyboard. A simple fix for this is to add `tabindex="0"` to the main element containing the tab. Once added, without reloading the page, the Tab Key Navigation test is conducted again to see if the tab now takes keyboard focus. It does, though it is still not possible to operate the tab, which requires modifying the associated JavaScript.

Figure: Result of adding `tabindex="0"`

After clicking the Edit button, the selected code from above is opened for editing. In this case `tabindex="0"` has been added to test whether this adds keyboard focus to the Feedback tab (which it does).

For a look at other tools for examining code, watch the following video on the Chrome accessibility audits.

Video: **The new way to test accessibility with Chrome DevTools**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1349

5.6: Media Review

Another element of web content that is typically examined manually is multimedia. There are three potential accommodations that can be found with various media: captions, audio description, and transcripts (and combinations of these, depending on the media).

Video

All video with meaningful spoken dialogue must include **captions** that reproduce the verbal elements of the video. Depending on the jurisdiction you are in, video may also require **audio description** (referred to as **described video** for television) – an audio track added to the video that describes the action or context of the video that one would not be able to determine by listening. The third element is an optional **transcript**, made available as a separate file that can be downloaded or reviewed online on its own.

> **Key Point:** In Ontario, audio description is only required from government organizations as of 2020, despite being a Level A requirement in WCAG 2.0. For other organizations in Ontario it is not required. Audio description, however, can be an important accommodation for people who are blind, so smaller organizations should still attempt to provide audio description when needed.

Adding captions to a video is a fairly straightforward process, with the right tools. Services like YouTube provide built-in tools that allow video producers to add captions directly through the YouTube video manager. Many video production programs also include tools for creating captions. The Amara caption editor, which will also caption YouTube videos, can be used to caption videos from other sources on the Web. It generates a caption file that can be imported into video editors or players, to quickly add captions. It is also relatively straightforward to convert the caption file into a transcript, by removing the time codes from the caption file.

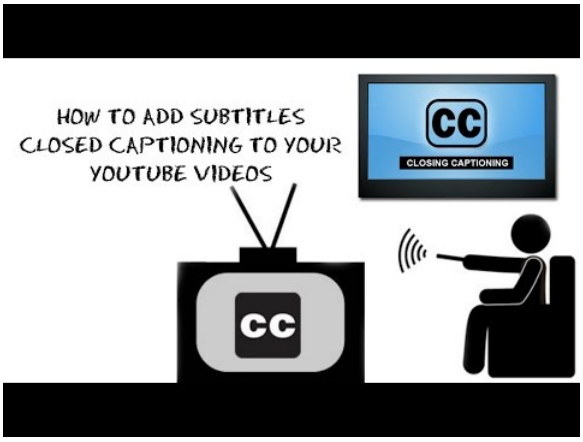
> **Toolkit:** Add the **Amara Caption Editor** to your Toolkit, familiarize yourself with how it works, and provide the link to it in your audit reports where missing captions have been identified.

One word of caution regarding services that provide automated captions: these captions do not satisfy the success criterion associated with Guideline 1.2.2 Captions (Prerecorded) Level A. They may be a helpful strategy to consider in cases when a video must be posted in a hurry; however, in many cases these automated captions have a very high error rate, and provide little accommodation for those who require them. Only human-generated captions are acceptable to meet the requirements of this guideline. One of the most useful aspects of automated captions is that they are a good starting point for human-generated captions. They can be exported from YouTube into Amara where they can be refined, then exported back to YouTube. However, the more errors automated captions have in them, the less useful they become as a starting point for human-generated captions. With an error rate of about 35% or worse, you are better off captioning from scratch.

> **Key Point:** Automated captioning output is not considered an acceptable text alternative for audio. Captions must be created by a human being.

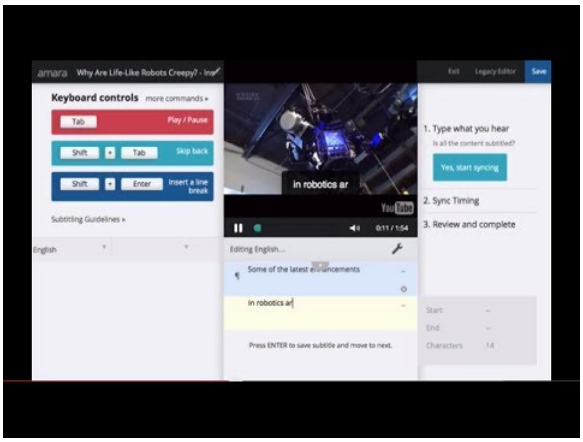
For more on how to use the YouTube and Amara caption editors, view the videos below.

Video: **How to Add Closed Caption Subtitles on YouTube 2015**



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1351

Video: Captioning with Amara Caption Editor



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1351

Audio

Examining the accessibility of audio content is straightforward. When audio with meaningful spoken information is presented, a transcript must be provided.

It is also possible in some cases to caption an audio track if it is being presented in a player that supports captioned audio. Provide captioned audio where possible, but also be sure to include a transcript.

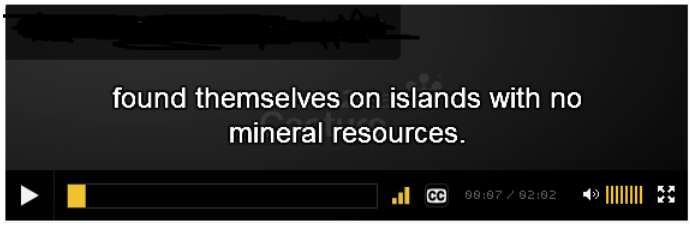


Figure: Example of captioned audio

5.7: Other Tools for Manual Testing

You may also find the following tools useful when auditing web accessibility. Though we won't go into any detail here, you may optionally install these add-ons and extensions and explore their capabilities.

Firefox Add-ons

- Firefox Web Developer ToolBar
- HeadingsMap (Firefox Add-on)
- AInspector
- WCAG Contrast Checker

Chrome Extensions

- WAVE Chrome Extension
- aXe (Accessibility Testing for Chrome Developer Tools)
- ColorPick Eyedropper

5.8: Activity- Chrome Tools

For this activity you will need the Chrome web browser. Be sure to install it now if you have not already. You will need it in the next unit as well. Visit the Chrome Web Store using the Chrome web browser, and install the ColorPick Eyedropper and the WAVE Chrome Extension. Explore the features of these tools and think about how they might be used during web accessibility auditing activities.

5.9: Self-Test 4

Question 1

The "Tab Key Navigation test" is useful for identifying a variety of potential barriers. From those uses listed below, select all that the Tab Key Navigation test would identify.

1. Focus visibility
2. Keyboard operability
3. Missing alt text
4. Focus order
5. Descriptive feedback

Question 2

Which of the following potential barriers would the "Select All test" be useful in identifying? Select all that apply.

1. Focus visibility
2. Keyboard operability
3. Missing alt text
4. Focus order
5. Descriptive feedback

Question 3

To examine the HTML markup associated with a potential barrier that has been identified using the Tab Key Navigation or Select All tests, a recommended approach would be to use:

1. The browser's "View Source" function
2. The Browser's "Inspect Element" function
3. Install and use the "Examine Markup" browser plugin
4. The W3C Markup Validator
5. Use the WebAIM toolbar's view source feature

Question 4

When reviewing video content for accessibility, which of the following alternatives does WCAG 2.0 suggest should be provided? Select all that apply.

1. An alternative slideshow for those who do not have a video player
2. Captioning
3. A downloadable PDF version
4. A downloadable slideshow version
5. A transcript
6. Audio description

Answers to Self-Test 4

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

6: Assistive Technology Testing

6.1: Assistive Technology Testing

In this unit we will look more closely at assistive technology testing, and particularly testing with a screen reader, and in the next unit we will look at strategies for including people with disabilities as part of a web accessibility audit. Specifically, we will examine:

- Screen readers as an accessibility testing tool
- ChromeVox screen reader and learning to use it
- Screening user testers
- Developing user testing protocols

Many of Lulu's potential clients might use assistive technology to access her site, so to help ensure the success of Lulu's "barrier-breaking" efforts, it is important to assess how the site and these devices interact.

There is a wide range of assistive technologies (AT) that people use to access the Web, from browser-based tools for magnifying text, to screen readers that read back text content, to various types of hardware such as braille displays, or switches and scanners that can be used by those with limited physical mobility to control keyboard and mouse actions.

Figure: Examples of assistive technology
Source: Intro2AT

Why Learn About Assistive Technologies?

While web accessibility guidelines are written to be technology neutral, and intended to remove the need for testing with specific AT, there are times when manual testing with AT may be necessary. Screen readers are most commonly used for manual AT testing. You were introduced to the ChromeVox screen reader in the section ChromeVox Screen Reader. We will introduce you to some other common screen readers and discuss their strengths and limitations. We will also examine their compatibility across web browsers, operating systems, devices, and with various web accessibility technologies.

6.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to:

- Use basic features of desktop screen readers such as JAWS and NVDA.
- Use basic features of mobile screen readers such as VoiceOver and Talkback.
- Identify assistive technologies other than screen readers that might be used in web accessibility testing.

Activities

- Practice using ChromeVox screen reader for day-to-day screen reader testing
- Experience web navigation with a screen reader as your primary means of accessing content
- Self-Test 5

6.3: Screen Reader Testing

In this course, we focus specifically on the ChromeVox screen reader add-on for the Chrome web browser because of its simplicity, support for standards, and its availability across platforms and being free, open source software. We will also introduce you to a number of other screen readers and provide a summary of the main keyboard commands you might use during screen reader testing.

For new or inexperienced users, learning to operate a screen reader can be difficult, particularly if you are not using one on a regular basis. Memorizing the basic commands provided in the upcoming pages is often enough for screen reader testing purposes, though there is much more functionality in screen readers that is not discussed here. You are encouraged to explore the full range of features screen readers have to offer as time allows.

ChromeVox is ideal for developers and auditors, though it does have its limitations, and it is a good idea to do final screen reader testing with one of the more broadly used screen readers like JAWS, Window Eyes, NVDA, or VoiceOver, and across multiple browsers and devices. What may seem accessible with one combination of browser and screen reader, may not necessarily have the same accessibility across other combinations.

6.4: Summary of Available Screen Readers

There are a variety of screen readers available for different operating systems, whether you are using Windows, Mac, Linux, iOS, or Android, and there are a few web-based screen readers. The more common screen readers are listed below for reference.

Screen readers should not be confused with Text-to-Speech (TTS) applications. Though both read text content aloud, TTS only reads content text, such as the text on this page, and not the menus or interface of the browser or reader application displaying the page. Screen readers also read content text, but they also read aloud elements of the browser's interface and elements of the operating system, as well as provide ways to navigate the content, with features for listing headings, links, or tables, for example. These features are not typically found in TTS applications.

Windows (Commercial)

- JAWS (Freedom Scientific)
- Window Eyes (GW Micro) – discontinued
- Dolphin (Dolphin)
- ZoomText (Ai Squared)

Windows (Free Open Source)

- NVDA (NV Access)

Mac

- VoiceOver (built into Macs)

Linux (Free Open Source)

- Orca (GNOME)
- Speakup (Speakup)

iOS

- VoiceOver (built into iOS devices)

Android (Free Open Source)

- Talkback (built into Android devices)

Browser-Based (Free Open Source)

- ChromeVox (Google, requires the Chrome browser)

For a more thorough list of screen readers, see Wikipedia's Screen Reader entry.

Important to Note: Many of the listings at this Wikipedia link are not actually screen readers, but rather Text-to-Speech (TTS) programs. The two should not be confused. TTS programs generally only read text selected from content, while screen readers tend to read all elements of the operating system they run on, or all elements in web content.

Screen Reader Usage Trends

It is rarely possible to test with every screen reader available, so it is a good idea to choose the screen readers you use strategically. Understanding screen reader usage patterns can help you decide which one(s) to test with.

WebAIM has been conducting screen reader user surveys since 2009, with the latest results from October 2019 (as of this writing). The 2019 WebAIM Screen Reader User Survey notes that 72.5% of respondents used more than one desktop/laptop screen reader on a regular basis, with NVDA (72.4%), JAWS (61.7%), and VoiceOver (47.1%) in the lead. This was the first year NVDA usage exceeded JAWS usage. With built-in screen readers like VoiceOver on Mac, and free open source screen readers like NVDA – both much improved in recent years – many users are opting for these less expensive options. JAWS, though highly functional, is expensive software and can be out of reach for some who need screen reader technology.

Microsoft's Narrator first made an appearance in the 2017 survey with 21.4% respondents reporting using it commonly on a desktop/laptop. In 2019, Microsoft Narrator usage increased to 30.3%. In 2015 its usage was so low that it wasn't even mentioned

by name, but because of significant improvements in Windows 10 it has been gaining users.

The previous 2015 survey reflected a significant dip in JAWS and NVDA usage in favour of Window-Eyes and ZoomText that isn't repeated in the 2017 or 2019 results. The 2017 survey attributes the difference to the respondents' demographics: "What happened in 2015? Essentially, the survey was distributed to a much broader audience, with many ZoomText and Window-Eyes users recruited to respond. Window-Eyes was also offered freely with Microsoft Office before the 2015 survey, but has since been discontinued."

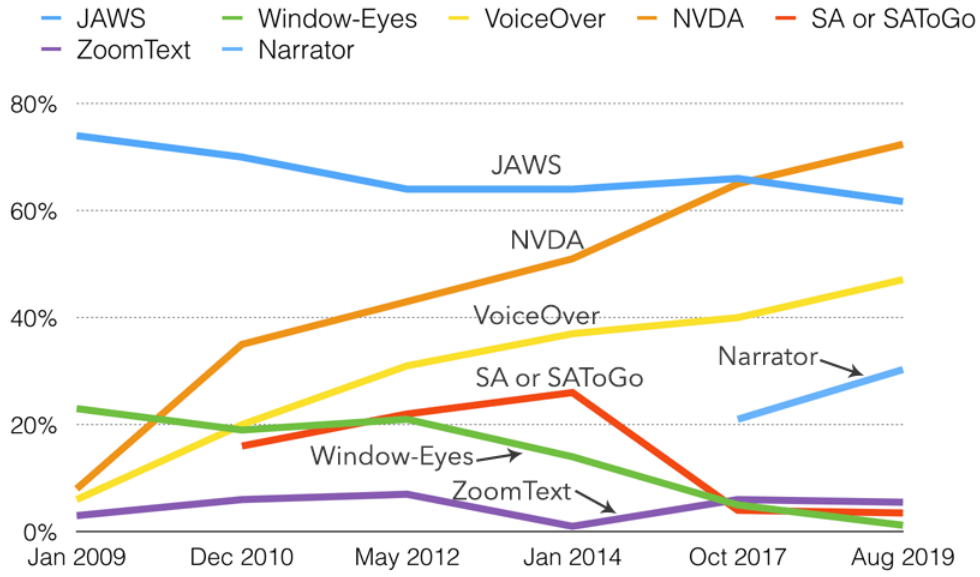


Figure: Usage patterns of commonly used screen readers
Source: WebAIM Screen Reader User Survey #8

Mobile screen reader usage has increased exponentially over the years, from just 12% in 2009 to 88% in 2017 (statistic not available in 2019). VoiceOver is a clear market leader on mobile platforms (commonly used by 69% of respondents in 2017, up to 71.2% in 2019), followed by TalkBack for Android (29.5% in 2017, up to 33% in 2019). Keep this in mind when screen reader testing. Testing with mobile screen readers should be considered.

The following table from WebAIM shows changes in screen readers commonly used for desktop and laptop computers between 2009 and 2019.

Which of the following desktop/laptop screen readers do you commonly use?

Screen Reader	2009	2015	2017	2019
JAWS	75.2%	43.7%	66.0%	61.7%
NVDA	25.6%	41.4%	64.9%	72.4%
VoiceOver	14.6%	30.9%	39.6%	47.1
Window-Eyes	23.5%	29.6%	4.7%	1.2%
ZoomText	7.5%	27.5%	6.0%	5.5%
System Access or System Access To Go	22.3%	6.9%	4.0%	3.5%
ChromeVox	n/a	2.8%	5.1%	4.7%
Narrator	n/a	n/a	21.4%	30.3%
Other	7.7%	6.5%	6.4%	6.0%

Other Screen Readers to Consider

Readings and References: Here is a list of Other Screen Readers to Consider [PDF] when screen reader testing.

6.5: Other Assistive Technologies

While screen readers are the most common assistive technology used in web accessibility testing, there are others that merit consideration when performing web accessibility audits. Fortunately, when AT testing is required, the issues that are identified while testing with a screen reader are often similar to issues that may arise with other AT.

Listed below are some of the more common assistive technologies that may be included in accessibility testing, perhaps as part of **user testing, covered in the unit User Testing,** to gather additional usability feedback across a range of diverse users.

Magnification

Screen magnification software is often used by people with low vision to make text and images larger and more visible. Some screen magnifiers, such as ZoomText, function much like a screen reader, with audio output in addition to magnifying the content. Issues that create barriers for those using screen readers often also arise with screen magnification.

For a sampling of different brands and types of magnifiers, you may wish to review the videos below.

Video: **Introducing ZoomText 11**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1381

Video: **Windows 7 Magnifier**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1381

Video: **Mac OS X Accessibility – Magnifier**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1381

Technical: Operating systems such as Mac, Windows, as well as iOS and Android, have screen magnification programs built into them. While they don't have all the capabilities of a full-fledged screen magnifier such as ZoomText, they are often sufficient to meet the needs of low vision users. In terms of potential accessibility issues, there are relatively few because these tools magnify the screen, as opposed to the content itself, so the content magnifies regardless of whether it was created in a way that would allow it to be resized. What may be problematic for magnifier users are low grade images, particularly those containing text, which tend to degrade when magnification is applied.

Another type of magnification is built into web browsers. Until recently, browser magnification would increase the size of text only, leaving images and other elements of the content at their original size. Now however, most browser magnification works like the screen magnifiers mentioned above, magnifying the entire browser window as opposed to the content within the window. As a result text and images, and other content elements, magnify at the same rate. At least for the short term, until all older browsers are replaced by newer ones that magnify the window instead of just the text, some users will still have trouble with magnification.

When testing content magnification with a browser, test with just the text magnified. In Firefox for instance, in the ViewZoom menu there is an option to Zoom the text only. If when testing in this mode the text does not increase in size, or the text size increases but other elements on the page do not, this may be an indication that elements have been sized with absolute measures using pixel (px) or point (pt) measures, rather than using relative measures such as percent (%) or "em" measures. The latter relative measures applied to content elements will resize these elements at the same rate as the text when using browser text magnification, while those sized with absolute measures typically will remain the same size.

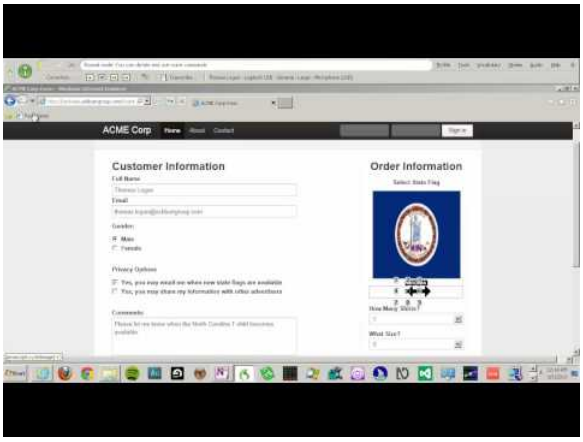
Voice Recognition

Voice recognition is being built into a range of systems and is not only for those who require it as an assistive technology. Take Siri, for instance, on iOS devices. Windows has built-in speech recognition and even Google allows you to simply speak your search terms. So, creating content that will be accessible by voice means that all operable elements in web content should include text that is readable by AT.

A range of users who are perhaps unable to use a mouse or keyboard can use voice recognition software instead to operate their computers. Within web content it is also possible to speak commands. To activate a link or a button, one would speak the text of these elements to bring focus to and activate the element. Barriers occur when these elements do not contain readable text, such as an image used as a button without alt text, or a navigation element created with images, again without alt text.

One of the more popular voice recognition applications is Dragon NaturallySpeaking. It can be used to navigate through web content or to control a computer's operating system. The following NaturallySpeaking Demo will give you a brief look at how voice recognition works.

Video: Web Accessibility 101 Dragon NaturallySpeaking Demo



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1381

Alternative Input

By alternative input we mean devices or software other than a mouse and keyboard, which allow users to control their computer and navigate the Web. You have already been introduced to voice recognition, which takes one's voice as input.

There are many devices that can take the place of a mouse and a keyboard; voice recognition, onscreen keyboards, a head mouse, and various types of switches. The following video will give you an idea of how these technologies are used. The person in the video has no use of his arms and legs and uses his computer to perform complex tasks with the help of an onscreen keyboard, a sip and puff switch, and a head mouse.

Video: Head-Designed

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1381

In terms of identifying accessibility issues that affect those using alternative input, there are relatively few when compared to barriers that might be faced by screen reader users. A few to watch for include:

- Small target areas that might be difficult to position a mouse pointer over. Targeting a radio button for instance, can be made easier if a proper label is used, making the label itself clickable to activate the button.
- Well designed error feedback can also improve usability by reducing the effort needed to recover when an error occurs. For example, if an email address is entered incorrectly, identify this error before the form submits, and send the cursor to the email field so it can be corrected after the error message is acknowledged.

6.6: Activity- Using ChromeVox to Find Accessibility Features

NOTE: If you are a regular day-to-day screen reader user (i.e., you are blind or have significant vision loss) use your own screen reader for this activity instead of ChromeVox.

Ideally, accessibility features will be invisible to typical users so they do not interfere with their user experience. In addition to using a screen reader to identify accessibility problems, it is an important tool for identifying features that add to the accessibility of a website, so when reporting you are not identifying potential barriers that may have hidden alternatives.

In this activity practice using ChromeVox to identify hidden accessibility features in a website. Refer back to **ChromeVox Screen Reader** in the section ChromeVox Screen Reader , and have the keyboard commands list beside you when completing this activity.

1. Open the Showcase Demo Site in Chrome, and turn on ChromeVox.
2. Leave your monitor turned on so you can see what you are doing.
3. Put your mouse away, and use only your keyboard to navigate through the site.
4. Create a list of all the hidden accessibility features on the site. You may also list the visible accessibility features if there are any.
5. In addition to listing the accessibility features, if relevant, describe what the screen reader announces when it encounters the accessibility features in your list.

Hint: Some of the features to listen for are WAI-ARIA enabled elements. You may need to examine the HTML source to determine what they are, or use the Chrome Inspect tool to see how WAI-ARIA is being used.

Suggested answers to Activity

6.7: Self-Test 5

Question 1

According to the data from the WebAIM Screen Reader Survey, when it comes to screen readers commonly used, which of the following screen readers experiences the least usage?

1. JAWS
2. NVDA
3. ChromeVox
4. VoiceOver
5. Window-Eyes
6. Talkback

Question 2

Based on your Chapter 5 readings, which screen reader makes use of a rotor for accessing different features of Web content, such as headings, lists, tables and links?

1. JAWS
2. NVDA
3. ChromeVox
4. VoiceOver
5. Window-Eyes
6. Talkback

Question 3

Which of the screen readers introduced in this Unit are open source software? Choose all that apply.

1. JAWS
2. NVDA
3. ChromeVox
4. VoiceOver
5. Window-Eyes
6. Talkback

Answers to Self-Test 5

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

7: User Testing

7.1: User Testing

While user testing is not a necessary element of a web accessibility audit, it can still be of value. This is because user testing can provide useful information about the usability of web content that an expert accessibility auditor may not discover through a technical audit.

Going back to the **“Curb Cut”** discussion introduced in the section Why Learn about Web Accessibility Auditing?, user testing with people with disabilities is a good way to identify usability issues in general, that affect all users. Issues are typically “amplified” for people with disabilities, making them easier to identify than might be the case with other users who may work around usability issues.

There are a variety of ways to approach user testing, ranging from having colleagues with disabilities provide feedback on web content to highly controlled scientific studies that recruit randomly sampled control and experimental groups, exposing them to content that is and is not accessible to study the difference in their behaviour.

While we will not address testing at the level of scientific studies, this unit will look at the benefits and challenges associated with user testing, and provide some guidelines to help you design user testing scenarios that provide useful feedback on accessible designs without incurring extensive additional costs.

7.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to:

- Identify instances where user testing is needed.
- Recruit and screen user testers.
- Develop a test protocol, including observation and recording.

Activities

- Identify possible agencies in your area that might assist with user testing
- Develop a possible test protocol for users of Lulu's Lollipops website
- Self-Test 6

7.3: Involving User Testers

User testing in web accessibility auditing projects is a good idea, though who to include and when needs some thoughtful consideration. You should not attempt to generalize results when only a small number of users are involved. Testing with users will help identify issues for a particular user, or groups of users with similar disabilities, but may not be relevant to people with other types of disabilities, those with the same disabilities who use different assistive technologies (AT), or those with different levels of expertise with the Web and their AT. Nonetheless, involving just a few experienced AT users can provide valuable input for your audit.

When to Involve Users

If you plan to involve user testers in the auditing process, they should be included **after the auditing against all relevant standards** has been done, and **the resulting recommendations have been implemented**. At that point the accessibility of the site should be relatively good, so the focus can be aimed at improving usability.

In some cases, if web accessibility auditing involves incremental testing during the development of a new website or a web application, it is useful to include user testers from the start of the development process. This can help avoid costly issues later on in the development by identifying accessibility and usability problems early on in the design phase of a development project.

How to Select the Types of Users to Recruit

In most cases user testers should have average to expert web and AT knowledge to produce the best feedback. This helps reduce issues that arise due to not knowing how to use AT effectively. Later in this unit we'll look at screening user testers. There are cases however, when you may want to include novice AT users, if for instance you are working with a site that caters to specific disability groups. Sites such as these are often visited by novice users, thus should be functional with just basic web and AT experience.

When choosing user testers, it is helpful to select a group based on the assistive technology they are using. Choose screen reader users, magnifier users, alternative input users, text to speech users, voice recognition users, and so on, rather than choosing based on disability. You might also choose people who do not use assistive technologies. For example, some people may use browser-based adaptations to access web content, and older users can provide useful information about common age-related visual, auditory, physical, and cognitive changes that affect their ability to access the Web.

A Note on Working with People with Disabilities

It is not uncommon for people who have not previously worked with people with disabilities to feel a little unsure of themselves, sometimes uncertain how to interact, or worried about saying the wrong thing. The best approach, not surprisingly, is simply to interact as you would with anyone:

- Introduce yourself
- Speak normally
- Ask before attempting to help
- Ask before touching a guide animal
- Don't be afraid of using non-disabled words (e.g. "…as you'll see" to a blind person)
- Talk to the person, not their companion or helper
- Use people first language (e.g., person who is blind, rather than a blind person)
- Avoid offensive language (use "person who is blind" or "…with a visual impairment")
- Be aware of personal space

For more about interacting with people with disabilities see the following resources:

> **Readings and References:** Interacting with People with Disabilities

Video: Disability Sensitivity Training Video

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1402

Video: Stupid Questions Not to Ask a Disabled Person

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1402

7.4: Recruiting User Testers

It's relatively easy to find user testers through social media groups, disability and accessibility mailing lists, university accessibility services, or organizations that serve people with disabilities. People with disabilities tend to be receptive to testing when you are improving accessibility, and are often willing to refer you to other potential testers.

After all the work that she and her team have done, Lulu realizes that one potential source of referrals for user testers may in fact be the organization who approached Lulu's Lollipops to inquire about their accessibility in the first place!

Initial Screening

It is important that user testers be screened for particular characteristics, including good understanding of web technologies, as well as proficiency using their respective AT. This is necessary, in most cases, to ensure that issues that testers' experience during testing are attributable to problems with the web content or application being tested, and not the result of inexperience with the Web or limited expertise with the AT being used.

There are a number of questions that you can ask that will help gauge a user tester's level of knowledge.

The two main categories of questions to cover in screening user testers are:

- Web Knowledge
- Assistive Technology Expertise

Toolkit: Download the User Tester Screening Questions [docx] and add it to your Toolkit. Note that the template includes instructional commentary that you should remove if you distribute the questions to potential users. Though these questions can be a good indicator of a tester's level of understanding, keep in mind that users may exaggerate their experience or not be aware of their level of understanding. Additional questions or observation may be needed once the user is in front of a computer using their assistive technology.

For another approach to screening users for accessibility testing, visit the following resource: Recruiting Screener.

7.5: Developing a Test Protocol

Thanks to some helpful referrals from her client, Lulu has reached out and contacted a number of people to assist with user testing. Now she is ready to plan her testing. To conduct your user testing, in most cases you will want to develop a "test protocol" that details the activities and the steps taken to test a particular set of features. Most testing sessions with users should not exceed one hour, so a test protocol should provide a number of relatively short scenarios that can be completed in 5-10 minutes, allowing time between each scenario for a few questions to probe the user's experience.

Talk Aloud Protocol

One of the best ways to gather information about a user's experience using your web content is to have them talk aloud as they complete tasks. Record verbal responses as well as any emotional responses or facial expression in a log. You can also ask simple questions like "what were you thinking when…?" to determine their thoughts. It may be preferable to video or audio record sessions and analyze them afterwards so you as the observer can focus your attention on guiding and probing the tester's thoughts.

Note: If you plan to video or audio record testing sessions, always be sure to inform user testers of this fact.

Test Protocol Example – The Lake Devo Website

As an example of a potential user testing protocol, we will look at the plans put together to user test Lake Devo, a web-based role playing game used by students at Ryerson University to design and play out various scenarios related to their subject of study. The Lake Devo website has recently undergone extensive improvements for accessibility.

The User Testers

A couple of screen reader users who had not used Lake Devo previously were recruited to complete a series of tasks that would test the accessibility and usability of key features in the software. Both were skilled JAWS users and knowledgeable about web technology. They were both also students in online courses at the university.

The testers were told they would receive compensation in the form of a $100 CAD prepaid credit card. Regardless of whether the testers completed all the scenarios, they received their compensation.

Pre-Test Tasks

Before starting the testing session, the Observer (in this case the web developer) provided a description of Lake Devo, its purpose, its main features, and an overview of how it might be used to develop a role playing movie. Each user tester was informed at the start of the session that if at anytime they needed a break, felt uncomfortable or wished to discontinue testing, they were free to do so.

Then the Observer introduced the scenarios the tester would be asked to complete and how the session would unfold. For each of the scenarios, the Observer essentially "trained" the user testers by doing the following:

- Reading out the scenario in full
- Walking through the scenario him/herself describing aloud the steps taken to complete the task
- Modelling the talk aloud protocol

Lake Devo Test Scenarios

Scenario 1: Watch the web accessibility movie and answer a skill-testing question

[no login required] low effort

1. Find the Gallery link in the Lake Devo main navigation and open the Gallery.
2. On the Gallery screen enter the words "Lake Devo Accessibility" into the search field and submit the search.
3. In the search results choose the "Lake Devo Accessibility" movie and click or keypress to open the movie.
4. On the movie player screen that opens, find the play button and explore the other options available in the player toolbar.
5. Return to the play button and click or keypress the button to start the movie.

6. Listen to the movie as it plays, and pay attention so you can answer the question about the movie that will follow.
7. Answer the question the Observer asks you.

Scenario 2: Create a new character

[login required] medium effort

1. Log in to Lake Devo with the account created for you, using the login link at the top right of the screen, then fill in the login form, and press the Login button.
2. In the MyStudio screen that opens, find the Access Team community and click or keypress to open the list of movies created by community members (of which you are one).
3. In that list of movies, find the Learning About Accessibility movie, and click or keypress that movie to open it in the script editor.
4. Find the Movie Settings button in the Script Editor, and press it to open the Movie Setting tabpanel, consisting of Movie Info, Character, and Scenes tabs.
5. Click or keypress the Characters tab to open the list of current characters in the movie.
6. In the Create New Character area, open the character editor.
7. Observer describes the character editor: The character editor consists of two main panels, with the preview of the character on the left, and a series of tab panels on the right from which to choose characteristics for the character. These include: info, face, nose, hair, shirt, outerwear, and accessories.
8. To begin creating your character, fill in the name, description, choose male or female, adult or child, and if desired check the checkbox “This character requires a wheelchair.” These are all elements of the form that opens under the info tab.
9. After entering the character info, return to the tabs, navigate to the faces tab and choose a face shape and a face colour.
10. Next open the Nose tab and choose a nose.
11. Optionally, choose hair and a hair colour, a shirt and shirt colour, outerwear, and accessories from the other tabs.
12. After choosing characteristics for your character, press the Save button to save the character.
13. Your character is now created and you will be returned to the list of characters. Find the character you created and click or keypress the Edit link to reopen the character editor.
14. Navigate back to the preview panel of the character editor and listen to the description provided to confirm the characteristics of your character.

You will note that each of the scenarios carefully step the user testers through a specific process on the Lake Devo website. In cases like this one, existing documentation such as the “Help” area of the website often provides a good starting point for writing up the steps involved in a given test scenario.

7.6: Recording Observations

There are a range of ways you can record your own observations when watching user testers complete activities. You might use an informal strategy, like taking anecdotal notes, then expand on those notes after the session. As mentioned previously, you may wish to videotape the sessions, then after the sessions are complete, watch the videos and create notes. Or, you could create a blended observation strategy, recording specific behaviours in a spreadsheet based on the scenarios, with codes to indicate particular behaviours or observations, with space to add anecdotal notes, and perhaps in addition record the sessions so it is possible to go back through the session later to provide clarifications on recorded observations.

The following is an example of a record sheet, based on the Lake Devo Testing – Scenario 1 introduced on the previous page. Notice a short description of the **task** in the first column, a coded level of **effort** in the second column ranging from 1 (no difficulty) to 5 (unable to complete task). In the third column record the **tester's comments** as they think aloud, and in the final column record the **observer's comments**.

Toolkit: Download the Observation Notes Template [docx] and add it to your Toolkit.

7.7: Activity- Finding User Testers

Spend a few moments with your favorite search engine and find agencies or resources in your area that might help you find people with disabilities to assist with user testing. Document three potential sources in your area, including the name of the organization, and why you think it would be a good source. Some sources might include:

- Associations for the blind
- University accessibility services
- Services for veterans
- Services for those with cognitive or developmental disabilities
- Associations for those with severe physical disabilities
- First Nations disability association

7.8: Self-Test 6

Question 1

When selecting user testers, which of the following prerequisite skills or knowledge should recruits have? Choose all that apply.

1. Ability to read HTML
2. Knowledge of WCAG
3. Good understanding of web technologies
4. Ability to use multiple assistive technologies
5. Moderate to expert skill using their own assistive technology
6. Fluent English speaker
7. Touch typing skill

Question 2

When developing a test protocol, which of the following features should it have? Choose all that apply.

1. Can be completed in one hour
2. Multiple short tasks to complete
3. Coverage of the whole website or application being tested
4. Time between tasks to ask questions
5. Printed out on paper for tester to read
6. Provided in electronic form so it can be read by assistive technologies

Question 3

When recording observations during a user testing session, which of the following strategies might be used. Choose all that apply.

1. Anecdotal notes
2. Video taping
3. Audio taping
4. Recording in a spreadsheet

Question 4

During a user testing session which of the following should an observer not do? Choose all that apply.

1. Ask questions about what a tester is thinking
2. Provide hints to make a task easier
3. Help a tester complete a task if they get stuck
4. Remain quiet
5. Answer a phone call
6. Describe to a tester how a task is done
7. Pay the tester for their time and expenses

Answers to Self-Test 6

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

8: Web Accessibility Reporting

8.1: Web Accessibility Reporting

Having greatly improved their awareness of how to identify and test for barriers in their web content, Lulu and her team quickly realized that proper documentation of this work would be necessary in order to make the most of their accessibility improvement efforts. As such, they next turned their attention to tracking and reporting. The first six units introduced you to web accessibility auditing, went through the WCAG 2.0 guidelines, and covered the tools and methods for conducting accessibility reviews.

Building on this foundation, this unit will explore what to do with the results of the accessibility testing tools. Specifically, we will look at:

- Reporting strategies – different types of auditing reports, when to use each, and the elements of such reports
- Web accessibility around the world and the relationship between international regulations and WCAG 2.0
- Other accessibility guidelines and standards that complement WCAG 2.0, that you may need to consider while performing audits

After identifying accessibility issues, the next step is to inform the website's owner or developer so that they may begin to remove barriers. This is accomplished by producing an audit report.

This unit will introduce reporting strategies that can be used to:

- Document potential barriers
- Provide the reasoning to help consumers understand the importance of "barrier free" web content
- Prioritize issues
- Recommend strategies to correct potential barriers

8.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to.

- Identify factors to be considered when choosing a type of audit.
- Perform a quick informal review.
- Produce a Template Audit.
- Produce a General Audit.
- Produce a Detailed Audit.
- Create graphical enhancements for audit reports.
- Write an effective executive summary for an audit report.
- Assemble appendices for audit reports.

Activities

- Examine a completed audit report
- Conduct an informal review of the Lulu's Lollipops website
- Walk through the steps of a Template Audit
- Self-Test 7

8.3: Choosing an Audit

Different situations will require different types of web accessibility audits or reviews. More detailed information on each type of review is provided in the pages that follow. However, here are some questions that may assist you when deciding what type of audit to conduct:

- **Is this an internal or external review?** Depending on your audience, a review may be more or less formal. If you are providing feedback to a developer in your organization, it may be sufficient to provide point form notes in an email. If you are reporting to senior management, or perhaps to an external organization, a more formal review is likely more appropriate.
- **What is the budget for the review?** If you are working with a small company, or even a larger company with limited resources committed to web accessibility, a quick informal review may be appropriate. A template review may also be desirable in such cases. These tend to be completed quickly and produce the biggest effect on accessibility for the effort and cost expended. If you are working with a larger budget, then a combination of formal reviews and user testing might be conducted.
- **What is the client's motivation for the audit?** For jurisdictions that have legislated web accessibility requirements, more detailed reviews may be desirable to ensure that organizations are in compliance. On the other hand, organizations may be in jurisdictions where there is no obligation to make their web content accessible and may not be willing to invest in an audit. A quick, informal review may open their eyes to the benefits of an inclusive website, acting as a loss leader for a formal review. And, there will be other organizations that just want to be good corporate citizens, who will be more open to a thorough review of their web content.

Balancing context, motivation, and budget will often guide the approach you'll take as an auditor, giving clients what will serve them best. Depending on the answers to the questions above, it may happen that a series of reviews are offered to a client, beginning informally and building to more detailed reviews.

Lulu is interested in making improvements to the accessibility of her web content for both compliance-related and business reasons. If Lulu was your client, what types of audits and related reports might you offer her in order to optimize the accessibility outcomes for her website?

8.4: Informal Reviews

An informal review is a quick scan of a website to identify obvious accessibility issues. While these reviews do not represent exhaustive audits, they are useful for a variety of purposes.

Purpose of Review

An informal review is often attached to a quote for a formal accessibility audit, providing some introductory information to a client to give them a better idea of the types of issues on their website before they commit to the formal review. An informal review can be helpful in justifying a formal review.

Process of Review

Informal reviews often occur as part of a conversation, perhaps with a member of an organization who is responsible for managing an organization's image, or with a developer who is planning or reviewing design activities. These reviews will often involve a couple of quick tests, like the Tab Key Navigation test, or passing a page through an automated accessibility checker, or quickly examining the code where suspected issues may be present, or running a page through a screen reader. These quick reviews often turn up a number of potential barriers that help get a discussion started on next steps toward making web content accessible.

Reporting Results from the Review

The following is an example of the types of issues that might be documented in an informal review. Characteristics of an informal review could include (in this example):

1. **Type of site:** a registration system with integrated eCommerce
2. **Timing of review:** prior to going live
3. **Duration of review:** about 30 minutes
4. **Audience:** the developer of the User Interface (UI) created over a third party eCommerce system
5. **Style of Report:**
    1. Provided by email to the developer and the developer's management team
    2. Brief and succinct
    3. Written in a way that the developer would understand, already being familiar with the UI, and already being familiar with the technical language being used
    4. A few non-accessibility related issues identified as a courtesy
    5. Not too detailed if the review is intended to elicit a formal review

Sample Informal Review by Email

Hi John,

Here's a quick summary of the potential issues found on your registration site. If you like, we can arrange a time to talk about these issues, and the possibility of conducting a formal review that will address these and other potential issues in more detail to ensure that as many people as possible are able to access your site and to register.

I've identified some issues and offered suggestions for possible fixes where applicable:

- Associate labels with form fields by matching the for attribute in the label with the id attribute in the input element.
- Add `aria-required="true"` to the required input fields.
- Use `aria-describedby="[id]"` to associate the description in the hidden spans with the respective input field.
- The Yes/No inputs look like checkboxes, but function like radio buttons. Maybe not an issue, but inconsistent with what most people might expect.
- For the footnote numbers next to Price and Group, aria-describedby could be used to associate the footnote with the number, or the numbers could be linked to an anchor next to the associated footnote.
- Because there are two levels of table header cells in the tickets table, they should use headers/id to associate both levels of header, though in this case this is a trivial issue given the small size of the table.
- The checkbox looking button beside the credit cards accepted line is a bit confusing. It shows a hand cursor which suggests it should be clickable, but it's not.
- When an error message is displayed, include `role="alert"` in the div containing the message.

- When an error occurs, send focus to the first field that has an error.
- It was possible to submit the form for payment without the ticket holder email being valid.
- Clicking “return to form” in the credit card popup hangs, apparently trying to access Google Analytics.
- In the credit card popup, focus should be trapped in the dialog in a loop until either Pay Now, Back to Form, or the Escape key is pressed.
- In the credit card popup, the initial checkbox and other form fields should be associated with the respective labels using the Label element (with matching for/id).
- For the error message that appears in the credit card popup, add `role="alert"` to the span containing the message.
- The close X should have title text added such as `title="close credit card details"` .
- After submitting the credit card form, the screen hangs, again trying to access Google analytics.
- Unable to see the output after making a credit card submission, to determine if there are any issues at the final step.
- Unable to see how the tickets are issued, perhaps via email. Not sure if there are any issues there.

8.5: Template Audit and Audit Walk-Through

A Template Audit is perhaps the most impactful of the different types of audits that will be discussed here.

Purpose of Audit

These audits focus on the common elements throughout a website, such as the navigation, header, footer, menus, and the layout in general. They are often quick to complete, taking only a few hours, and often involve looking at only a single page. There are occasions when multiple templates might be reviewed, such as the home page, which often differs from other pages, as well as one or two unique layouts from other pages on a website.

Process of Audit

In the screenshot below you can see the areas of a page outlined. For a Template Audit, the *Main Navigation*, the *Header (i.e,. Banner)*, the *Side Menu*, and the *Footer* area are reviewed. The Main Content Area would be ignored for now, to be reviewed as part of a General Audit.

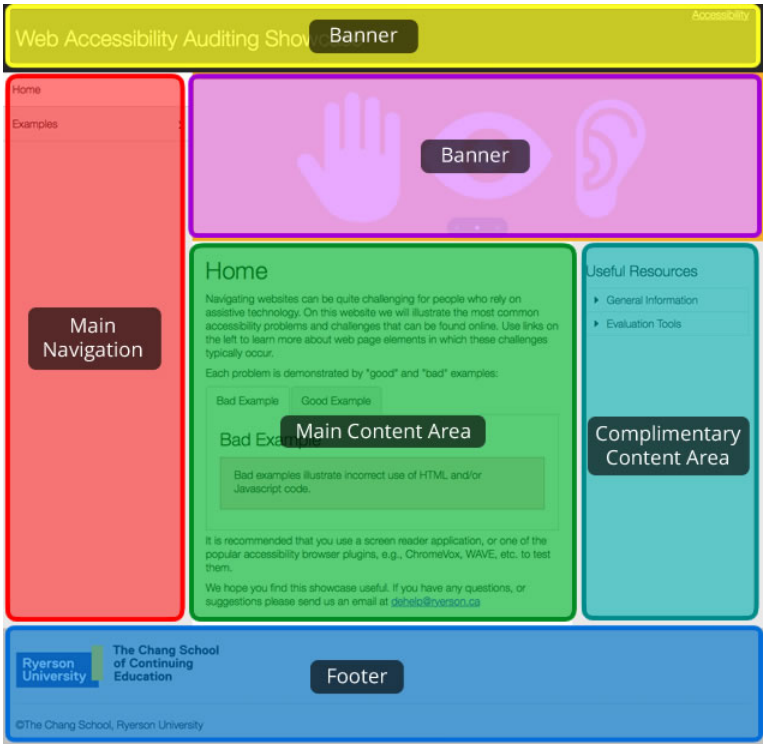


Figure: **Typical template elements include the header, the side menu, banner, main content area, complementary content, and the footer**

> **Key Point:** Before reading further, download the **WCAG2 Review Template [doc]**, if you have not already, and open it in Microsoft Word, or another word processor that supports .doc files.

Audit Procedure

Using the sample site template displayed in the figure above, examine all the features except the main content area. The following series of tests can be followed to audit the common elements of the template. **This same series of tests would be used for General and Detailed Audits** as well, but rather than focusing on elements of a single page in the case of a Template Audit, these steps would be followed for each page that is being reviewed as part of an audit.

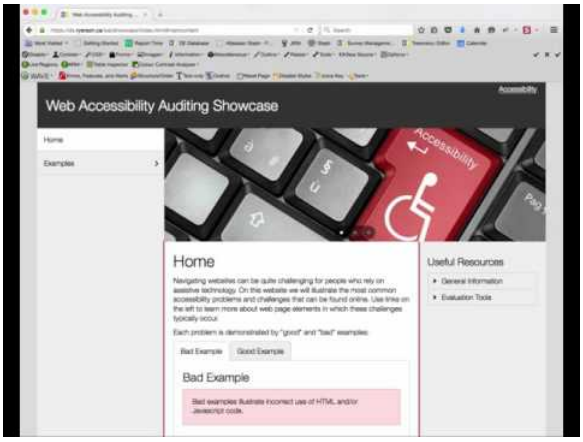
Visit the Web Accessibility Showcase to follow along while we **walk through** a page audit. Open the audit template so you can add notes to it as you are following along. Each of the following test strategies include a multimedia alternative to the text of the walk

through.

Note regarding the following videos: The videos that appear in the section below are considered to be "media alternatives for text" and as such they do not require captions. The text itself provides the text equivalents for the videos (See Guideline 1.2.2). Nonetheless, we have captioned them here. If you encounter videos used in this way, without captions, they need not be identified in an audit report as a potential barrier, as long as they are listed as media alternatives.

Tab Key Navigation Test

Video: Tab Key Accessibility Testing



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1438

1. Place the cursor in the top left corner of the page. Begin by pressing the Tab key repeatedly and following the cursor's path through the template elements. Look for bypass links at the top of the page, and if they are not visible, look at the browser's status bar at the bottom of the browser window to see if hidden bypass links are present. The URL displayed there should have "#content" on the end of it, or something similar prefixed with the number sign, or hash (#) as it is often referred to. Follow the bypass link(s) by pressing the enter key when they receive focus, to ensure they lead to the main content area, or in some cases to the side menu. If these bypass links are not present, look for other means to navigate through the content such as landmarks, as described in the screen reader test below or by examining the HTML markup to find them, or look for good use of headings. (Guideline 2.4.1, Level A)
2. Ensure that the path the cursor takes is visible. (Guideline 2.4.7, Level AA)
3. Look for access to an accessibility statement somewhere near the top of the template, and that it appears early in the Tab sequence. (Guideline 3.3.5, Level AAA)
4. Ensure the menus down the left of the page open and elements in the submenus can be accessed by keyboard. This may require using the arrow keys, or they may open using the Tab key or space bar. (Guideline 2.1.1, Level A)
5. Ensure there is a way to skip past the menus, particularly if they contain many items in the sub-menus. Typically the Tab key brings focus to the menu, the arrow keys are used to navigate through it, and the Tab key is pressed to exit the menu, and in this case move on to the banner area to the right. (Guideline 2.4.1, Level A)
6. After the banner area, the cursor should move into the main content area. Again ensure the focus is visible through elements in the main content. Notice the tabpanels in the main content area. Ensure that it is possible to move between the tabs in the tabpanel, typically using the arrow keys, and to move directly from a tab to its associated panel, typically using the Tab key. Keyboard functionality for tabpanels may vary somewhat from site to site. (Guidelines 2.4.7, Level AA, Guideline 2.1.1, Level A, Guideline 2.4.1, Level A)
7. After reaching the end of the side menu, the cursor should move into the main content area. We'll ignore testing the elements within the main content area for now, and come back to these when we discuss General Audits. (Guideline 1.3.2, Level A)
8. After tabbing through the main content area, the cursor should move to the right side complimentary content. Again ensure the focus is visible while navigating through its elements, and that the toggles used to open and close the accordion menu operate with a keypress, and that they do so without reloading the page, or without losing focus on the toggles when their state changes (e.g., open to closed). Ensure that elements in the opened submenus are keyboard operable. (Guideline 1.3.2, Level A, Guideline 2.4.7, Level AA, Guideline 3.2.2, Level A, Guideline 2.1.1, Level A)

9. After passing through the complimentary content area with the Tab key, the cursor should move into the footer area. Again ensure that the focus is visible, and that functional elements, in this case links, all receive keyboard focus and operate with a keypress. (Guideline 1.3.2, Level A, Guideline 2.4.7, Level AA, Guideline 2.1.1, Level A)
10. Having reached the end of the page, note whether the path the cursor took through the page was a logical path, crossing from left to right, moving from top to bottom. (Guideline 1.3.2, Level A)
11. Also note whether all of the elements the focus passed through are meaningful on their own, and/or within the context of other functional elements on the page. (Guideline 2.4.9, Level AAA, Guideline 2.4.4, Level A

Using an Automated Accessibility Checker

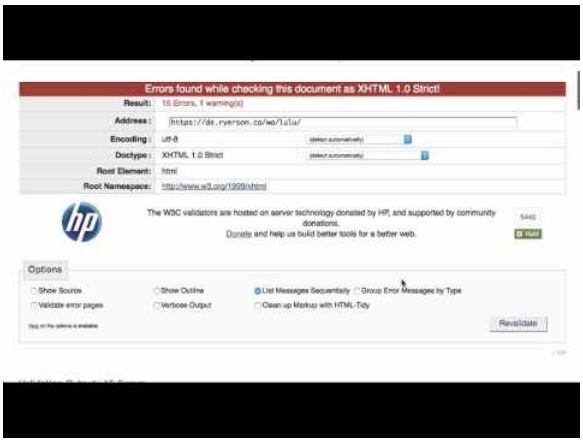
Video: **Automated Accessibility Checking**

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1438

1. We will use AChecker here for demonstration purposes, though you might choose to use another automated accessibility testing tool.
2. Either test the page through its URL, or if the site is not publicly available, view the source of the page, typically found in the browser's View menu, select all the markup displayed in the view source window (e.g., press Ctrl-A), copy the markup (e.g., press Ctrl-C) to the system's clipboard, then paste the markup from the clipboard (Ctrl-V) into the Paste HTML Markup area of the accessibility checker.
3. Open the Options Menu in AChecker, and select Show Source, WCAG 2.0 (Level AA), and View by Guideline. Or, adjust these options as needed. You might choose WCAG 2.0 (Level AAA), though issues identified at this level are typically optional.
4. After selecting options, press the "Check It" button to run the checker, and wait for a few moments while the report is generated.
5. Note the number of Known, Likely, and Potential problems the checker identifies, focusing on the Known Problems to start. Examine the Known Problems to ensure they are not false positives. You may need to follow the Line number link next to a problem to examine the surrounding markup. If the issues are actual, note them with the appropriate guideline in your developing audit report. You can also examine other information about issues by following the link next to each check that is listed in the checker's report.
6. After documenting the Known Issues in your developing audit report, switch to the Likely Problems tab in the checker, if there are any, and scan through these issues to confirm whether issues are actual or not. These issues may be actual, though often they are not, when accessible alternatives are provided. Scan through the content of the page to ensure items marked as likely have an accessible alternative. If these turn out to be actual issues, note them with the appropriate guideline in your developing audit report.
7. Finally scan through the issues presented under the Potential Problems tab. These quite often are not problems at all, but because the checker is unable to identify these issues with certainty, a human has to make a decision. If these turn out to be actual problems, identify them in your developing audit report.

Markup Validation

Video: HTML Validation

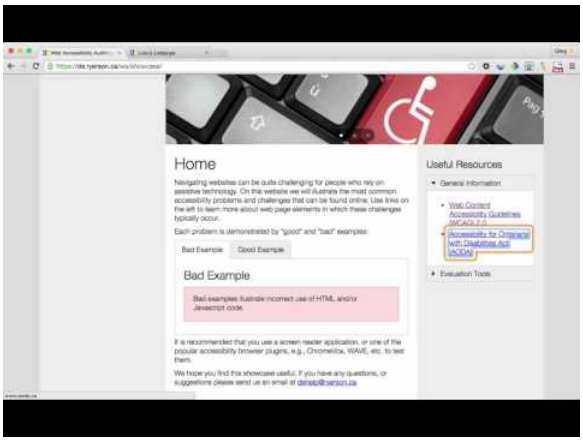


A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1438

1. As with AChecker, submit the URL or paste a copy of the HTML source of the page into the W3C HTML Validator to assess the validity of the HTML to ensure that markup errors are not causing potential barriers. Like AChecker you can also select Options, though the default settings are typically sufficient.
2. Pay attention to the errors identified in the report the validator generates, and don't be concerned with the warnings. Pay particular attention to duplicate IDs, elements that are not closed, and elements that are incorrectly nested. These issues run the risk of confusing screen readers.
3. If the page does not validate (most won't) provide a general statement along with Guideline 4.1.1 (Level A) in your audit report that validation should be conducted to remove potential barriers that may arise when assistive technologies encounter broken markup, and provide a link to the validator. There is no need to document all the markup errors, apart from those mentioned above.

Screen Reader Scan

Video: Testing Accessibility with ChromeVox



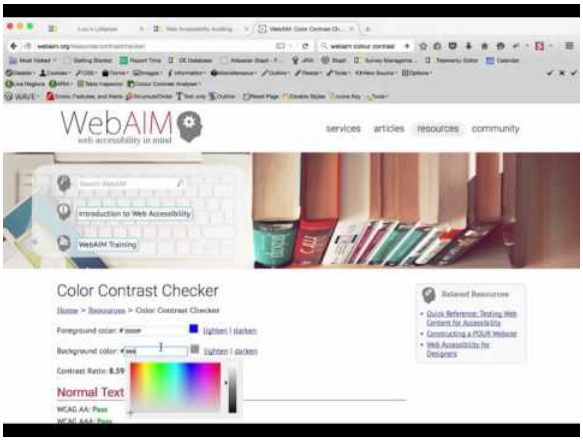
A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1438

1. For screen reader testing we will use ChromeVox, turn it on then continue.
2. Repeat the Tab Key Navigation test with the screen reader running, and listen carefully to what the screen reader announces. Is what you hear meaningful? Document in your audit report where additional description could be provided. Are all functional elements able to receive focus, and operate with a keypress. (Guideline 3.3.2, Level A, Guideline 2.1.1, Level A)

3. List the headings on the page using the screen reader list headings command (Cvox-L-H) and use the down arrow key to cycle through the list. Are headings present, and structured in a meaningful way? Is there text that appears to be a heading but it not recognized by the screen reader (e.g., large bold fonts instead of proper headings)? Document these issues in your report if they are relevant (Guideline 1.3.1, Level A, Guideline 2.4.6, Level AA, Guideline 2.4.10, Level AAA). If bypass links are not present, headings are provided to allow navigation through content (Guideline 2.4.1, Level A)
4. List the landmarks on the page using the screen reader's list landmarks command (Cvox-L-;) and use the down arrow key to cycle through the landmarked regions. Are all areas of the page contained within a landmarked region? Are landmarks present if bypass links or headings are not? Document these issues in your report if relevant. Suggest including them regardless of other ways to navigate through the page being present. (Guideline 2.4.1, Level A)
5. List the links on the page using the screen reader's list link command (Cvox-L-L). Are all the links meaningful in context, or not in context? (Guideline 2.4.4, Level A, Guideline 2.4.9, Level AAA)

Other Tests

Video: Check Colour Contrast



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1438

Scan the page for potential colour contrast issues. Though the page should not have any, the grey text on the grey background in the footer area appears suspicious. Determine the colour codes, using your browser's Inspect Element feature, and run those colours through a colour contrast tester to confirm they provide sufficient contrast. (Guideline 1.4.3, Level AA, Guideline 1.4.6, Level AAA)

8.6: General Audits

Purpose of Audit

A General Audit is a review of a sample of content from the main content areas of a website, the results of which are generalized to the whole site. It is usually too time-consuming and expensive to review all pages on a website; many pages would be similar which would result in a very long repetitive report. Generalizing results to the whole site should be emphasized in the audit report.

Process of Audit: Selecting a Review Sample

Reviewing a representative sample of pages is the most efficient approach for a General Audit. When choosing pages for the sample, be sure to include pages that are key to the operation of the website, such as:

- the home page
- a registration page
- a product purchase page, etc.

Also choose pages with different types of content such as:

- a page with multimedia
- a page presenting data laid out in a table
- a form-based page
- pages with embedded objects such as Java or Flash
- a page with a structured article, etc.

The sample should provide a complete cross-section of the different types of content on the site.

Depending on the size of the site, and the different types of content it contains, a sample might include 10 pages for a smaller site, and up to 20–25 pages for a larger site with a broad variety of content. For more information about choosing a representative sample, refer to the Website Accessibility Conformance Evaluation Methodology produced by the W3C.

When choosing pages for the sample, a thorough scan of the site should be done by methodically clicking from page to page, viewing the content quickly, and copying the URL and title for each of the pages that will be included in the sample. It is often helpful to choose the sample pages in cooperation with the developers of the website, who will have a better idea of the types of content found on the site, and where they might be located within a complex site structure. Alternatively, you can scan through the site yourself, gather the sample, and send that list to the owner of the site for their confirmation of whether the sample is representative of the content on the site.

Additional Scope Considerations

If a Template Audit has not been conducted, elements of the template will need to be included as part of the General Audit. A Template Audit should be recommended to a client to avoid complicating a General Audit.

Time Required for the Audit

You should estimate how much of your time will be required for the audit before beginning. Your general sense of the complexity of the content on the sample pages, the number of issues identified while assembling the sample, whether a Template Audit will accompany the General Audit, as well as the effort required to gather the sample will all help you to establish a rough time-per-page estimate. A simple site with basic content may take 10–15 minutes per page, while larger, more complex sites may take an hour or more per page. Performing a review and writing a report on 15 website pages might take a total of 10 to 15 hours.

With your first few audits, time estimates will likely be higher. As you begin accumulating reports, there will be elements that can be reused to save time. For example, the executive summary will tend to follow the same format, introducing the report, providing a description of the report and how to use it, with just the summary of key issues changing from report to report. You will also find that similar issues will arise from website to website, and the descriptions for those issues can also be reused in many cases. Likewise, when describing solutions to issues within reports, the time you initially invest to develop solutions is time you will save later on.

Audit Procedure

Assuming a Template Audit is being conducted along with the General Audit, the audit procedure will be much like that of a Template Audit, but in this case will focus on the main content area of each of the sampled pages (see figure on the previous "Template Audits" page). The high level procedures are reiterated here; refer back to the procedure outlined with the Template Audit for details.

- Tab Key Navigation test
- Use an automated accessibility checker
- Markup validation
- Screen reader scan
- Other test (colour, readability)

In most cases testing the main content is much simpler than testing the templates. The main content tends to be less complex so it is likely that a quick scan will yield no issues. For example, an article presented on a website may simply be a collection of headings and paragraph text; checking the headings to be sure they are HTML headings and nested properly takes only a few moments. On the other hand, if the site has more complex elements and there are issues with those elements, it may take just a few moments to discover the issues, but significantly more time to describe them.

For a more detailed look at web accessibility auditing methods, see the following resource.

Readings and References: W3C Website Accessibility Conformance Evaluation Methodology

8.7: Detailed Audits

A third type of web accessibility audit is a Detailed Audit. This type of audit is conducted on a particular feature of a website or on a particular process. All aspects of the accessibility of the feature or process are examined.

Purpose of Audit

Detailed Audits may be part of a series of audits that include a Template and General Audit or they may be conducted on their own. A Detailed Audit may be conducted on a standalone web application as a whole, where a vendor or developer wishes to certify the accessibility of their product. Alternatively, a Detailed Audit may be conducted on a particular collection of pages that serve a particular purpose within a site.

Process of Audit

The procedure for conducting a Detailed Audit is much like that of a Template or General Audit, with the added review of the process or transition elements of the process associated with a feature or application.

A Detailed Audit begins by identifying all pages or screens associated with the feature(s) to be reviewed. Think of this collection of pages as representing a path through the site a visitor might take to reach an ultimate destination. For example, consider a shopping cart application used within a larger community website. The community site may include a registration screen, a login screen, a user home page, and the cart itself may include a product selection page, an invoice page, a checkout page, and a credit card submission page, among others. All of these pages together represent a process that must be accessible as a whole before the cart application can be judged conformant.

Each page of the process of making a purchase with the cart application is reviewed independently and as part of the whole process. Individual pages are evaluated much like a content page would be assessed in a General Audit. For example, can a screen reader user easily navigate through a collection of products and make a selection from the product page?

It is also important to evaluate the transitions between screens in the process of making a purchase. For example, if a user wants to find out more details about a product and opens a details window, once the user has finished with the details window and closes it, are they able to easily find their way back to their position in the products page from which the details were opened? Or, after making a selection from the product screen and being directed to the checkout screen, is there sufficient feedback provided to indicate the product selection was successful, without having to spend too much time searching through the content of the checkout screen to make that determination? These types of accessibility issues are part of the process, rather than part of the content. Both **content and process** need to be considered as a whole in a Detailed Audit.

Time Required for Audit

The scope of a Detailed Audit can vary quite significantly from audit to audit. Assessing the accessibility of a whole web application, for instance, can take weeks or more to complete. When estimating the time required to complete a Detailed Audit, a strategy similar to the sampling process in a General Audit is helpful. Create a list of each of the pages or screens to be reviewed, do some initial informal review to get a sense of the level of accessibility and the complexity of the elements to be reviewed. Come up with a base time-per-page and multiply that by the number of pages to be assessed to estimate the effort required for the audit.

Conformance Considerations

When conducting Detailed Audits of web applications, it is important to note a software version number in the report. A Detailed Audit will only apply to a specific version of the software or to a specific feature on a website on a particular date. Because software and websites change over time, it is only appropriate to assign conformance on a particular “date identified” snapshot of the features or functionality being reviewed.

> **Key Point:** A conformance claim following a Detailed Audit applies only to a particular version of software, or to a particular feature of a website at a specific point in time.

8.8: Follow-Up Audits

Purpose of Audit

The final type of audit to be introduced here is a Follow-Up Audit, which occurs some time after the initial Template, General, or Detailed Audits have been issued. After the site's developers have gone through the audit to understand the issues and the steps needed to address accessibility problems, you will likely want to arrange a time to answer any questions that arise. Once their questions are answered, developers will go ahead and fix the issues in your report and will likely want a Follow-Up Audit to confirm that the fixes have successfully removed the barriers identified and that no new barriers have been introduced.

Often just a single Follow-Up Audit is required, though there may be a need for multiple audits. When estimating time required for questions and the follow-up review(s), an hour or two is usually enough for questions and a follow-up or two adds about 20% to the cost of the project.

Process of Audit

As the reviewer, start a new audit with a fresh copy of the audit template and go through the issues identified in the initial audit report, confirming that each has been addressed. While confirming, watch out for any new issues that may have been introduced. Document any remaining or new issues in the Follow-Up Audit report.

Conformance Confirmation

Assuming the outcome of the Follow-Up Audit confirms that all of the issues identified in the initial audit report have been addressed, you may choose to issue a conformance claim; this might include a conformance seal, either those issued by the W3C or perhaps your own company seal. Refer to the "WCAG 2.0 Conformance Levels" in unit 2 for additional details on issuing conformance claims.

Publicly posting conformance claims is optional and not posting a claim does not in any way affect conformance. Many organizations choose not to make public claims. They should still, however, provide documentation on the accessibility features found on the site and describe their goal to reach and maintain Level AA conformance.

8.9: Tour of an Audit Report

In the unit Introduction to WCAG 2.0, you were introduced to the "Web Auditing Review Template" and the elements it contains. Here we will look more closely at the "WCAG 2.0 Review" elements of the report: the Executive Summary and the Appendices. Download a copy of the Canvas LMS General Review [PDF] and follow along.

The General Comments or Executive Summary

The **General Comments** in the Canvas LMS audit can also be thought of as the Executive Summary, and provides an overview of the report.

General Comments or an Executive Summary will commonly include:

- The scope of the audit
- A description of key issues
- Terms used to evaluate issues

In this case the **scope of the audit** is the student facing components of the LMS, presented below:

> **Scope:**
>
> "This evaluation looks at the accessibility and usability of the student facing components of the Canvas LMS. It is not an exhaustive review of all features, but rather more general coverage of the accessibility and usability of the student features as a whole."

Following the scope comes a **description of the key issues** that have been identified in the report. These are typically the more significant Level A issues that would result in barriers to access for a given group of users, or issues that are recurring throughout the site or application being reviewed. Depending on the scope of the review, this can be anywhere from a few paragraphs to a few pages.

Finally, the General Comments describe the **Evaluation terms**, before leading into the full WCAG 2.0 Review.

> **Evaluation Terms:**
>
> "In places throughout the review, "Fail?" or "Pass?" have been used where a fail or pass is questionable. "Pass?" is used in places where a single instance of a barrier has been identified, perhaps an oversight, or where it could be argued that an item might fail or pass, typically a minor issue, leaning toward a Pass. "Fail?" is used in cases where an item could be argued as a fail or pass, leaning toward a fail. In all cases, developers should consider the recommendations made to remove any potential argument."

The WCAG 2.0 Review

The WCAG 2.0 Review area of an audit report is a table formatted into 4 columns and 62 rows. Each row represents one of the WCAG 2.0 guidelines. The four columns present the following key elements of the review:

- **Success Criterion:** The guideline numbers and a brief description of the guideline.
- **Level:** The conformance level for the associated guideline, i.e., A, AA, or AAA. Note that the AAA requirements are greyed out, indicating that these are optional requirements. You may also notice that Guidelines 1.2.4 and 1.2.5 are also greyed out; these are optional requirements for Ontario organizations, though may be required in other jurisdictions.
- **Evaluation:** This is the outcome of the evaluation of a particular guideline, and there are 4 options.
  - "Pass" is specified if the success criteria for a guideline are met.
  - "Pass?" indicates that you have dismissed an issue as trivial, though it should still be considered when making accessibility updates to the site. For example, if just one image on a website is missing alt text, while all others include it, a questionable pass would be specified.

- “Fail” is specified when the success criteria for a guideline are clearly not met.
- “Fail?” is used when it could be argued that a strategy arguably meets the success criteria, but there are perhaps better approaches. In either case, questionable pass or fail, a subjective judgement is being made. This should be clearly stated in the General Comments.
- “N/A” marks those guidelines that are not applicable in the current context.

- Comments: This is the “meat” of a web accessibility audit. Here, potential barriers are described with enough detail so that readers familiar with the site being reviewed are able to reproduce or find the barriers themselves. Reading through the Comments section of the Canvas LMS review, you can gather a sense of the detail provided.

The Comments Area – Use of Graphics

Continuing to look at the Comments section in more detail, you will see that some graphics have been added to explain issues more clearly, particularly where the written explanations may be too complicated or technical for some people to understand, or in places where a key issue needs to be highlighted. And, there are times when just pointing to an issue in a graphic is more effective than trying to describe it in words.

Graphics to Enhance Explanations and Summarize Main Issues

Take Success Criterion 1.4.3 in the Canvas LMS review for instance. In the explanation of the first issue, it can be difficult to pinpoint exactly which colours are problematic. An added graphic explanation, like the figure below, makes it clear which colours are being referred to almost instantly upon viewing the image. In fact, one may be able to understand the issue based on the graphic without needing to read the text explanation.

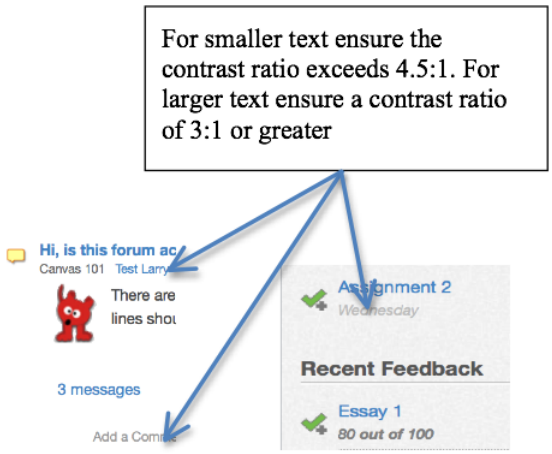


Figure: Example of a graphic used to enhance the explanation of an issue

The collection of graphics in the report as a whole can act as a summary of the main issues. If you scan through just the graphics in the report, you will notice they address most of the main issues.

> **Reading and References:** If you would like more information on tools that can be used to create graphics, see Tools for Creating Graphic Enhancements [PDF].

The Comments Area – Issue Descriptions

When describing an issue, always include:

- a brief description of the issue itself
- the reason why it is an issue
- one or more potential solutions to correct the issue

For each type of issue, reasoning need only be provided once. Examine the following description of an issue and note these elements in the description.

Issue described

Reason why it's an issue

Potential solution(s)

In the main calendar view, the days of the week that appear in the top row should be marked up with table headers (th). Currently when navigating the data cells for each day, Assistive Technology users hear only the number, with no indication of the day of the week. The `scope="col"` attribute could be added in each header cell to help ensure day of the week is announced with each number.

Appendices

For a General Review, the Appendices should include a list of the pages sampled for the review, including the page title and URL.

For a Detailed Review, the Appendices should include a list of page titles and their associated URLS for the process or feature being reviewed. This might include a description of a user scenario that was tested, such as the process of making a purchase (described earlier).

The Appendices may also contain information not directly related to the accessibility review, such as pointing out potential bugs, providing recommendations on processes for addressing issues outlined in the report, or outlining strategies to address accessibility of web content as part of everyday business practice.

8.10: Activity- Lulu's Lollipops Informal Review

Based on what you learned in this unit, conduct an informal review of the Lulu's Lollipops website, and write a brief report (maximum two pages). Re-read the **Sample Informal Review** from earlier in this unit to understand what, and how much information to include in your Informal Review. The goal should be to encourage a formal review.

Suggested Answer to Activity

8.11: Self-Test 7

Question 1

Which of the following is not a type of audit that was covered in this Chapter? Please select all that apply.

1. Informal
2. Template
3. Navigation
4. Content
5. General
6. Detailed
7. Follow-Up

Question 2

What is the time limit on the validity of a Web accessibility conformance review for a website?

1. Two years
2. A year
3. Six months
4. A month
5. A week
6. None of the above

Question 3

Which of the following elements would be reviewed in a Template Audit? Please select all that apply.

1. Main Navigation
2. Header
3. Side Menu
4. Main Content Area
5. Footer
6. None of the above

Question 4

Which of the following elements would be reviewed in a General Audit, assuming a Template Audit had already been conducted? Please select all that apply.

1. Main Navigation
2. Header
3. Side Menu
4. Main Content Area
5. Footer
6. None of the above

Answers to Self-Test 7

A link to an interactive elements can be found at the bottom of this page.

CHAPTER OVERVIEW

9: Other Accessibility Standards

9.1: Other Accessibility Standards

At a recent planning meeting with her management team, Lulu was reminded of one additional consideration with respect to her website. Lulu hopes to expand her business more widely to international markets. She wonders if her website is in compliance with accessibility requirements in other jurisdictions. Because the learning and work that Lulu and her team have been doing is anchored in the WCAG 2.0 guidelines, she will meet the compliance requirements of most regions across North America and the rest of the world. However, it would be beneficial for those at Lulu's Lollipops and for you to become familiar with a few additional guidelines that may be relevant in specific contexts and situations.

So far WCAG 2.0 has been the main guideline we have used for auditing web accessibility. In most cases it will be the guideline of choice, though there are others to be aware of that might also be referenced as part of web accessibility auditing projects. In this unit we will look at:

- The W3C Authoring Tool Accessibility Guidelines (ATAG)
- User Agent Accessibility Guidelines (UAAG)
- WAI's Accessible Rich Internet Applications Guidelines (WAI-ARIA)
- The ISO 24751 Access for All standards

We will also look at how rules and legislation around the world have adopted WCAG 2.0 as the basis for various international laws that dictate web accessibility requirements in many countries. As a result of this adoption, it is possible through courses like this one to train developers and auditors with one set of instructions. Ultimately, the good news is that what you learn in this course will be applicable for a broad range of country-specific accessibility requirements.

9.2: Objectives and Activities

Objectives

By the end of this unit, you will be able to:

- Identify a range of accessibility guidelines and standards and relate them to relevant business contexts and jurisdictions.

Activities

- Identify any relevant accessibility guidelines that may be in place in your jurisdiction
- Compare WAI-ARIA implementation strategies using the ChromeVox screen reader
- Self-Test 8

9.3: WCAG Relation to International Web Accessibility Guidelines

The W3C Web Content Accessibility Guideline (WCAG 2.0) has become broadly accepted as the definitive source for web accessibility rules around the world, with many jurisdictions adopting it verbatim, or with minor adjustments, as the basis for accessibility laws that remove discrimination against people with disabilities on the web. The following is a listing of some of the countries that have adopted WCAG 2.0.

Canada

Accessibility for Ontarians with Disabilities Act (AODA)

This course has been created in the context of the AODA, which came into effect in 2005 with the goal of making Ontario the most inclusive jurisdiction in the world by 2025. Part of this 20 year rollout involved educating businesses in Ontario, many of which are now obligated by the Act to make their websites accessible, first at Level A between 2012 and 2014, and at Level AA between 2016 and 2021.

The AODA adopts WCAG 2.0 for its web accessibility requirements, with the exception of two guidelines:

1. Ontario businesses and organizations are not required to provide captioning for live web-based broadcasts (WCAG 2.0 Guideline 1.2.4, Level A)
2. Ontario businesses and organizations are not required to provide audio description for pre-recorded web-based video (WCAG 2.0 Guideline 1.2.5, Level AA)

Otherwise, AODA adopts WCAG 2.0 verbatim.

> **Readings and References:** For key information on the adoption of WCAG 2.0 in the context of the AODA, refer to The Integrated Accessibility Standards (of the AODA).

Canadian Government Standard on Web Accessibility

In 2011, the Government of Canada (GOC) introduced its most recent set of web accessibility standards, made up of four sub-standards that replace the previous Common Look and Feel 2.0 standards. The Standard on Web Accessibility adopts WCAG 2.0 as its web accessibility requirements, with the exception of Guideline 1.4.5 Images of Text (Level AA) in cases where “essential images of text” are used, in cases where “demonstrably justified” exclusions are required, and for any archived web content. The standard applies only to Government of Canada websites.

> **Readings and References:** For full details of the Government of Canada accessibility requirements, read the Standard on Web Accessibility.

Accessibility 2024

In 2014 the British Columbia government released Accessibility 2024, a 10-year action plan designed around 12 building blocks intended to make the province the most progressive in Canada for people with disabilities. Accessible Internet is one of those building blocks. The aim is to have all B.C. government websites meet WCAG 2.0 AA requirements by the end of 2016.

> **Readings and References:** For additional details visit the Accessibility 2024 website.

United States

Americans with Disabilities Act (ADA)

The ADA does not have any specific technical requirements upon which it requires websites to be accessible; however, there have been a number of cases where organizations that are considered to be “places of public accommodation” have been sued due to the inaccessibility of their websites (e.g., Southwest Airlines, AOL), where the defendant organization was required to conform with WCAG 2.0 Level A and Level AA guidelines.

There is a proposed revision to Title III of the ADA (Federal Register Volume 75, Issue 142, July 26, 2010) that would, if passed, require WCAG 2.0 Level A and AA conformance to make web content accessible under ADA.

Readings and References: See: Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations

Section 508 (of The Rehabilitation Act, U.S.)

Section 508 is part of the U.S. Rehabilitation Act and its purpose is to eliminate barriers in information technology, applying to all Federal Agencies that develop, procure, maintain, or use electronic and information technology. Any company that sells to the U.S. Government must also provide products and services that comply with the accessibility guidelines Section 508 describes in the Act.

These guidelines were originally based on a subset of the WCAG 1.0 guidelines, which was recently updated to adopt WCAG 2.0 Level A and AA guidelines as new requirements for those obligated through Section 508.

Readings and References:

- Section 508 Refresh (Jan 18, 2018)
- Section 508 – 1194.22 (Old 508)
- Comparison Table of WCAG 2.0 to Existing 508 Standards
- Section 508 Proposed Update (February 18, 2015 – See section B of Major Issues)

United Kingdom

Equality Act 2010

The Equality Act in the UK does not specifically address how web accessibility should be implemented, but does, through Section 29(1), require that those who sell or provide services to the public must not discriminate against any person requiring the service. Effectively, preventing a person with a disability from accessing a service on the web constitutes discrimination.

Sections 20 and 29(7) of the Act make it an ongoing duty of service providers to make “reasonable adjustments” to accommodate people with disabilities. To this end the British Standard Institution (BSI) provides a code of practice (BS 8878) on web accessibility, based on WCAG 1.0.

Readings and References:

- Equality Act 2010
- Equality Act 2010: Guidance
- Website accessibility and the Equality Act 2010

For more about BSI efforts, watch the following video:

Video: BSI Documentary – Web Accessibility World Standards Day

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1486

Europe

Throughout Europe a number of countries have their own accessibility laws, each based on WCAG 2.0. In 2010 the European Union itself introduced web accessibility guidelines based on WCAG 2.0 Level AA requirements. The EU Parliament passed a law in 2014 that requires all public sector websites, and private sector websites that provide key public services, to conform with WCAG 2.0 Level AA requirements, with new content conforming within one year, existing content conforming within three years, and multimedia content conforming within five years.

This does not mean, however, that all countries in the EU must now conform. The law now goes before the EU Council, where heads of state will debate it, which promises to draw out adoption for many years into the future, if it gets adopted at all.

Readings and References:

- The EU Internet Handbook: Web Accessibility
- New European Standard on accessibility requirements for public procurement of ICT products and services (ETSI EN 301 549)
- Standard – EN 301 549

Italy

In Italy the Stanca Act 2004 (Disposizioni per favorire l'accesso dei soggetti disabili agli strumenti informatici) governs web accessibility requirements for all levels of government, private firms that are licensees of public services, public assistance and rehabilitation agencies, transport and telecommunications companies, as well as ICT service contractors.

The Stanca Act has 22 technical accessibility requirements originally based on WCAG 1.0 Level A guidelines, updated in 2013 to reflect changes in WCAG 2.0.

Readings and References: Stanca 2013 Requirements (Italian)

Germany

In Germany, BITV 2.0 (Barrierefreie Informationstechnik-Verordnung), which adopts WCAG 2.0 with a few modifications, requires accessibility for all government websites at Level AA (i.e., BITV Priority 1).

Readings and References: BITV (Appendix 1)

France

Accessibility requirements in France are specified in Law No 2005-102, Article 47, and its associated technical requirements are defined in RGAA 3 (based on WCAG 2.0). It is mandatory for all public online communication services, public institutions, and the State, to conform with RGAA (WCAG 2.0).

Readings and References:

- Law No 2005-102, Article 47 (French)
- Référentiel Général d'Accessibilité pour les Administrations (RGAA) (French)

Spain

The web accessibility laws in Spain are Law 34/2002 and Law 51/2003, which require all government websites to conform with WCAG 1.0 Priority 2 guidelines. More recently UNE 139803:2012 adopts WCAG 2.0 requirements, and mandates government and government funded organizations, as well as organizations larger than 100 employees, or with a trading column greater than 6 million Euros, or those providing financial, utility, travel/passenger, or retail services online to comply with WCAG Level AA requirements.

(see: Legislation in Spain)

Readings and References:

- Law 34/2002 – Information Society and Electronic Commerce Services Act PDF (Spanish)
- UNE 139803:2012: Web content accessibility requirements (supersedes 139803:2004)
- Law 51/2003 – Equality of opportunities, non-discrimination, and universal accessibility for people with disabilities (Spanish)

Australia

Though not specifically referencing the Web, the Disability Discrimination Act of 1992 section 24 makes it unlawful for a person who provides goods, facilities or services to discriminate on the grounds of disability. This law was tested in 2000, when a blind man successfully sued the Sydney Organizing Committee for the Olympic Games (SOCOG) when its website prevented him from purchasing event tickets.

The Australian Human Rights and Equal Opportunity Commission (HREOC) shortly after released World Wide Web Access: Disability Discrimination Act Advisory Notes. These were last updated in 2014 and though they do not have direct legal force, they do provide web accessibility guidance for Australians on how to avoid discriminatory practices when developing web content, based on WCAG 2.0.

Readings and References: World Wide Web Access: Disability Discrimination Act Advisory Notes

For more about international web accessibility laws, see the following resources:

Readings and References:

- Chapter 17 – Web Accessibility (2006)
- Policies Relating to Web Accessibility (W3C)
- Government accessibility standards and WCAG 2
- World Laws WebAIM

9.4: ATAG- Authoring Tool Accessibility Guidelines

Authoring tools come in many forms. Some familiar **web-based** examples of authoring tools include blogs (e.g., WordPress), wikis (e.g., Mediawiki), content management systems (e.g., Drupal), learning management systems (e.g., Canvas), document authoring tools (e.g., Google Docs), and video production environments (e.g., YouTube). Some other tools that are **not web-based** include HTML editors (e.g., Adobe Dreamweaver), video authoring tools (e.g., Camtasia Studio), and document authoring tools (e.g., Microsoft Word) that are all capable of creating content for the Web.

In addition to providing guidance on developing web content that is accessible through WCAG 2.0, the Web Accessibility Initiative (WAI) has introduced the AuthoringToolAccessibility Guidelines (ATAG 2.0) which provide guidance for web authoring tool developers to ensure that:

1. Tools are accessible to be used by people with disabilities
2. Tools make it possible to create WCAG 2.0 conformant Web content

Conformance

ATAG 2.0 guidelines are sorted by levels of importance, much like WCAG 2.0. Because ATAG 2.0 covers tools that are not web-based, it does not specifically refer to "accessibility supported" requirements like those of WCAG 2.0 because those refer to web-based strategies that are supported by assistive technology.

ATAG 2.0 conformance for authoring tools is more complex than WCAG 2.0 conformance for web content, as it subsumes WCAG 2.0 and adds a range of requirements specific to authoring tools.

Partial ATAG 2.0 **process component conformance** is also possible in cases where additional add-on components would be needed to claim full conformance. For example, if the tool does not provide accessibility checking capability (a requirement for ATAG 2.0 conformance), it can claim partial conformance if it is possible to add a plugin that provides accessibility checking. Partial conformance can also be claimed when the platform limits compliance. For example, if a tool runs on multiple operating systems, and conformance is possible on one platform (e.g., Windows) that has an add-on accessibility checking service available, but a similar service is not available for the system run on on a different platform (e.g., Linux), a **platform limitation conformance** claim can be made.

More details about conformance claims can be found in the ATAG 2.0 specifications itself:

> **Readings and References:** ATAG 2.0 Conformance Claims

ATAG 2.0 Part A

Part A of ATAG 2.0 provides guidance on making the authoring tool user interface accessible. Generally speaking, these guidelines reflect WCAG 2.0 with the addition of accessibility requirements for tools that are not web-based.

The four top level guidelines in Part A are as follows:

- Principle A.1: Authoring tool user interfaces follow applicable accessibility guidelines
- Principle A.2: Editing-views are perceivable
- Principle A.3: Editing-views are operable
- Principle A.4: Editing-views are understandable

ATAG 2.0 Part B

Part B of ATAG 2.0 focuses on guidelines for creating tools that are able to generate WCAG 2.0 conformant web content. It too has four top level guidelines, and a series of sub-guidelines for each. For a full listing of these guidelines, refer to the the full ATAG specification.

- Principle B.1: Fully automatic processes produce accessible content
  - This set of guidelines refers to functions within the authoring tool that automatically generate web content.

> **Technical:** For example, if a tool automatically generates a basic HTML template when authoring a new page, that template must include a DOCTYPE declaration, a proper `<head>` area and `<title>` element, as well as a `<body>` area, and it must validate based on a given HTML specification.

    - When existing content is being edited in the authoring tool, it must provide a means to preserve any accessibility information contained within the original content.
- Principle B.2: Authors are supported in producing accessible content
    - If, for example, the tool provides a means to add images, it must also provide a means to add a text alternative, and that means must be prominent.
    - If, for example, an image is added but no alt text has been provided, the tool prompts the author to include it, and explains why it is necessary.
    - If existing accessibility information is available in previously existing content, a means is provided to edit that information.
    - The tool does not attempt to automatically repair existing accessibility information, unless specific issues are identified, such as default alt text like “image”.
    - Accessible templates provided by the system are identified as such.
- Principle B.3: Authors are supported in improving the accessibility of existing content
    - Tools are provided to check the accessibility of the authored content against WCAG 2.0 or other accessibility specifications.
    - Guidance is provided where manual checking is required.
    - If issues are found, the tool provides suggestions to repair the issues.
- Principle B.4: Authoring tools promote and integrate their accessibility features
    - Accessibility features in the tool are enabled by default.
    - Tool does not have an option to turn off accessible authoring features.
    - If accessibility features can be turned off, a warning is provided explaining the potential dangers of doing so.
    - Documentation is provided on authoring accessible content.

9.5: UAAG- User Agent Accessibility Guidelines

In cases where you may be auditing a browser application like Chrome or Firefox, a plugin, a web-based mobile app, or perhaps a video or audio player like Quicktime or Windows Media Player, UAAG 2.0 (currently in draft form) should be referenced. These guidelines are aimed primarily at the developers of web browsers, browser extensions, and media players, but also at assistive technology developers so they understand the types of accessibility information to expect from UAAG 2.0 compliant user agents.

The UAAG 2.0 specifications are structured much like WCAG 2.0 and ATAG 2.0 are, and include principles, guidelines, and success criteria. Conformance levels are also much the same, with Levels A (minimum), AA (recommended) and AAA (advanced). WCAG 2.0, ATAG 2.0, and UAAG 2.0 are a collection of guidelines, together guiding the development of accessible web content, tools for creating accessible web content, and tools for viewing web content in accessible ways.

Though UAAG 2.0 is currently a W3C draft specification, it should be used instead of UAAG 1.0, as it reflects the advances in web technologies since UAAG 1.0 was released in 2002. Changes may still occur in the specification, though these are not anticipated to be significant.

UAAG 2.0 Principles

UAAG 2.0 has 5 principles:

- Principle 1 ensures that the user agent is **perceivable**, so users can access user agent output.
- Principle 2 ensures that the user agent is **operable**, so users can communicate with the user agent.
- Principle 3 ensures that the user agent is **understandable**, so users know how to use the user agent.
- Principle 4 ensures that **assistive technologies can access** user agent controls.
- Principle 5 ensures that user agents **comply with other accessibility specifications** (e.g., WCAG 2.0, ATAG 2.0) and platform conventions (e.g., Windows, iOS, Linux, Blackberry).

UAAG 2.0 Guidelines

In the primary guidelines listed below, you will see that many directly reflect WCAG 2.0 recommendations. For example, WCAG 2.0 requires that visual elements in web content have text alternatives (WCAG 2.0 – G1.1.1) and UAAG 2.0 requires that user agents (browsers, etc.) provide access to those alternatives (UAAG 2.0 – G1.1).

- Principle 1: Perceivable
  - Guideline 1.1: Provide access to alternative content
  - Guideline 1.2: Repair missing content
  - Guideline 1.3: Provide highlighting for selection, keyboard focus, enabled elements, visited links
  - Guideline 1.4: Provide text configuration
  - Guideline 1.5: Provide volume configuration
  - Guideline 1.6: Provide synthesized speech configuration
  - Guideline 1.7: Enable configuration of user stylesheets
  - Guideline 1.8: Help users to orient within, and control, windows and viewports
  - Guideline 1.9: Provide Alternative views
  - Guideline 1.10: Provide element Information
- Principle 2: Operable
  - Guideline 2.1: Ensure full keyboard access
  - Guideline 2.2: Provide sequential navigation
  - Guideline 2.3: Provide direct navigation and activation
  - Guideline 2.4: Provide text search
  - Guideline 2.5: Provide structural navigation
  - Guideline 2.6: Configure and store preference settings
  - Guideline 2.7: Customize display of graphical controls
  - Guideline 2.8: Allow time-independent interaction
  - Guideline 2.9: Help users avoid flashing that could cause seizures
  - Guideline 2.10: Provide control of time-based media
  - Guideline 2.11: Support other input devices

- Principle 3: Understandable
  - Guideline 3.1: Help users avoid and correct mistakes
  - Guideline 3.2: Document the user agent user interface including accessibility features
  - Guideline 3.3: Make the user agent behave in predictable ways
- Principle 4: Programmatic access
  - Guideline 4.1: Facilitate programmatic access to assistive technology
- Principle 5: Specifications and conventions
  - Guideline 5.1: Comply with applicable specifications and conventions

For a look at the full set of UAAG 2.0 recommendations, visit the draft specification and resources at the following links:

Readings and References:

- User Agent Accessibility Guidelines
- UAAG 2.0 Reference: Explanations, Examples, and Resources for User Agent Accessibility Guidelines 2.0

9.6: ISO

This page was auto-generated because a user created a sub-page to this page.

9.6.1: ISO/IEC-24751 (AccessForAll)

Individualized Adaptability and Accessibility in E-Learning, Education and Training

In 2008, the ISO/IEC (International Standards Organization/International Electrotechnical Commission) released the initial version of the AccessForAll (AFA) standards. AFA is based on the AccessForAll 2.0 work undertaken at the IMS Global Learning Consortium, along with the Inclusive Design Research Centre at OCAD University in Toronto. For those familiar with Universal Design for Learning (UDL) principles, AFA is similar in its approach. It sets out guidelines for developing adaptable learning content that matches how different learners learn, often creating the same learning experience in multiple forms.

The goal of AFA is to match learning content to the specific needs of each learner and this concept is not new. Where learning content is involved, web accessibility audits might include recommendations to provide multiple versions of the same content, so a wider range of people can access the content depending on their individual needs. Here are some examples:

- If instructions are presented as a list of ordered steps, providing a multimedia version demonstrating those same steps would make the content more usable by more people.
- Providing alt text for an image is a text adaptation for visual content.
- Adding captions to a video in the UDL context does not imply that the learner has a hearing-related disability in the traditional sense, but rather that the learner, for whatever reason, is unable to hear. For example, one might be learning in a noisy environment and unable to hear the audio clearly, or may be working on a system that does not have speakers, or may be working in a place where quiet is required.

In terms of evaluating web accessibility based on AccessForAll, it may be too early to start making AFA recommendations, given very few systems have yet implemented the standards. AFA is a rather complex set of standards, given the range of potential needs and preferences and the variety of ways content can be presented. The following is an overview of the three standards that make up AccessForAll.

- Part 1: **Framework and Reference Model**
  - This part of AFA provides common language for describing users' personal needs and preferences on the one hand, and describing characteristics of digital resources on the other. This part of the standard provides the framework for additional parts, described below.
- Part 2: "Access for all" **Personal Needs and Preferences (PNP) for Digital Delivery**
  - Personal Needs and Preferences describe the needs of the learner. For example, a learner may require text alternatives for visual elements, or require audio alternatives to textual elements, or require sign language alternative to spoken audio, and so on. PNP does not specifically define needs based on disability, but rather learning needs within particular contexts. A person may define multiple PNPs that are applied in different situations.
- Part 3: "Access for all" **Digital Resource Description (DRD)**
  - A Digital Resource Description describes the characteristics of learning content. A DRD can include a range of information on a particular piece of content, including the form of the original content as well as the adaptations of the content that are available. This information is used to match content adaptations with learners' specific needs as defined in their PNP profile. If, for instance, a learner specifies they require text alternatives with visual elements, the AFA compliant system would identify visual elements in the content, and if text alternatives are available and described in the DRD for that piece of content, it would append or replace the visual content with equivalent text.

Watch the following video for a demonstration of AccessForAll in ATutor and AContent. AFA enhanced content is easily created in either system, and easily moved between the systems.

Video: IMS common Cartridge with AccessForAll

A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1510

The AccessForAll Standards can be downloaded from the ISO website, for those who wish to investigate further:

Readings and References:

- ISO/IEC-24751-1 Part 1: Framework and reference model
- ISO/IEC-24751-2 Part 2: “Access for all” personal needs and preferences for digital delivery
- ISO/IEC-24751-3 Part 3: “Access for all” digital resource description
- IMS Global Learning Consortium – AccessForAll

Try This: If you would like to experience AccessForAll firsthand, **download the Optional AccessForAll Activity,** for a look at how the ATutor learning management system has implemented Personal Needs and Preferences, and Digital Resource Descriptions.

9.7: WAI-ARIA- Web Accessibility Initiative - Accessible Rich Internet Applications

WAI-ARIA is perhaps the most significant web accessibility technology to come along since the introduction of WCAG 1.0. It allows developers of web applications or custom web interactivity to define specific roles, states, and properties for custom made interactions that assistive technologies are able to understand. **Though WAI-ARIA is aimed primarily at developers, others should at least understand where and when it gets used.**

WAI-ARIA is a W3C specification that defines a collection of attributes that can be used within HTML elements to add semantic information. For example, a developer may want to create a navigation menu, often using HTML list markup to structure the menu items and JavaScript to control which elements of the menu to display at any given time. Without using WAI-ARIA, such a menu may be accessible in the sense that an AT user could navigate through its elements and open menu items, but they will be announced by the AT as a collection of nested lists. By adding ARIA menu roles to these list elements, AT will announce them as parts of a menu, whether they are opened or closed, and whether they have submenus, and so on.

When auditing custom web interactivity, a screen reader like ChromeVox should be used to navigate through a tool or widget to determine whether WAI-ARIA has been used to add roles, states and properties to the feature. You can also examine the code using the Inspect tool in various browsers, to see what ARIA is being used to operate the tool and watch the ARIA update dynamically, as states and properties change. In audit reports, recommendations can be made to use ARIA to make elements more meaningful, thus more usable by AT users. Refer to Guideline 4.1.2 (Level A).

The full WAI-ARIA specification and WAI-ARIA authoring practices can be found on the W3C website. At least scan through these documents to familiarize yourself with their contents so you can refer back to them in your audits when making ARIA related recommendations.

Toolkit: Bookmark these two documents to add them to your tool kit.

- Accessible Rich Internet Applications (WAI-ARIA 1.1)
- WAI-ARIA Authoring Practices

WAI-ARIA in Action

The following is an HTML excerpt from a large main navigation menu that has been marked up with WAI-ARIA. The markup contains the basic ARIA attributes used to create an AT usable main menu. Read through the comments in the box below, and examine the markup it describes to develop your understanding of how WIA-ARIA is used.

Technical: An example of a main menu created with HTML unordered list markup.

The first line of markup below creates a container around the menu, gives it a role of navigation, is describe with the text in the menu_keys span element below referenced using aria-describedby, and is made keyboard focusable with `tabindex="0"` . When accessed with a screen reader, it announces itself as navigation and describes to the user how to navigate through the menu.

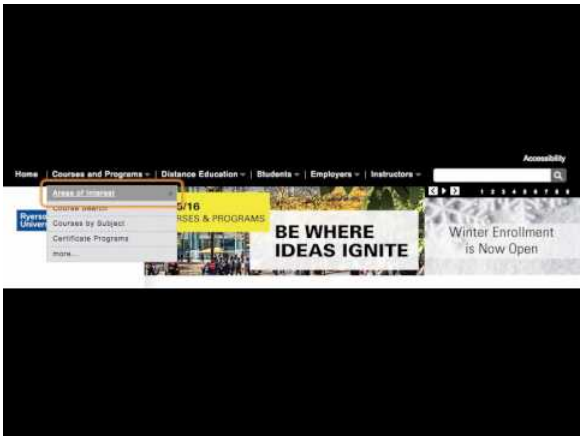
```
<div role="navigation" aria-describedby="menu_keys" tabindex="0">
<span id="menu_keys" style="font-size:0;">
 Main Menu: Use arrow keys to move left and right and
 up and down through menus
</span>
```

The menu itself is a basic nested unordered list. JavaScript injects the ARIA dynamically. The ULs are given a role of menubar, list items are given a role of menuitem. Where a nested list occurs (which is a submenu) aria-haspopout is set to true to indicate to the screen reader that a submenu is present. The aria-activedescendant is set to the ID of the parent element of the submenu that currently has focus.

```
<ul id="nav" role="menubar" aria-describedby="menukeys">
<li role="menuitem">Home </li>
<li id="activeItem" role="menuitem" aria-haspopout="true">
  Courses and Programs
  <ul role="menubar" aria-activedescendant="activeItem">
        <li role="menuitem" aria-haspopout="true">Areas of Interest
          <ul>
            <li role="menuitem">Information Technology</li>
                <li role="menuitem">Communication and Media</li>
                <li role="menuitem">Business Systems and Strategies</li>
                …
         </ul>
        </li>
   …
  </ul>
</li>
…
</ul>
</div>
```

To see the menu in action, view the following video. Listen closely to how the menu is announced by ChromeVox.

Video: WIA-ARIA Main Navigation



A YouTube element has been excluded from this version of the text. You can view it online here: https://pressbooks.library.ryerson.ca/pwaa/?p=1512

The menu in the video above uses the MooTools accessible dropdown menu scripts to inject the appropriate ARIA attributes when they are needed. Fortunately many of the common interactions, like menus, accordions, and tabpanels for instance, have open source scripts available to quickly add in the appropriate ARIA.

Toolkit: Bookmark the open source WAI-ARIA Examples used in ARIA workshops for developers at Ryerson University. These examples can be referred to when making recommendations where ARIA is needed in web accessibility audits.

When to Use ARIA

Though ARIA is a necessity for developers who create custom interactivity for the Web, there are times when it should and should not be used.

Do use ARIA:

- When HTML is being used in a non-standard way (e.g., making a checkbox out of a div)
- When within page navigation is needed (use ARIA landmarks)
- When creating web widgets like sliders, datepickers, tooltips, tabpanels, accordions, etc.

Do not use ARIA:

- When there is a way to create the same interactivity with standard HTML
- When HTML is being used in a standard way (e.g., an HTML form does not need role="form" added because it has that role by default)

Key ARIA Attributes

Technical: Here are some WAI-ARIA attributes that are used often and are relatively easy to understand.

aria-describedby

This attribute is very useful for adding instructions or descriptions of web elements for AT users. In the menu example above, aria-describedby is used to provide instructions on using the menu, in that case referencing a hidden span element containing a description of keyboard navigation.

It could also be used to provide extra information about a particular feature, such as describing the format for a password form field. If the password must include numbers, letters, and special characters, that text might be positioned after the password field in a span element and through its ID attribute, referenced using aria-describedby in the input element for the password field. With the example markup below, a screen reader would announce the label for the password field, followed by format for the password. Without referencing the format span element, this information may go unnoticed by AT users.

```
<label for="pass">Password</label>
<input type="password" id="pass" aria-describedby="format">
<span id="format">
 must contain numbers, letters, and special characters
</span>
```

aria-live vs. alert role

The aria-live attribute, often referred to as a live region, must be used in places where information is dynamically updating on a page, without the page itself reloading. Otherwise AT users are unlikely to notice that changes are occurring. The aria-live attribute can be set to "polite," as seen in the code snippet below, in which case a screen reader will wait until a break in the screen reader's output to read the content. Or, aria-live can be set to "assertive" in which case a screen reader will interrupt whatever is being read to read the changes within the live region. Live regions are useful for things like news feeds (e.g., Twitter or news sites), live chat applications, social media streams, rotating banners or other kinds of auto-updating information.

```
<div id="news_feed" aria-live="polite">
 //updating content goes here
</div>
```

On the other hand, the `role="alert"` attribute, often called an ARIA alert, is a special type of assertive live region, that should be used in places where feedback is being presented. If, for example, a required field in a form is left empty, and

an error message is injected immediately below the field to indicate the error (like that in the code snippet below), these types of feedback messages are good candidates for ARIA alerts. Otherwise such messages may go unnoticed by AT users. Or, after successfully submitting a form to register, for instance, the message that appears on the page after submitting the form indicating the registration was successful, would also be a good candidate for an ARIA alert.

```
<div id="username_feedback" role="alert">
 <p style="color:red;">Username field cannot be empty.</p>
</div>
```

roles and landmarks

ARIA provides a whole range of roles that can be used to assign a functional application to particular HTML elements. You have already been introduced to the the “alert” role, and the roles associated with a navigation menu.

There is a particular set of roles that are referred to as landmarks. These should be used carefully throughout a user interface to define regions throughout that UI. Screen readers are able to list these landmarks and users can jump to any one of them to navigate directly to a relevant area of a page.

Where landmarks are used, all areas of a page should be contained within a landmarked region. These regions, introduced back in Unit 2 (2.4.1 Provide Ways to Navigate), are presented again here:

Full list of landmark roles:

- **banner:** Associated with the header area of a page. There should only be one banner landmark per page.
- **complementary:** A section of content that complements the main content but also retains its meaning when separated from the main content. Often used with a region containing advertising or promo items aligned down the right side of the page. There can be multiple areas defined as complementary.
- **contentinfo:** Contains the content usually found in the footer of a page, like copyright and privacy statements. There should only be one contentinfo landmark per page.
- **form:** Contains form input elements that can be edited and submitted by the user. Multiple elements can have the form role.
- **main:** The main content of the page. There should only be one main landmark per page.
- **navigation:** A collection of navigation links used to navigate the site or page. There can be multiple elements with the role navigation.
- **search:** A search tool.
- **application:** Represents a unique functional unit, and keyboard commands are handled by the application rather than the browser or the assistive technology itself. An embedded movie player, a calendar widget, or other customized software embedded in web content are examples where the application role might be used. This role should be used sparingly as it can create some confusion for screen reader users when key commands begin working differently.

tabindex

Though the HTML `tabindex` attribute has been around since HTML4, for use with specific HTML elements, with HTML5 it can be used with any element to add keyboard focus to elements that do not normally receive focus, using `tabindex="0"` .

In the code for the menu above, you will notice tabindex in the opening div element. Normally divs do not receive keyboard focus. In the case of the menu, adding focus to the container div is needed for the description referred to by aria-describedby to be read. When the div receives focus, the screen reader will announce “Main Menu: Use arrow keys to move left and right and up and down through menus.”

aria-expanded

The `aria-expanded` state is used for menus that have toggles to open and close submenus, and also to inform AT users whether a menu item has a submenu, and whether that submenu is open or not.

The following markup is from a side menu, with toggles to open and close sections of the menu. You will notice that aria-expanded is set to true, indicating to AT that a submenu is open following this element. If the submenu were closed, aria-

expanded would be set to false, updated dynamically by the JavaScript that controls interactivity of the side menu.

```
<span id="acc_tab_2170"
 class="navtoggler active"
 tabindex="0"
 aria-expanded="true"
 role="tab"
 aria-selected="false">
 Archived Calendars
</span>
```

aria-label

When forms are formatted in a way that prevents the use of the HTML label element to explicitly associate a label with a form field, only then should aria-label be used to label the form element. If label can be used, it should be used instead of the ARIA version.

A good example of a case where aria-label might be used is on a search form. These forms usually do not include a label element.

```
<form>
 <input type="text" id="search" aria-label="Enter search terms" />
</form>
```

aria-labeledby

This attribute can be used with non-standard forms to associate a label or multiple labels with a form field. For example, you may have a data entry form laid out in a table, like that in the figure below, in which the content of the table header cells provides labels for multiple input fields.

Consider the following table, in which the content of the header cells provides labels for each form input field in the column below. In the markup that follows the figure, you can see how aria-labelledby has been used to assign the values in the header cells as labels for each form element.

Name	Email	Login
John Smith	js@smail.com	jsmith

Figure: A table used to layout a data entry form.

```
<table>
 <tr>
   <th id="name_label">Name</th>
   <th id="email_label">Email</th>
   <th id="login_label">Login</th>
 </tr>
 <tr>
   <td><input type="text" id="name" aria-labelledby="name_label"/></td>
   <td><input type="text" id="email" aria-labelledby="email_label"/></td>
   <td><input type="text" id="loginl" aria-labelledby="login_label"/></td>
 </tr>
```

```
…
</table>
```

If there is the option to use the label element over using aria-labelledby, then label should be used. If both label and aria-labelledby are used on the same input element, aria-labelledby will override the label.

9.8: Activity- Web Accessibility in Your Part of the World

Spend a few moments researching relevant (if any) web accessibility compliance requirements in the jurisdiction where you live.

9.9: Self-Test 8

Question 1

Match the following accessibility rules and regulations with their respective jurisdictions:

1. Ontario
2. USA
3. United Kingdom
4. Italy
5. France
6. Australia

1. Section 508
2. Disability Discrimination Act 1992
3. AODA
4. Stanca Act
5. Disability Discrimination Act 1995
6. RGAA

Question 2

Which of the following are elements of the ISO/IEC 24751 AccessForAll Standards? Please select all that apply.

1. Personal Needs and Preferences
2. Accessible Rich Internet Applications
3. Hypertext Markup Language
4. Digital Resource Descriptions
5. Extensible Markup Language
6. Accessibility Evaluation and Repair

Question 3

Which of the following are W3C specifications? Please select all that apply.

1. WAI-ARIA
2. ATAG
3. ISO/IEC 24751
4. UAAG
5. WCAG
6. RGAA

Answers to Self-Test 8

A link to an interactive elements can be found at the bottom of this page.

Index

D

Glossary

Sample Word 1 | Sample Definition 1