



Ontario Colleges Library Service

## **Library eResources Accessibility Project (LEAP)**

### **Phase 1: Environmental Scan (v. 1.2)**

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on behalf of the HLLR AODA Committee for Ontario College Libraries

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**Note:** If you are reading the PDF version of this document, the headings in Section 2, Section 3, and the Appendix serve as direct links to the resources being described.

## Executive summary

The Integrated Accessibility Standards under the Accessibility for Ontarians with Disabilities Act (AODA) require that libraries of educational institutions make their resources accessible by January 1, 2020 (*IASR*, 2011, s. 18(3)). Ontario college libraries are looking to establish accessibility best practices, and develop a tool to evaluate the accessibility of library resources. The goal is to recommend workflows for implementing the evaluation tool at the local level, and to allow Ontario college libraries to collaborate on evaluations and share their results.

This document summarizes the major laws and standards that govern accessibility, both in Ontario and internationally. It finds that the regulations in Ontario provide a deadline, but no specific criteria for resources to meet. As such, Ontario college libraries must look beyond the AODA for guidance on how to make their resources accessible. Exemplars include the Section 508 standards in the United States, the World Wide Web Consortium's Web Content Accessibility Guidelines (WCAG) 2.0, and the PDF/UA Universal Accessibility ISO standard.

Next, the document reviews the scholarly and professional literature as well as real-world examples to determine how libraries are currently evaluating resources for accessibility. The **4. Discussion** section examines trends in ten areas: evaluation methods, evaluation criteria, evaluation tools, quality of evaluation methods, evaluation by non-experts, use in libraries, sharing results, resource types, user types, and usability. Evaluation examples are examined in more detail in the **Appendix**.

Lastly, the document provides a series of recommendations for Ontario college libraries on how they should proceed with developing an evaluation tool:

### 1. Competency building

1. Libraries should avoid relying solely on vendor-supplied accessibility statements (including VPATs) because they are often incomplete and inaccurate.
2. Libraries should not rely on automated evaluators (e.g. WAVE) exclusively, because they exclude many important accessibility criteria that can only be evaluated by humans.
3. Libraries should recognize that accessibility does not necessarily equal usability. An resource can be compliant with accessibility criteria, but still not be usable. Libraries are encouraged to perform usability tests with users with disabilities wherever possible.

### 2. Tool development

1. Libraries should attempt to compensate for the limitations of the conformance review approach when developing their evaluation tool, though some kind of conformance review will be necessary.

2. Libraries should investigate the barrier walkthrough approach to see if it can be adapted for their needs, as it provides better results than conformance reviews when completed by non-experts.
3. Libraries will need to develop their own criteria checklist, based on WCAG 2.0 and similar resources, and should attempt to balance quantity and specificity.
4. Libraries should avoid pre-assigning priority or severity levels to criteria, because they are likely to be inaccurate.
5. Libraries should not forget to address user groups beyond those with visual impairments, and should find a way to balance the needs of differing user groups.
6. Libraries will need to develop an evaluation tool that provides evaluators with easily testable criteria, as well as guidance for evaluating those criteria.
7. Libraries will need to assess any tool they develop for its effectiveness, efficiency, and usefulness.
8. Libraries should ensure their evaluation criteria address the content of eresource databases, not just the interfaces. They should include specific criteria that address PDFs and multimedia resources.

### **3. Tool implementation**

1. Libraries will need to provide their staff with access to automated evaluators, developer tools, and/or assistive technology in order for them to carry out accessibility evaluations.
2. Libraries should incorporate accessibility evaluations into their eresource procurement processes. Additionally, the results of evaluations should be translated into user support, reference services, and instruction, wherever possible.
3. Libraries should put policies and procedures in place to ensure evaluations are refreshed periodically.
4. Libraries should collaborate on accessibility evaluations and share their results wherever possible.

# 1. Introduction

## 1.1 Background

The primary purpose of the Library eResources Accessibility Project (LEAP) is to assist Ontario college libraries in upholding accessibility best practices and becoming compliant with the requirements of the Accessibility for Ontarians with Disabilities Act (AODA), particularly the January 1, 2020 deadline for ensuring the accessibility of electronic resources (*IASR*, 2011, s. 18(3)).

In collaboration with the AODA Committee for Ontario College Libraries, this project will fulfill the directive from HLLR to:

- Build capacity among college library staff for understanding the necessity of evaluating the accessibility of library resources
- Create a template or tool to evaluate the accessibility of library databases and discovery tools outlining minimum-standards and best practices
- Recommend workflow for implementation of evaluations at the local college level
- Recommend options for shared access and crowdsourced contributions from the colleges

## 1.2 Purpose

This document fulfills the objectives for Phase 1 of the research project:

1. To review the accessibility templates and results already compiled for this project by OCLS and the AODA Committee.
2. To assess the need to conduct informal interviews with key staff at college libraries (via the AODA Committee) in order to understand existing practices including workflow and rationale, and to identify model templates already in use for evaluating accessibility.
3. To perform an environmental scan of other library websites and scholarly literature in order to find accessibility evaluations of library eresources and to review existing templates at the local, provincial, national, and international levels, in colleges and other libraries.
4. To help shape plans for future template development and implementation in the Ontario college libraries.

## 1.3 Definitions

We will use the following definition of **electronic resource (eresource)**, from the *Online Dictionary of Library and Information Science*:

“Material consisting of data and/or computer program(s) encoded for reading and manipulation by a computer, by the use of a peripheral device directly connected to the computer, such as a CD-ROM drive, or remotely via a network, such as the Internet. The category includes software applications, electronic texts, bibliographic databases, institutional repositories, Web sites, e-books, collections of e-journals, etc.” (Reitz, 2013).

We will also use the International Organization for Standards (ISO)’s definition of **accessibility**:

“[The] usability of a product, service, environment or facility by people with the widest range of capabilities” (ISO, 2008).

The ISO further defines **usability** as:

“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO, 1998).

## 1.4 Scope

Our primary research question is as follows:

According to the scholarly and professional literature as well as real-world examples, what kinds of accessibility evaluations of electronic resources are currently being done, in Ontario college libraries and beyond?

We will further break down our broad research question into the following subsections:

### Evaluation methods

- What kinds of accessibility testing methodologies exist that are applicable to the evaluation of e-resources?
- What are the pros and cons of these different methods?

### Evaluation criteria

- What accessibility criteria are evaluations built on?
- Are there certain criteria that are common to multiple checklists?
- How many criteria are used?
- How specific are the criteria used?
- How much technical expertise is required to evaluate accessibility criteria?

### Evaluation tools

- What kind of automated evaluators, developer tools, and assistive technology are used in order to conduct accessibility evaluations?

### **Quality of evaluation methods**

- How can the quality of different evaluation methods be measured?

### **Evaluation by non-experts**

- How effective are evaluations performed by non-experts compared to evaluations performed by experts?
- How can we support more effective evaluations by non-experts (e.g. documentation, training)?

### **Use in libraries**

- How frequently are accessibility evaluations carried out?
- Does the accessibility evaluation inform eresource selection, negotiation, and acquisition processes?
- How do accessibility evaluations inform the work of different departments at the library, e.g. collection development, technical services, reference, instruction?

### **Sharing results**

- What are the formats used for collection, storage, and display of evaluation templates and results?
- Are libraries currently sharing or collaborating on accessibility evaluations?

### **Resource types**

- Are special criteria needed to evaluate the accessibility of database interfaces (e.g. websites) versus database content (e.g. full text, images, video, audio)?

### **User types**

- What user groups are being addressed in library accessibility evaluations?
- How can accessibility evaluations effectively balance the needs of different user groups?

### **Usability**

- How does accessibility relate to usability?
- How do evaluations compare with actual usability tests?

## 2. Laws

This section examines accessibility-related legislation and regulations, providing some context for the necessity of the evaluation project.

### 2.1 Accessibility for Ontarians with Disabilities Act (AODA)

In 2005, the Accessibility for Ontarians with Disabilities Act was passed for the purpose of “developing, implementing and enforcing accessibility standards in order to achieve accessibility for Ontarians with disabilities with respect to goods, services, facilities, accommodation, employment, buildings, structures and premises on or before January 1, 2025” (AODA, 2005). The act creates the legal framework for developing and enforcing regulations regarding accessibility.

Two regulations have been implemented under the AODA: the Accessibility Standards for Customer Service (CSS, 2007) and the Integrated Accessibility Standards (IASR, 2011). These regulations provide more specific requirements for organizations as well as deadlines for compliance. The IASR includes provisions applicable to library resources, so we will examine it more closely.

#### Integrated Accessibility Standards (IASR)

The IASR is divided into four subsections, including one on Information and Communication Standards that prescribes requirements that apply to college libraries.

Section 18(3) states that libraries of educational or training institutions must make “digital or multimedia resources or materials” accessible by January 1, 2020. Note, however, that it does not provide any specific criteria for libraries to meet. While Section 14 does specify that organizations’ websites and web content must conform to the Web Content Accessibility Guidelines (WCAG) 2.0, this does not apply to resources, as libraries do not generally have a contractual relationship with vendors that allows us to directly modify the resources we license access to. So the IASR does require libraries to make their resources accessible by the 2020 deadline, but it does not outline how this should be achieved. Ontario college libraries must look to other standards in the field for guidance.

Also important, Section 18(1) says that libraries of educational or training institutions “shall provide, procure or acquire by other means an accessible or conversion ready format of print, digital, or multimedia resources or materials for a person with a disability, upon request.” Given the wide range of accessibility needs, it is not practical to ensure that any one resource can meet every possible user’s needs. However, this provision indicates that libraries should be prepared to accommodate users on demand.

### 2.2 Section 508 Amendment to the U.S. Rehabilitation Act

In 1998, an amendment to Section 508 of the U.S. Rehabilitation Act was passed (*Section 508 of the Rehabilitation Act, 1998*). The law states that federal agencies that procure or use electronic information and technology must ensure the technology is accessible to any members of the public with disabilities. Although the legal obligations only extend to those vendors that participate in government procurement



processes, both vendors and evaluators frequently consult these standards when assessing the accessibility of a product.

U.S. legislation is useful to us for two reasons. First, it can provide us with some guidance in lieu of specific recommendations from the AODA itself. Second, compliance with this legislation is cited by a majority of the vendors in the library market, therefore it is important for library staff to be familiar with it.

### Access Board: Section 508 Standards for Electronic and Information Technology

The United States Access Board is an independent agency of the federal government. Created in 1973 with the Rehabilitation Act, its role is to ensure access to federally funded facilities and resources. The Access Board developed the actual Section 508 standards (United States Access Board, n.d.-b). It is these technical criteria that vendors and evaluators are referring to when they assess compliance according to Section 508.

### Information Technology Industry Council (ITI): Voluntary Product Accessibility Template (VPAT) (v1.3)

The Voluntary Product Accessibility Template (VPAT) is a tool developed by the Information Technology Industry Council (ITI) that is used to document a product’s compliance with the accessibility standards outlined in Section 508 (ITI, n.d.). It is a translation of the Access Board’s Section 508 standards into template form. Its primary purpose is to assist federal officials in evaluating the accessibility of products during the procurement process. Many library vendors have adopted the VPAT to demonstrate the accessibility of their products, and thus many libraries rely on VPATs to evaluate the accessibility of their eresources.

The VPAT is provided in Word document format, and is divided into sections according to the subsections of the Section 508 standards. Each subsection has a three-column table.

The first column lists the criteria, the second column asks vendors to describe the features that support the criteria, and the third column provides room for additional comments.

Not all subsections apply to every product, so each vendor can decide which subsections to fill out. The VPAT has the following subsections:

- **Section 1194.21** Software Applications and Operating Systems

**VPAT™**  
Voluntary Product Accessibility Template®  
Version 1.3

The purpose of the Voluntary Product Accessibility Template, or "VPAT", is to assist Federal contracting officials and other buyers in making preliminary assessments regarding the availability of commercial "Electronic and Information Technology" products and services with features that support accessibility. It is assumed and recommended that offerors will provide additional contact information to facilitate more detailed inquiries.

The first table of the Template provides a summary view of the Section 508 Standards. The subsequent tables provide more detailed views of each subsection. There are three columns in each table. Column one of the Summary Table describes the subsections of subparts B and C of the Standards. The second column describes the supporting features of the product or refers you to the corresponding detailed table, e.g., "equivalent facilitation." The third column contains any additional remarks and explanations regarding the product. In the subsequent tables, the first column contains the lettered paragraphs of the subsections. The second column describes the supporting features of the product with regard to that paragraph. The third column contains any additional remarks and explanations regarding the product.

Date: \_\_\_\_\_  
Name of Product: \_\_\_\_\_  
Contact for more information (name/phone/email): \_\_\_\_\_

Summary Table		
VPAT™		
Voluntary Product Accessibility Template®		
Criteria	Supporting Features	Remarks and explanations
<a href="#">Section 1194.21 Software Applications and Operating Systems</a>		
<a href="#">Section 1194.22 Web-based Internet Information and Applications</a>		
<a href="#">Section 1194.23 Telecommunications Products</a>		
<a href="#">Section 1194.24 Video and Multi-media Products</a>		
<a href="#">Section 1194.25 Self-Contained, Closed Products</a>		
<a href="#">Section 1194.26 Desktop and Portable Computers</a>		
<a href="#">Section 1194.31 Functional Performance Criteria</a>		
<a href="#">Section 1194.41 Information, Documentation and Support</a>		

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- **Section 1194.22** Web-based Internet Information and Applications
- **Section 1194.23** Telecommunications Products
- **Section 1194.24** Video and Multi-media Products
- **Section 1194.25** Self-Contained, Closed Products
- **Section 1194.26** Desktop and Portable Computers
- **Section 1194.31** Functional Performance Criteria
- **Section 1194.41** Information, Documentation and Support

For example, under Section 1194.22 Web-based Internet Information and Applications, there are 16 criteria (ITI, n.d.):

- (a) A text equivalent for every non-text element shall be provided (e.g., via “alt”, “longdesc”, or in element content).
- (b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.
- (c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.
- (d) Documents shall be organized so they are readable without requiring an associated style sheet.
- (e) Redundant text links shall be provided for each active region of a server-side image map.
- (f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.
- (g) Row and column headers shall be identified for data tables.
- (h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.
- (i) Frames shall be titled with text that facilitates frame identification and navigation.
- (j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.
- (k) A text-only page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.
- (l) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.
- (m) When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with §1194.21(a) through (l).
- (n) When electronic forms are designed to be completed on-line, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form, including all directions and cues.
- (o) A method shall be provided that permits users to skip repetitive navigation links.
- (p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

### **General Services Administration (GSA): Quick Reference Guide to Section 508**

On their Section508.gov website, the General Services Administration (GSA), an independent agency of the U.S. federal government, has provided a quick reference guide to Section 508 (United States General Services Administration, n.d.). For each criterion, it answers the following questions: “What does this requirement mean? How can I tell if this requirement is met? Where can I get additional information?”

### **Libraries for Universal Accessibility (LUA): VPAT Repository**

Libraries for Universal Accessibility (LUA) is an online community for information professionals who advocate for library accessibility. The LUA website keeps a list of VPATs and accessibility statements from major library vendors (Libraries for Universal Accessibility, 2015). There are currently VPATs available in PDF form for about 40 different products. As indicated on the website, these VPATs are filled out by vendors and their completeness and accuracy has not been verified.

### **Ontario Council of University Libraries (OCUL): VPAT Initiative**

The primary goal of the Ontario Council of University Libraries (OCUL)'s VPAT project is to create a Canadian version of the VPAT that makes specific reference to and conforms to the AODA. This document will be directed towards the vendors responsible for products procured by libraries and will be presented to them with the criteria they have to report on. The OCUL Accessibility Working Group is currently beginning the process of analyzing the relevant legislations and identifying overlap between the current VPAT and one that relates more precisely to a Canadian, and specifically an AODA, context.

Ontario college libraries are represented on this OCUL Subcommittee as partners on this project with representation from Centennial, La Cité, and George Brown College, with Corinne Abba ([cabba@georgebrown.ca](mailto:cabba@georgebrown.ca)) serving as the primary contact for the Ontario colleges.

## 3. Standards

This section reviews the major accessibility standards and some associated implementation aids that are used by libraries or cited by scholars in the evaluation of websites and databases. Because the legislation in Ontario is nonspecific, we must look to other accessibility standards for guidance.

### 3.1 Web Content Accessibility Guidelines (WCAG) 2.0

Developed by the World Wide Web Consortium (W3C), the Web Content Accessibility Guidelines (WCAG) 2.0 (W3C, 2008) are the de facto international standards for web accessibility. There are 14 guidelines organized under 4 broad principles, as reproduced below (W3C, 2008):

#### 1. Perceivable

1. Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
2. Provide alternatives for time-based media.
3. Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
4. Make it easier for users to see and hear content including separating foreground from background.

#### 2. Operable

1. Make all functionality available from a keyboard.
2. Provide users enough time to read and use content.
3. Do not design content in a way that is known to cause seizures.
4. Provide ways to help users navigate, find content, and determine where they are.

#### 3. Understandable

1. Make text content readable and understandable.
2. Make Web pages appear and operate in predictable ways.
3. Help users avoid and correct mistakes.

#### 4. Robust

1. Maximize compatibility with current and future user agents, including assistive technologies.

Each guideline is accompanied by success criteria, 65 in total, which are testable but technology-agnostic. Furthermore, there are three levels of conformance: Level A, Level AA, and Level AAA, with Level AAA representing the highest level of conformance.

#### World Wide Web Consortium (W3C): How to Meet WCAG 2.0 (Quick Reference)

The W3C offers this interactive Quick Reference tool, which can be used as a WCAG 2.0 checklist (W3C, 2014b). For each of the WCAG 2.0 guidelines, it provides all the success criteria, as well as suggested techniques for meeting the requirements, failures to avoid, and explanatory links for more information.

### **World Wide Web Consortium (W3C): PDF Techniques for WCAG 2.0**

The W3C also offers a list of 23 techniques for ensuring that PDFs meet WCAG 2.0 requirements (W3C, 2014c). This is of interest because of the large volume of library database content that is provided in PDF format.

### **World Wide Web Consortium (W3C): How WCAG 2.0 Differs from WCAG 1.0**

Some of the older studies (pre-2008) mentioned in this document reference WCAG 1.0 guidelines, which consisted of 14 guidelines with checkpoints for each, at three different priority levels. The W3C has produced this document which outlines the differences between WCAG 1.0 and WCAG 2.0 (W3C, 2009).

### **Access Board: Comparison of WCAG 2.0 to Section 508**

The United States Access Board has created this table that compares WCAG 2.0 criteria with Section 508 standards (United States Access Board, n.d.-a). There are a number of other resources online that provide similar comparisons.

## **3.2 PDF/UA (Universal Accessibility) ISO Standard**

In July 2012, PDF/UA (Universal Accessibility) became an ISO standard (ISO 14289-1, 2012), which was later updated in December 2014 (ISO 14289-1, 2014). It is an international standard for creating accessible PDFs. The standard defines a series of conditions that must be met in order for a document to conform to PDF/UA. It also specifies whether a PDF reader or assistive technology conforms to the PDF/UA standard, by supporting all the accessibility features in a PDF/UA document. It is a highly technical specification, designed mainly for those involved in developing software capable of creating or reading accessible PDFs.

### **PDF Association: PDF/UA in a Nutshell**

The PDF Association is an international organization that promotes the use of international standards in related to PDF technology. The PDF Association's PDF/UA Competence Center has produced a guide that explains some of the context behind the development of the PDF/UA standard, as well as information about its requirements (PDF Association, 2013).

### **PDF Association: Matterhorn Protocol 1.02**

The PDF Association produced the Matterhorn Protocol to support the adoption of the PDF/UA standard (PDF Association, 2014). It is essentially a list of all the possible ways a document could fail to meet PDF/UA requirements. The latest version was released in April 2014, and consists of 36 checkpoints and a total of 136 failure conditions. Each failure condition provides a citation to the specific paragraph in the ISO standard, and indicates whether the failure condition can be judged by a machine or a human.

## 4. Discussion

This section discusses the findings of our environmental scan of accessibility evaluations of library resources, organized into ten subheadings. For a list of the examples we consulted, please see the **Appendix**.

### 4.1 Evaluation methods

A wide range of evaluation methods were employed by libraries and researchers in the examples we reviewed, including vendor self-reporting, automated testing, conformance reviews, screening techniques, user surveys, and usability testing, as well as some hybrid and idiosyncratic methods.

**Vendor self-reporting** is the widespread practice of relying on a vendor's own assessment of the accessibility of their products. When libraries evaluate the accessibility of an resource, they often refer to the product's VPAT, which many vendors provide to communicate the accessibility of their products. However, libraries should not rely on VPATs or other vendor self-reporting as sufficient evaluations of a product's accessibility, as they are often unsystematic and inaccurate. For example, many vendors provide full text via PDFs, but there is no Section 508 criterion that explicitly addresses PDFs, so the accessibility of PDFs is often overlooked (DeLancey, 2015). One accessibility consultant stated: "To be blunt, VPAT submissions by vendors are often laughably bad and tend to be subject to ridicule in the 508 offices of government agencies. The bad information in them ranges from woefully inadequate to laughably uninformed to maddeningly false" (Groves, 2011). Byerley et al. (2007) found that the majority of vendors surveyed claimed their products met most Section 508 standards, while DeLancey (2015) found in reality this is often not the case. DeLancey recommends that "[v]endor-supplied accessibility documentation should not be taken at face value, but requires verification and follow up to ensure its accuracy" (2015, p. 103). Groves suggests that VPATs created by third parties are more likely to be complete and accurate (2011).

**Automated testing** involves using an automated tool to test the accessibility of a resource, such as WebAIM's WAVE Accessibility Tool (WebAIM, n.d.). Several studies employed automated tools (Coonin, 2002; McCord, Frederiksen, & Campbell, 2002; Southwell & Slater, 2013; Blechner, 2015; DeLancey, 2015; Nganji, 2015), but few relied on them as the sole methodology. Automated tools are embedded with their own accessibility criteria, though many are based on established guidelines like WCAG 2.0. It is important to note that automated tools are necessarily limited to those criteria that can be evaluated by a machine. Many accessibility criteria can only be evaluated by humans. Automated tools are covered in more detail in **4.3 Evaluation tools**.

**Conformance reviews or compliance tests** are a common way of evaluating the accessibility of an resource (George Brown College, 2008; Bowman, 2002; Stewart, Narendra, & Schmetzke, 2005; UIUC, 2006; Tatomir & Durrance, 2010; San Jose State University, 2014; Blechner, 2015; Nganji, 2015). These involve manually inspecting a website to see if it conforms to certain accessibility criteria, such as WCAG 2.0 or Section 508. Like other methodologies, conformance reviews often require the use of evaluation tools and adaptive technology to carry out the evaluation of each criterion, but cannot be entirely

automated. Brajnik notes that the effectiveness of a conformance review depends on the expertise of the evaluator and “the quality of the underlying checkpoints” (2008). Ribera et al. caution that conformance reviews may encourage “easy compliance rather than real accessibility” (2009, p. 404) (see further discussion of this in **4.10 Usability**). This method is of most interest for this project, as Ontario college libraries will likely be developing a template and criteria to be used for conformance reviews. Accessibility criteria are discussed in more detail in **4.2 Evaluation criteria**.

**Screening techniques** involve “using a website in a way that some sensory, motor or cognitive capabilities of the users are artificially reduced ... to simulate some of the conditions that are typical for people with disabilities” (Brajnik, 2008, p. 24). Though screening techniques do not provide systematic criteria by which to evaluate a resource, they are useful for simulating real-world conditions. Many evaluators employ screen readers in their processes, but only one researcher explicitly stated that she turned off her monitor while navigating resources with a screen reader (Bowman, 2002). As other evaluators did not declare whether or not they disabled their screens when using screen readers, it is difficult to assess how much this influenced their results. This method is most valuable because it can be combined with other methods like conformance reviews.

At least one evaluator used **user surveys** to evaluate the accessibility of resources (Horwath, 2002). User surveys are a kind of remote usability testing where the results are reported by participants rather than observed directly. Users are given tasks to perform, and are asked to rate the difficulty of these tasks using Likert scales or similar ratings. They allow evaluators to gain feedback on real accessibility problems encountered by users, but they may miss problems that might be observed in usability testing but not reported on surveys. For example, Dermody & Majekodunmi found a discrepancy between the success rates reported by users on tasks and the success rates actually observed (2011). Users are also able to use their own workstations—this may make the evaluation process easier, but also makes it difficult to control for variables and thus identify problems. Mankoff et al. found remote studies one of the least reliable evaluation methodologies (2005).

Another widely-employed technique is **usability testing** (Byerley & Chambers, 2002; Stewart et al., 2005; Dermody & Majekodunmi, 2011; Haanperä & Nieminen, 2013; Walker & Keenan, 2015). Brajnik et al. define usability testing as “a process where formal or informal experiments are set up with real users, who are individually asked to perform goal-free or goal-oriented navigation on a web site, and whose behavior is observed by evaluators” (2010, p. 44). Participants are given tasks to perform, and are usually asked to “think aloud” so observers can record their feedback (Lewis & Rieman, 1993). Usability testing can measure different criteria like task completion, number of problems encountered and severity, duration, and user satisfaction (Lang, 2003, p. 5). Many researchers expressed the importance of conducting usability studies to see how real users actually interact with websites, and the problems they encounter (see further discussion in **4.10 Usability**). However, usability testing can be resource-intensive, especially in terms of time, labour, and facilities, and relatively inefficient at identifying accessibility problems (Brajnik, 2008).

One additional methodology we discovered in the literature is the **barrier walkthrough**. Developed by Brajnik (2008), the barrier walkthrough is an inspection methodology that draws on the “cognitive walkthrough” approach from usability testing, in which an evaluator examines an interface by going through a series of tasks (Wharton, Rieman, Lewis, & Polson, 1994). In this method, “[a]n evaluator has to assess the number of predefined barriers which are interpretations and extensions of well known accessibility principles” (Brajnik, 2008). Brajnik defines an accessibility barrier as “any condition that makes it difficult for people to achieve a goal when using the web site through specified assistive technology” (2008). Most importantly, the barrier walkthrough method takes into consideration user categories, usage scenarios, and user goals, which conformance reviews generally do not. In his experiments, Brajnik found the barrier walkthrough method “is more effective than conformance review in finding more severe problems and in reducing false positives; however, it is less effective in finding all the possible accessibility problems” (2008). The barrier walkthrough is discussed further in **4.5 Evaluation by non-experts**.

## 4.2 Evaluation criteria

Given the lack of specific accessibility criteria in the AODA, we must look elsewhere to see what evaluation criteria are being used by libraries. Aside from the laws and standards discussed earlier in this document, one other notable source of criteria for libraries is the Association of Specialized and Cooperative Library Agencies (ASCLA)’s “Think Accessible Before You Buy” toolkit, which includes accessibility guidelines and evaluation forms for assessing the accessibility of two types of potential purchases: the “Internet and Web-based Content Accessibility Form,” and the “Electronic Database and Computer Software Accessibility Evaluation Form” (ASCLA, n.d.). The toolkit attempts to translate the sometimes difficult technical language of accessibility standards into plain English in order to assist library staff. At least one library we found draws on the guidelines in this toolkit for evaluating their eresources (George Brown College, 2008).

Of the rest of the evaluation examples we found, while a few drew on WCAG 2.0 or Section 508 or other lesser-known guidelines, the majority employed their own, home-grown criteria. For example, Tatomir and Durrance developed their own “Tatomir Accessibility Checklist” in order to assess library databases (2010). Different checklists often had many criteria in common, such as meaningful alt tags, skip navigation links, and logical reading order. However, the degree of specificity in each checklist varied. For example, one of Blechner’s criteria is worded more generally as “Ability to Navigate” (2015), while Stewart et al.’s criterion is much more specific: “Skip-over-navigation link provided” (2005). The number of criteria used varied between five and fifteen, with some outliers. There is clearly a balancing act that is required in terms of quantity and specificity of criteria.

Given that WCAG 2.0 is an international standard that was designed to be testable, it appears odd that not many libraries use these criteria directly for evaluating the accessibility of their eresources. However, the literature revealed some limitations of WCAG 2.0. Ribera et al. note that WCAG 2.0 criteria are not based on “statistically validated research of users” (2009, p. 404). Several researchers also found that many WCAG 2.0 criteria were not particularly effective at identifying accessibility problems. For example, Rømen and Svanæs found that WCAG 2.0 criteria could only identify 32% of the accessibility



problems found in a real usability test (2011, p. 380). Power et al. found similar results (2012, p. 438). The validity and reliability of WCAG 2.0 conformance reviews are especially poor among non-experts (see **4.5 Evaluation by non-experts** for more). Additionally, there are 65 success criteria in WCAG 2.0, which is significantly higher than the number of criteria generally used in the library evaluations we found. Some criteria are also quite technical, and require considerable expertise to evaluate. It appears that it may be too difficult for libraries to evaluate all WCAG 2.0 criteria for each library resource. The criteria that Ontario college libraries choose to employ will likely need to be whittled down so they are more manageable.

Another common element of evaluation criteria is the assignment of priority or severity levels that indicate the significance of each particular guideline or violation of that guideline. For example, WCAG 2.0 is divided into three conformance levels, where A is the minimum and AAA is the maximum level of conformance (W3C, 2008). Priority levels help divide longer lists of criteria into more manageable categories. However, Yesilada et al. found that “it is extremely inaccurate to use fixed predefined priorities/severities” (2009, p. 204). They noted that while the assignment of priorities is important and valuable, it can only be done with reliability “provided that appropriate usage scenarios are considered” (2009, p. 204).

### 4.3 Evaluation tools

The vast majority of the evaluations we looked at used tools like automated evaluators, developer tools, and assistive technology in order to conduct their evaluations.

**Automated evaluators** are software tools that automatically assess the accessibility of a website according to pre-defined criteria, such as WCAG 2.0. A popular example of this is WebAIM’s WAVE Accessibility Tool, which evaluates websites according to select WCAG 2.0 and Section 508 criteria (WebAIM, n.d.). While automated tools can be helpful, most caution against relying on them exclusively, as automated tools can only offer a narrow interpretation of accessibility guidelines, and there are many accessibility criteria that require human evaluation. For example, one WCAG checkpoint says that colour should not be used as the only means of conveying information. While an automated tool can identify that colour may be assigned to an element, it cannot judge whether that element conveys information that is not conveyed by other means (National Disability Authority, n.d.). Therefore, automated testing tools are “best used by experts who can interpret their results accurately,” by identifying false positives and false negatives (n.d.). As Southwell & Slater write, “[a]lthough testing web sites with accessibility checkers is very helpful and will reveal a variety of accessibility roadblocks, nothing can substitute for the experience of testing with an actual screen reader” (2012, p. 469). The W3C maintains some guidelines for tool selection (2005), and a list of automated evaluation tools (2014d).

A number of other **developer tools** can be useful for assessing the accessibility of a resource. For example, many evaluators will inspect a website’s source code using their browser’s “view source code” or “inspect element” features. Other examples include software like Color Oracle, which simulates browsing with colour blindness (Jenny, 2013), Tanaguru Contrast-Finder, which verifies if any colours used meet minimum contrast requirements (Oceane Consulting, n.d.), and the Photosensitive Epilepsy

Analysis Tool (PEAT), which allows developers to identify potential seizure risks (University of Wisconsin-Madison, 2010). Other useful tools can also be found on the W3C's list (2014d).

**Assistive technology** is also an important tool for accessibility evaluations, as many users employ assistive technologies when navigating the web. The United States Assistive Technology Act of 1998 defines assistive technology as any “any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities” (*Assistive Technology Act*, 1998). For example, users with visual impairments might use screen magnifiers, screen readers, or refreshable Braille displays. It is useful to employ assistive technology when evaluating the accessibility of a resource, because it helps simulate the real-world conditions under which users will be interacting with the resource. However, it is also important to note that not all users will use a particular assistive technology in the same way. For example, many screen readers come with extensive configuration options, so the setup used by the evaluator may differ from the actual user.

Regardless of the evaluation criteria chosen, the accessibility of an resource cannot effectively be judged without the use of some kind of evaluation tools. Libraries will need to be prepared to provide staff with access to these tools so they can perform evaluations.

#### 4.4 Quality of evaluation methods

Brajnik (2008, 2009b) provides a useful framework for assessing the quality of different accessibility evaluation methods. He assesses evaluation methods based on the following criteria, and provides a series of formulas for operationalizing most of these criteria:

- **Effectiveness:** the extent to which the method can systematically and accurately predict all and only the real problems that will occur when real users use the system
  - **Validity:** the extent to which the problems detected during an evaluation are also those that show up during real-world use of the system
    - **Correctness:** the percentage of reported problems that are true problems (also called *precision*)
    - **Sensitivity:** the percentage of the true problems that are reported (also called *recall* or *thoroughness*)
  - **Reliability:** the extent to which independent evaluations produce the same results
- **Efficiency:** the amount of resources (time, skills, effort, money, infrastructure) that are expended to carry out an evaluation that leads to given levels of effectiveness and usefulness
- **Usefulness:** the effectiveness and usability of the results produced (with respect to those who have to assess or fix the accessibility of a website)

Comparing different accessibility evaluation methods allows us to optimize resources expended, produce predictable quality results, support sustainable accessibility practices, and standardize the content of accessibility reports (Brajnik, 2008). Any tool developed by the Ontario college libraries will

need to be tested to ensure it is effective, efficient, and useful, and Brajnik provides a productive framework for this analysis.

#### 4.5 Evaluation by non-experts

An interesting thread we discovered in the literature was a discussion about the process of evaluation by non-experts. This is relevant for the Ontario college library context because the degree of experience that library staff have with accessibility testing will likely vary widely.

Two studies looked at the testability of WCAG 2.0 success criteria by non-experts (Brajnik et al., 2010; Alonso, Fuertes, González, & Martínez, 2010). Brajnik et al. found that experts performing a WCAG 2.0 conformance review produce an average of 20% false positives and miss 32% of true problems, while non-experts produce an average of 42% false positives and miss 49% of true problems (2010, p. 49). Alonso et al. also found that only 8 out of the 25 WCAG 2.0 success criteria they examined were reliably human testable by non-experts, according to the W3C's definition (2010). The W3C defines a success criterion as "reliably human testable" if it can be "tested by human inspection and it is believed that at least 80% of knowledgeable human evaluators would agree on the conclusion" (2003). Another study by Brajnik compared the results of a conformance review using Italian accessibility requirements and a barrier walkthrough by non-experts, and found that correctness (i.e. the identification of true problems) increased between 9% and 60% when using the barrier walkthrough method instead of the conformance review (2008). Yesilada et al. found that expertise matters for the effectiveness, reliability, and subjective confidence of evaluations, but also noted that the barrier walkthrough method had a relatively high accuracy rate when performed by non-experts (78-80%, as compared to 85-87% for experts) (2010, pp. 203, 209). These studies suggest that conformance reviews, especially using WCAG 2.0 criteria, may not be particularly effective when completed by non-experts, but the barrier walkthrough method may perform better.

Several studies by Bailey and Pearson examine the development of a web-based knowledge management tool called the Accessibility Evaluation Assistant (AEA), designed to help novice evaluators assess the accessibility of a website (Bailey & Pearson, 2010, 2011; Pearson, Bailey, & Green, 2011; Bailey & Pearson, 2012; Bailey, Pearson, & Gkatzidou, 2014). The tool is based on Brajnik's barrier walkthrough method, and uses 48 accessibility checks drawn from a variety of accessibility guidelines. It guides the evaluator by allowing them to select from a list of ten different user groups, then displaying the accessibility checks most relevant to the user group selected. They noted that in tests performed using the AEA, the validity of novice evaluations (i.e. the extent to which novices' evaluations matched those of experts) ranged from 48% to 73%, and the reliability (i.e. the extent to which different evaluators produce the same result) was 76% (Bailey et al., 2014). Unfortunately, even though the most recent paper on the AEA was published in 2014, as of August 2015 the AEA website is down so we are unable to assess the tool ourselves.

There is still insight to be gained from the literature published about the AEA, though. Bailey and Pearson note that any evaluation tool designed for novices "should incorporate a set of easily digestible, specific expert recommendations, tailored to the resource being assessed" (Pearson et al., 2011, p. 29).

For example, the AEA tool provides evaluators with a step-by-step walkthrough for each check, with the following components: the name of the accessibility principle, a brief description, the rationale behind the check, its relevance to the user group(s) affected, and step-by-step instructions on how to perform the check, along with a video demonstration (Bailey et al., 2014). It is clear that any evaluation tool developed by Ontario college libraries will need to provide specific, easy-to-use criteria, and should be supported by instructions that guide the evaluator through the evaluation process. While some training will likely be necessary, the tool will ideally be able to stand on its own. Any documentation on its use could be directly integrated into the tool, for example hyperlinks could be provided for each criterion that present more information and assistance on how to evaluate it.

## 4.6 Use in libraries

The way accessibility evaluations are used by libraries varies. Many libraries address the accessibility of library resources in one-time reports (Niagara College, 2014; San Jose State University, 2014; UIUC, 2006). Most of the research studies in the literature also fall into this category as none were longitudinal studies. Setting aside the research-oriented examples, in most cases it is not clear if these reports were directed towards specific audiences or specific usage purposes, and what, if any, outcomes followed from them. It is likely this varied from institution to institution. The other downside of one-time studies or reports is that the results may quickly become obsolete as vendors release upgrades to their databases (Byerley et al., 2007). Some procedure or policy must be in place to ensure accessibility evaluations are periodically refreshed.

George Brown College is the only example we found where the accessibility evaluation explicitly informs their acquisition process—it is part of the form library staff are expected to fill out when requesting a new database (George Brown College, 2008). However, many studies did recommend that library staff either include accessibility criteria in their procurement policies or perform evaluations themselves in order to advocate and negotiate for more accessible databases (Bowman, 2002; Coonin, 2002; Riley, 2002, 2004; Stewart et al., 2005; Byerley et al., 2007; Dermody & Majekodunmi, 2011; Southwell & Slater, 2013; Blechner, 2015).

In most of the other cases, the results of an accessibility evaluation—whether formal or informal— have been translated into user support, in the form of webpages or LibGuide pages that summarize accessibility features and issues for each of the library's databases (for example, The Open University, n.d.; also, Penn State University, n.d.; Austin Community College, 2015; Suffolk University, 2015; Syracuse University Libraries, 2015). In addition to helping users, this information can also provide support to front-line staff who may be assisting users. A few studies in particular emphasized the importance of accessibility evaluations in informing library services like reference and instruction (Bowman, 2002; R. Power & LeBeau, 2009; Dermody & Majekodunmi, 2011).

## 4.7 Sharing results

The majority of the examples we looked at were research studies, which generally took the form of verbal, qualitative analyses, with some data tables and illustrative graphs. Otherwise, evaluations were usually presented in the form of tables, either in spreadsheets, documents, or websites. The example

from UIUC is interesting because it is an “editable” table on a website, allowing library staff to submit updated evaluations (UIUC, 2006). The evaluation form from George Brown College demonstrates how spreadsheets can be used with pre-defined options in drop-down menus (2008), while the example from Colorado State University shows how the “notes” feature can be used on spreadsheets to include additional information about each criterion (2014).

One interesting non-library example is the W3C’s WCAG-EM Report Tool (2015). This tool is presented as a paged web form that guides evaluators through the process of an accessibility evaluation. Once the evaluator completes the form, the results are presented in a tabular format. Out of all the accessibility evaluations we reviewed, this was the most sophisticated and contemporary approach. The W3C tool’s provision of in-context guidance offers a good model on which Ontario college libraries can base their own tool.

Many libraries shared their evaluation results by publishing their findings in journals or posting them on their website. Only a few examples demonstrated actual inter-library collaboration on evaluations: the abandoned ASCLA wiki (2014), Libraries for Universal Accessibility’s VPAT repository (2015), and OCU’s upcoming VPAT initiative. It seems accessibility evaluation is an area that would benefit from pooling resources, and Ontario college libraries could pave the way for greater collaboration among libraries.

#### 4.8 Resource types

One important thing to remember in the library context is that both the *interface* and the *content* of databases will need to be evaluated. While web accessibility guidelines can apply to web-based database interfaces, evaluating the content of these databases may require additional considerations.

Given their predominance in library databases, the accessibility of a database’s PDFs must be evaluated. Both Nganji (2015) and Splendiani and Ribera (2015) examined this explicitly, though a few other researchers commented on it briefly. Turró (2013) investigated the accessibility of PDFs in general and found that PDFs could potentially conform to all but two of the 65 WCAG 2.0 success criteria. However, the actual accessibility of PDFs can vary greatly, based on the authoring tools and guidelines used by their creators. As Turró explains, there are four levels of PDF accessibility: PDF image, PDF text, PDF with ordered text, and tagged PDF (2013, p. 27). Nganji found that while 97% of the PDFs in the journals they examined were of a version that could support tagging, only 14% were actually tagged (2015, p. 6). Many vendors provide access to archives of older material, which may have been digitized but not processed using Optical Character Recognition (OCR) software, thus leaving them as inaccessible, image-only PDFs. Even for born-digital material, creating a properly tagged PDF requires post-processing that is rarely part of a publisher’s guidelines for authors or a vendor’s ingest procedures (Nganji, 2015, p. 8). Additionally, vendors usually provide access to content from multiple publishers, and claim they are not responsible for this content, even though it is hosted on their platform (Stewart et al., 2005, p. 275; DeLancey, 2015, p. 107). PDFs thus require close scrutiny to ensure they are accessible, or that alternative formats (e.g. HTML) are provided. The PDF/UA ISO standard, the Matterhorn Protocol, and the W3C’s PDF techniques for WCAG can serve as useful guidelines for assessing the accessibility of PDFs (ISO, 2014; PDF Association, 2014; W3C, 2014c).

While some of the evaluations we found addressed visual media (Southwell & Slater, 2012; Splendiani & Ribera, 2015), very few addressed multimedia content such as audio and video materials (George Brown College, 2008; Niagara College, 2014). As many college libraries subscribe to databases with multimedia content, this must be kept in mind when developing accessibility criteria. WCAG 2.0 guidelines also address multimedia content (W3C, 2008).

Another important consideration is regarding special collections and institutional repositories, which were examined in three articles (Southwell & Slater, 2012, 2013; Walker & Keenan, 2015). Though they are not traditionally considered “resources” because they are often hosted or developed locally, they are still databases of content that libraries provide to their users, and should thus be evaluated for accessibility in the same way. The benefit is that libraries may have greater control over these databases, which may make it easier to improve their accessibility.

#### 4.9 User types

By far, the user groups most addressed in library accessibility evaluations are blind and low-vision users, almost to the exclusion of other user groups. The only other group occasionally addressed is users who are deaf or hard of hearing, usually in the context of transcripts for audiovisual materials. While this narrow focus may seem inevitable given the dominance of textual and visual content in library databases, it is important not to forget other user groups, database interfaces, and content types.

Brajnik’s (2009a) barrier walkthrough method is useful to consult here, as it provides a list of possible website accessibility barriers for a wide range of user groups: users who are blind, users who have low vision, users who are colour-blind, users with hearing impairments, users with motor impairments, users with cognitive disabilities, and users with photosensitive epilepsy. Accessibility evaluations should “address the needs of people with all disabilities, balance the needs of people with differing disabilities, and match those needs to optimal techniques” (W3C, 2014a).

Blechner created a user persona to carry out their evaluation (2015, p. 147). User personas are hypothetical archetypes that represent real users during the design process (Henry, 2007). According to Henry, a persona includes “specific characteristics, demographics, and experience levels from a user profile, for example, a specific hardware and software configuration ... [and] personal details such as behaviors, attitudes, motivations, and goals” (2007). In the context of accessibility testing, a user persona would also include a “description of the limiting condition” and information about any adaptive tools used, including the user’s level of experience with the tool and their frequency of use (2007). User personas can be constructed from empirical data. As Pearson et al. write, “[t]he aim is to enable developers, designers, managers, and other stakeholders to develop empathy for their end-users, to think from the user’s perspective and to put into context the application of guidelines” (2011, p. 30).

User groups are often very generalized, and evaluators may incorrectly assume that all users in a particular group will encounter the same accessibility problems. User personas allow for a degree of specificity that may be helpful during the evaluation process. For example, when evaluating a resource,

should an evaluator assume a user who is blind is using the default settings on their screen reader, or that they have customized the settings to meet their needs (and if so, how)? Questions like these could very well result in different evaluations of accessibility criteria, depending on how those criteria are worded. A user persona would provide enough detail to resolve these ambiguities. While creating user personas may or may not be desirable or feasible for this project, it is important to avoid over-generalizing user groups and to consider the human factor.

#### 4.10 Usability

There is one common refrain throughout the literature: accessibility does not equal usability (Byerley & Chambers, 2002; Coonin, 2002; McCord et al., 2002; Riley, 2002; Stewart et al., 2005; Byerley et al., 2007; Haanperä & Nieminen, 2013; Blechner, 2015). Byerley et al. observe that while “[i]t may be technically possible for people who use assistive technologies to perform a given task within a database ... that does not mean they can execute the task gracefully” (2007, p. 526). Vendors can claim technical compliance with accessibility standards like Section 508 or WCAG 2.0, but the database may still not be usable in the real world. As Riley writes, “[m]aterial must be usable to be truly accessible” (2002, p. 186).

We have already seen that usability tests are more effective at identifying accessibility problems than conformance reviews (Rømen & Svanæs, 2011; C. Power et al., 2012). Consequently, many researchers stress the importance of conducting actual usability tests with real users (Coonin, 2002; Stewart et al., 2005; McCord et al., 2002; Southwell & Slater, 2012; Haanperä & Nieminen, 2013). As the W3C’s wiki on accessibility testing reads, “Accessibility guidelines and tools help bridge ... experience gaps. However, they are a supplement, not a replacement, for empathic imagination, technical ingenuity, and talking to users” (W3C, 2014a). However, it was also noted that the time, skills, or resources needed for this may not be available to all libraries (Byerley & Chambers, 2002; Horwath, 2002; Stewart et al., 2005; Byerley et al., 2007). Other types of accessibility evaluations like conformance reviews are at least a step in the right direction.

## 5. Recommendations

Following the findings of our environmental scan, we would make the following recommendations for Ontario college libraries on developing an accessibility evaluation tool for eresources:

### 5.1 Competency building

1. Library staff should build competencies to support their understanding of accessibility evaluation methods. Libraries should avoid relying solely on vendor-supplied accessibility statements (including VPATs) because they are often incomplete and inaccurate. **(4.1 Evaluation methods)**
2. Libraries should not rely on automated evaluators (e.g. WAVE) exclusively, because they exclude many important accessibility criteria that can only be evaluated by humans. They can be used as tools to assist evaluators in carrying out their assessments. **(4.1 Evaluation methods)**
3. Libraries should recognize that accessibility does not necessarily equal usability. An eresource can meet all accessibility requirements but still not be usable. Conducting real usability tests with real users will provide the best results. Libraries are encouraged to perform usability tests with users with disabilities wherever possible, and advocate for vendors to do the same. **(4.10 Usability)**

### 5.2 Tool development

1. Libraries should attempt to compensate for the limitations of the conformance review approach when developing their evaluation tool. Conformance reviews depend on the expertise of the evaluator and the quality of the underlying criteria, and may encourage “easy compliance” over true accessibility. **(4.1 Evaluation methods)**
2. Libraries should investigate the barrier walkthrough approach proposed by Brajnik to see if it can be adopted for their needs. The barrier walkthrough approach has produced better results than conformance reviews, especially when performed by non-experts. **(4.1 Evaluation methods and 4.5 Evaluation by non-experts)**
3. Libraries will need to develop their own criteria checklist, based on WCAG 2.0 and similar resources found in our environmental scan. These criteria should attempt to achieve a balance between quantity and specificity. WCAG 2.0 criteria are too technical and too lengthy for libraries to use in its entirety. They are also difficult to test, especially by non-experts. **(4.2 Evaluation criteria)**



4. Libraries should avoid pre-assigning priority or severity levels to criteria when developing their evaluation tool. Pre-assigned levels are likely to be extremely inaccurate because they do not consider different user types and usage scenarios. **(4.2 Evaluation criteria)**
5. Libraries should not forget to address user groups beyond those with visual impairments when developing evaluation criteria. It is important to find a way to balance the needs of differing user groups. It is also important not to over-generalize user groups. User personas might be considered as a way to bring a human element to evaluations. **(4.9 User types)**
6. Libraries will need to develop an evaluation tool that provides evaluators with easily testable criteria, as well as instructions to guide them through the process. The Accessibility Evaluation Assistant and the WCAG-EM Report Tool provide two good examples of how this can be achieved. **(4.5 Evaluation by non-experts and 4.7 Sharing results)**
7. Libraries will need to assess any tool they develop for its effectiveness, efficiency, and usefulness. Brajnik provides a good framework for this. **(4.4 Quality of evaluation methods)**
8. Libraries should ensure their evaluation criteria address the content of resource databases, not just the interfaces. For example, the PDF/UA ISO standard, the Matterhorn Protocol, and the WCAG Techniques for PDFs should be used to develop criteria for evaluating PDFs. WCAG 2.0 provides criteria that can be used for evaluating multimedia content. **(4.8 Resource types)**

### 5.3 Tool implementation

1. Libraries will need to provide their staff with access to automated evaluators, developer tools, and/or assistive technology in order for them to carry out accessibility evaluations. There are a number of free options that can be explored. Library staff should develop familiarity with these tools and/or build relationships with AT and IT experts at their institution. **(4.3 Evaluation tools)**
2. Libraries should incorporate accessibility evaluations into their resource procurement processes. Additionally, the results of evaluations should be translated into user support, reference services, and instruction, wherever possible. **(4.6 Use in libraries)**
3. Libraries should put policies and procedures in place to ensure evaluations are refreshed periodically. **(4.6 Use in libraries)**
4. Libraries should collaborate on accessibility evaluations and share their results wherever possible. **(4.7 Sharing results)**

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