

IBM's WCAG 2.0 Compliance Costing Model

ANNUAL
INTERNATIONAL TECHNOLOGY &
PERSONS WITH DISABILITIES
CONFERENCE



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Our agenda



Project Overview

I/T Web Project Life Cycle

Sample sites & pages

Testing Results

Costing Model

Policy Considerations

Opportunities & Challenges

Why this presentation?

Our experience is relevant to organizations and web sites trying to estimate the costs of accessibility.



Project Overview

Questions that need answers:

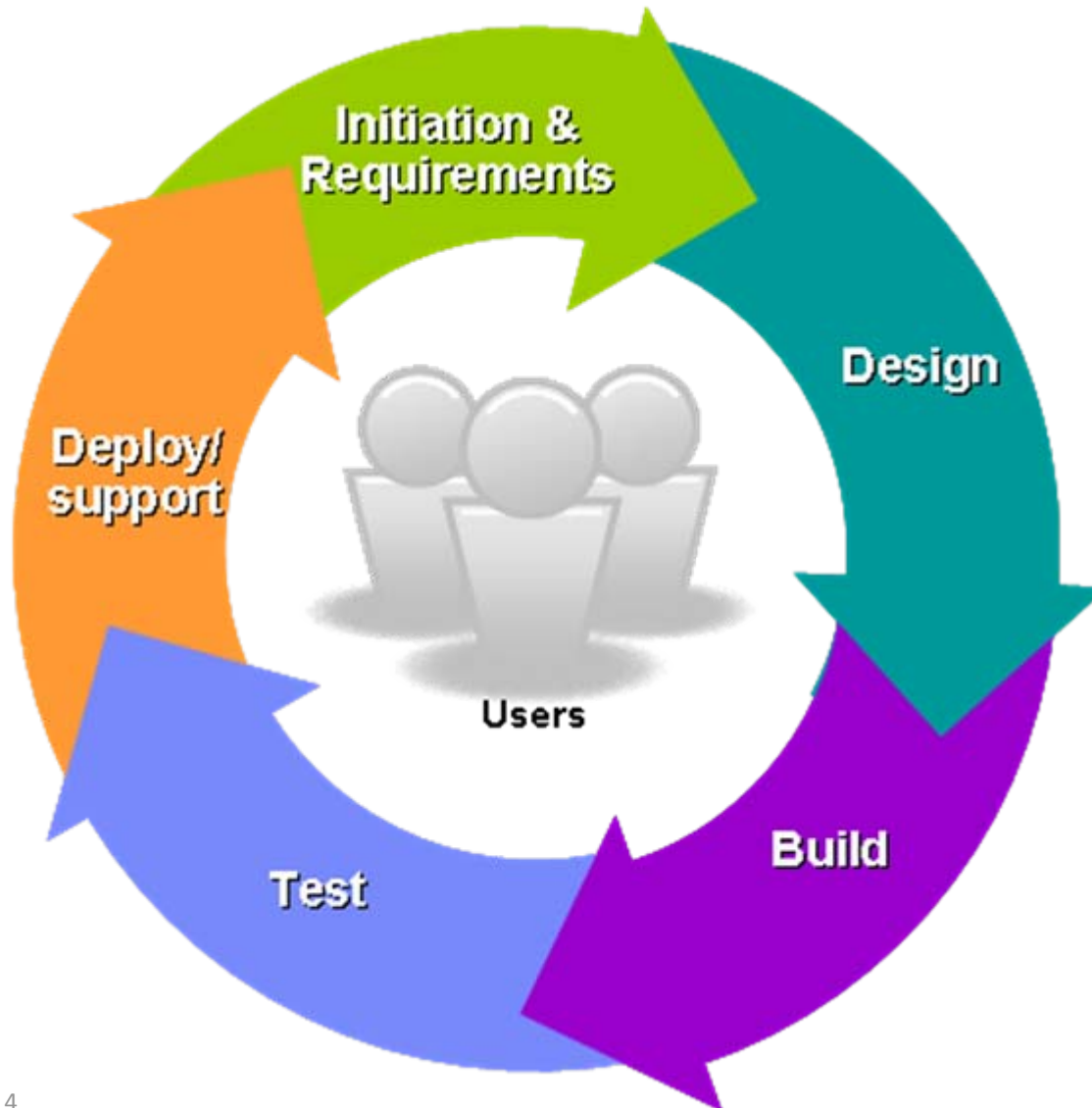
- What does it take to **make** a website accessible?
- What does it take to **keep** it that way?
- What are the opportunities and challenges?

Project Steps

- Identify candidate sites and sample pages
- Assess sample pages for accessibility
- Estimate cost to test, repair, and maintain
- How to apply project experiences to sites and policy

7 week timeline

I/T project life cycle (a simplified view!)



User experience, including accessibility and support for inclusive design, should be at the heart of your project – this can be integrated into every phase of the project.

Roles:

Activities:

Deliverables:

Web site refresh cycles

Two factors to consider

1. The look and feel (branding and navigation)
 - Expensive to update – design and significant coding changes. If you get accessibility wrong, it can be broken everywhere.
2. The content – e.g. seasonal hours of operation, ‘contact us’, online restaurant menu, new products and services.
 - This information can be relatively dynamic and may change frequently.
 - Compliance is a problem if the CMS is not enforcing the presentation style

How often do organizations update their sites ?

- Consensus from 5 web developer interviews
 - Static sites seem to be updated every 3 years, with a refresh of look & feel, navigation, menus, branding, and certainly refresh of content & technology
- Our test sample (10 sites)
 - Refresh periods varied over time. Anecdotal and a small sample.
 - In the last 5 years, most of our sites appear to have been refreshed on a cycle of < 2 years.

Sites selected and description

99% of businesses¹

Company Size / Site complexity	Small	Medium	Large
Static web pages	A1 Restaurant A12 Township	B1 Insurance	C1 Restaurant chain
Dynamic	A2 Online magazine	B2 University department	C2 National Retailer C22 Government department
E-commerce		B3 Computer retailer	C3 Automaker online store

Most businesses are small businesses

Canadian experience

- 380,000 businesses
- small and medium
 - 1 to 49 employees: 94.8 %
 - 50 to 200 employees: 4.2 %
 - 1 to 200 employees: 99.0 %
- large
 - > 200 employees: 1.0 %

Site pages tested

Company Size / Site complexity	Small	Medium	Large
Static web pages	<p>A1: 5 of 8 Homepage, Contact, About Us, Menu, Press</p> <p>A12: 5 of 154 Homepage, Contact, Map, Community Events, News & Announcements</p>	<p>B1: 5 of 46 Homepage, Forms, News, Contact, Sign In</p>	<p>C1: 6 of 50 Homepage, Location/hours, Nutrition calculator, Community, Card, FAQ</p>
Dynamic	<p>A2: 5 of 380 Homepage, Registration, Search Results, Video Page, Blog Page</p>	<p>B2: 6 of 126 Homepage, Permission forms, Graduate studies list, Publications, Calendar</p>	<p>C2: 7 of 107 Homepage, Search results, Sign up, Locations, E-flyer signup, Weekly flyer, Sports, Golf</p> <p>C22: 5 of 14 Homepage, Welcome, FAQ, Introduction, Step 1</p>
E-commerce		<p>B3: 4 of 1,434 Create account, Product, Shopping Cart, Order Confirmation, (Third Party "Place Order")</p>	<p>C3: 5 of 201 Build and Price, Choose Model, Choose Options, Choose Accessories, Summary</p>

Testing methodology

The assessment team performs the assessment tasks, collects, and summarizes the findings.

Scope & Schedule

Perform Assessment

Validate Requirements

Optional Usability Assessment

Deliver Findings & Recommendations

* Impact Analysis & Sizing

* Remediation

Perform Assessment phase

- Create detailed application test cases
- Configure automated test tools, AT, and OS settings
 - ¹ Run test using automated test tools
 - ¹ Conduct test using Assistive Technologies
 - ¹ Conduct manual test using expert techniques
- Inventory and summarize findings
- Assign severity ratings to issues
- Review issues with technical stakeholders

LEGEND

Assessment

*Remediate

Note: ¹Comprehensive testing methodology

Testing results – number of issues

Company Size / Site complexity	Small	Medium	Large
Static web pages	63 issues	87 issues	200 issues
	68 issues		
Dynamic	248 issues	85 issues	32 issues
			160 issues
E-commerce		48 issues	28 issues

Notes:

1. Total number of issues does **not** reflect the relative effort to remediate issues.
2. Total does **not** always reflect the relative maturity of a site.
3. Total does **not** reflect the severity of various issues.
4. Total does **not** reflect the nature of a category of site.
5. Sample size is **not** large enough to draw conclusions.
6. Totals are **not** strictly comparable due to variance in number of pages assessed.

Testing results – types of issues & challenges

Company Size / Site complexity	Small	Medium	Large
Static web pages	<p>A1: identical ALTs, no keyboard, video ownership</p> <p>A12: no keyboard, confusing; staff content</p>	<p>B1: Easy to understand, predictable, parsing errors, good attachments</p>	<p>C1: Pretty good, except Nutrition calendar, parsing errors</p>
Dynamic	<p>A2: Advertising, “messy”, “accessible, just not usable”, parsing issues</p>	<p>B2: good text-based navigation; unreadable attachments</p>	<p>C2: 900 Parsing errors, large but “pretty good”, minor structure issues</p> <p>C22: Step 1 focus issue, by line navigation</p>
E-commerce		<p>B3: Horrible code, “busy”, 3rd party transaction</p>	<p>C3: flash front end (not tested), On input error</p>

WCAG 2.0 Success Criteria and Techniques

4 Principles
12 Guidelines
38 Success Criteria (A + AA)
100's Techniques

Perceivable

- 1.1 Text alternative
- 1.2 Time-based media
- 1.3 Adaptable
- 1.4 Distinguishable

Understandable

- 3.1 Readable
- 3.2 Predictable
- 3.3 Input Assistance

Operable

- 2.1 Keyboard Accessible
- 2.2 Enough time
- 2.3 Seizures
- 2.4 Navigable

Robust

- 4.1 Compatible

4 Principles/ 12 Guidelines

- 61 Success Criteria
 - 25 Level A
 - 13 Level AA
 - 23 Level AAA

Understanding WCAG 2.0

- Rationale and Benefits
- Examples
- Sufficient Techniques

WCAG 2.0 Techniques

- General (G1-G199)
- HTML (H2-H91)
- CSS (C6-C63)
- SCRIPT (SCR1-37)
- SERVER (SVR1-4)
- SMIL (SM1-14)
- TEXT (T1-T3)
- ARIA (ARIA1-4)
- Common Failures (F1-F89)

How to Meet
Interactive – gives views by priority and technology

Issues/topics by WCAG 2.0 Success Criteria

	A	B	C	D	E
1	Issue	WCAG	WCAG#	Topics covered	Technique
2	ALT incorrect	Non-text content	1.1.1	ALT missing ALT should be empty ALT too long ALT not accurate	H24: Providing text alternatives for the area elements of image maps G94: Providing short text alternative for non-text content that serves the same purpose G82: Providing a text alternative that identifies the purpose of the non-text content G144: Ensuring that the Web Page contains another CAPTCHA serving the same purpose G143: Providing a text alternative that describes the purpose of the CAPTCHA
3	CAPTCHA inaccessible	Non-text content	1.1.1	Using visual-only means of confirming human user	
4	Content missing structure	Info and Relationships	1.3.1	Headings missing Lists missing Table poorly used as layout Using bold instead of semantic markup Missing labels for form fields NOTE: Title missing covered separately)	F49: Failure of Success Criterion 1.3.2 due to using an HTML layout table that does not make sense when linearized H49: Using semantic markup to mark emphasized or special text H44: Using label elements to associate text labels with form controls H25: Providing a title using the title element
5	Content not ordered properly	Meaningful Sequence	1.3.2	Using an HTML layout table that does not make sense when linearized	
6	Contrast insufficient	Contrast (Minimum)	1.4.3	Text without sufficient contrast from background	
7	HTML - improper use	Name, Role, Value	4.1.2	Invalid characters used Deprecated HTML used	H88: Using HTML according to spec
8	Inaccessible attachments	N/A		Documents linked or embedded in page are not accessible	
9	Instructions or context needed	Labels or Instructions	3.3.2	Unclear labels Unclear headings Inadequate instructions or context for form fields Label not well positioned	G131: Providing descriptive labels G130: Providing descriptive headings G184: Providing text instructions at the beginning of a form or set of fields that describe the form or set of fields G162: Positioning labels to maximize predictability of relationships
10	Keyboard inaccessible	Keyboard	2.1.1	Mouse-only based event handlers (e.g., onmouseover) Incorrectly emulating links with scripting	F42: Failure of Success Criterion 1.3.1 and 2.1.1 due to using scripting events to emulate mouse events
11	Keyboard trap	No Keyboard Trap	2.1.2	Can't escape from control	
12	Language missing	Language of Page	3.1.1	LANG value not set on page	
13	Link unclear	Link Purpose (in Content)	2.4.4	Link name not clear Link purpose not obvious	
14	Markup incorrect	Parsing	4.1.1	Tag missing	F70: Failure of Success Criterion 4.1.1 due to incorrect use of start and end tags or a mismatch between the two
15	Navigation - "skip to" missing	Bypass Blocks	2.4.1	Skip to missing	
16	No captioning on audio or video	Time-Based Media	1.2	The subsections of 1.2 are very specific. Will break out as we encounter	
17	Other				
18	Title missing or inadequate	Page Titled	2.4.2		G88: Providing descriptive titles for Web pages H25: Providing a title using the title element

Costs of Web Accessibility remediation

– Hours of effort by role

	12 Guidelines		25 Success Criteria (Level A)	Biz	Mkt	PM	Ach	Dev	QA	TW	
1.1	Text Alternative	1.1.1	Non-Text Content	4 ¹		*	1	1	*		All
1.2	Time-based Media	1.2.1	Audio-only and Video-only (Prerecorded)	1		*	1	1	*		+ \$ 2.25 / min
		1.2.2	Captions (Prerecorded)	1		*	1	1	*		+ \$ 4.00 / min
		1.2.3	Audio Descriptions or Captions (Prerecorded)	1		*	1	1	*		+ \$ 2.25 / min
1.3	Adaptable	1.3.1	Info and Relationships			*	2	8	*		All
		1.3.2	Meaningful Sequence			*	1	2	*		none
		1.3.3	Sensory Characteristics			*	1	2	*		none
1.4	Distinguishable	1.4.1	Use of colour			*	.5	1	*		none
		1.4.2	Audio Control			*	.5	8	*		none
2.1	Keyboard Accessible	2.1.1	Keyboard			*		4	*		8/10
		2.1.2	No Keyboard Trap			*		24	*		none
2.2	Enough Time	2.2.1	Timing Adjustable	2		*	2	4	*		none
		2.2.2	Pause, Stop, Hide	4		*	1	8	*		1 site
2.3	Seizures	2.3.1	Three Flashes or Below Threshold			*		.25	*		none
2.4	Navigable	2.4.1	Bypass Blocks			*	1	8	*		9/10
		2.4.2	Page Title			*	.1	1	*		6/10
		2.4.3	Focus Order			*	.5	12	*		2/10
		2.4.4	Link Purpose			*	.1	1	*		8/10
3.1	Readable	3.1.1	Language of Page			*		.25	*		9/10
3.2	Predictable	3.2.1	On Focus			*		12	*		1 site
		3.2.2	On Input			*	1	12	*		4/10
3.3	Input Assistance	3.3.1	Error Identification			*	.5	8	*	5	Help, Tutorials
		3.3.2	Labels or Instructions	1		*	.5	4	*		7/10
4.1	Compatible	4.1.1	Parsing			*		1	*		All
		4.1.2	Name, Role, Value	1		*	4	8	*		2/10

Costs of Web Accessibility remediation

– Hours of effort by role (Level AA)

	12 Guidelines		13 Success Criteria (Level AA)	Biz	Mkt	PM	Ach	Dev	QA	TW	
1.1	Text Alternative	1.1	Text alternatives								
1.2	Time-based Media	1.2.4	Captions (Live)	4		*	1	1	*		none
		1.2.5	Audio Description (Prerecorded)	1		*	1	1	*		5/10
1.3	Adaptable	1.3	Adaptable								
1.4	Distinguishable	1.4.3	Contrast (4.5:1 minimum)			*	6	3	*		4/10
		1.4.4	Resize text			*		8	*		none
		1.4.5	Images of text			*	2	1	*		1 site
2.1	Keyboard	2.1	Keyboard Accessible								
2.2	Enough Time	2.2	Enough Time								
2.3	Seizures	2.3	Seizures								
2.4	Navigable	2.4.5	Multiple Ways			*	4	8	*		3/10
		2.4.6	Headings and Labels			*	1	2	*		none
		2.4.7	Focus visible			*		8	*		2/10
3.1	Readable	3.1.2	Language of Parts			*		.5	*		none
3.2	Predictable	3.2.3	Consistent Navigation			*	.5	1	*		none
		3.2.4	Consistent Identification			*	.5	1	*		none
3.3	Input Assistance	3.3.3	Error Suggestion	1		*	.5	4	*		1 site
		3.3.4	Error Prevention (Legal, Financial)	1		*	.5	4	*		none
4.1	Compatible	4.1	Compatible								

Example rates by role

Large ICT businesses

\$130	Level 2	Business Owner
\$72	Level 1	Marketing
\$83	Level 1	Project Manager
\$115	Level 1	Architect
\$115	Level 1	Designer
\$83	Level 1	Developer
\$83	Level 1	Tester/QA
\$72	Level 1	Technical writer

Rates per day (7.25 hrs)

Level 1 = 2-4 years,

Level 2 = 4-9 years,

Level 3 = 10+ years of experience

Small ICT businesses

Rates approx. \$40 to \$100

15 page sites range from
\$3k to \$5k

Surveyed 5 small businesses

Preliminary survey – 5 web development teams

A very small and unscientific sample

- 5 web development businesses (2 sole-proprietor, 3 teams (6, 20 , 60))

Common themes

- Small sites (< 10 pages) are still reasonable candidates for an HTML solution
- Most sites are now implemented with a Content Management System (CMS)
 - CMS allows the end client to maintain their own site content
 - Emerging support in CMS for accessibility standards (Drupal, WordPress)
 - Some consultants have a proprietary CMS – this will be problematic
- New sites?
 - 10 to 15 pages cost in the range of \$3,000 to \$5,000 – with an open-source CMS
 - Municipalities – publicly available information (newspaper article) – refresh the look and feel and the information architecture of 4 municipal web sites @ \$57,000 with AODA (WCAG 2.0 AA) compliance - 8 years since last refresh
- Knowledge of accessibility and standards
 - General awareness (5 of 5)
 - Some consultants seem to have a good understanding (4 of 5 in this sample)

Sample Remediation costs

Company Size / Site complexity	Small	Medium	Large
Static web pages	A1: \$ 4.5k – \$ 18.5k 50 hours to 199 hours A12: \$ 4.8k - \$ 16.4k 53 hours to 184 hours	B1: \$ 4.8k - \$ 16k 52 hours to 178 hours	C1: \$ 12.4k - \$ 32.3k 134 hours to 349 hours
Dynamic	A2: \$ 10.3k - \$ 34k 112 hours to 382 hours	B2: \$ 4.5k - \$ 21.2k 50 hours to 247 hours	C2: \$ 9.2k - \$ 34.8 100 hours to 385 hours C22: \$ 2k - \$ 10k 24 hours to 115 hours
E-commerce		B3: \$ 3.7k - \$ 19.9k 41 hours to 224 hours	C3: \$ 2.4k - \$ 13.5k 27 hours to 152 hours

Notes:

1. Level A + AA costs for Business Analyst, Architect, Design, Development, & minimal Project Management (remediation costs did not include QA/Test)
2. Only costs to remediate 5 sample pages are shown.
3. Some remediation costs quickly exceed site redesign costs
4. Ranges reflect variability in site design, technology choices, and accessibility requirements themselves.

Example of variability

3.3.2 Level A Provide labels - Labels and input instructions

Sighted user sees the 'Search' button

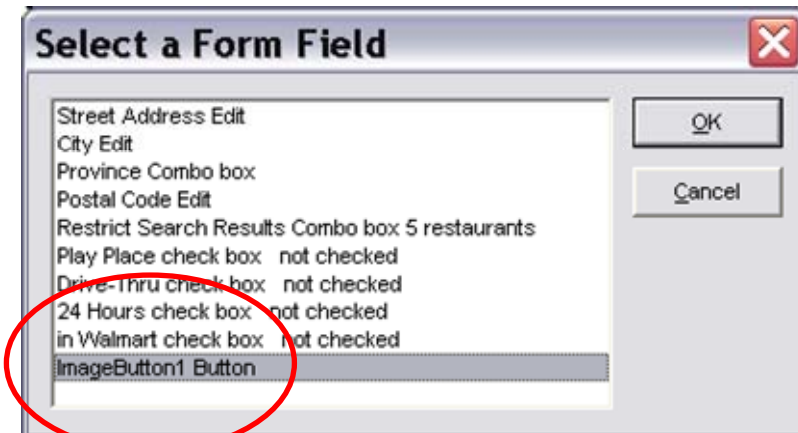
below. To refine your search further, enter a postal code or address, or select from the specific restaurant features listed below.



LIMIT SEARCH RESULTS TO RESTAURANTS WITH THESE FEATURES:



Blind user hears "Image Button 1"



JAWS screen reader displays list of fields

Technology choice has greatest impact on variability of remediation costs

- Maintenance considerations
- When technology changes
- In-house custom built vs open source vs vendor
- Trends: Today's technology may not be tomorrow's problem

Example of variability

1.4.4 Level AA Resize Text - Non-HTML may not resize

Flash video player



Video content zooms - good,
but not player controls and labels don't - poor

Fix choice requires major re-work or major dependency

Site type and design impact maintenance costs

Company Size / Site complexity	Small	Medium	Large
Static web pages	<p>Poor page structure</p> <p>Poor navigation</p> <p>Poor design/template affect whole (but small) site</p> <p>Little CMS usage</p>	<p>Average page structure</p> <p>Uses CSS well</p> <p>Easy Navigation</p>	<p>Poor control labels</p> <p>Poor keyboard</p> <p>Poor page structure</p> <p>Poor navigation</p>
Dynamic	<p>Dependency on inaccessible Non-HTML unique user interface components</p> <p>Poor page structure</p> <p>Poor navigation</p>	<p>Document repository accessibility will be large burden to maintain accessibility of all the documents</p>	<p>Good Navigation</p> <p>Good Keyboard</p> <p>Good Form labels</p> <p>Needs nested headings</p>
E-commerce		<p>Transactions cannot be completed with keyboard</p> <p>Difficult to understand</p> <p>Poor form labels</p> <p>Poor page structure</p> <p>Poor navigation</p>	<p>Flash movies have no audio or text descriptions</p> <p>Poor keyboard</p> <p>Needs long description of pictures</p>

Note: Example of maintenance impacts

Costs assumed outside model framework

Technical and business IT costs

Project level overhead costs

Organizational costs

Technical and business IT costs

1. **Software tools** purchases and training
 - Automated tools like IBM Rational Policy Tester, a-Designer, etc.
 - Costs are still impact to business and out sourcing groups
 - Opportunity for government to provide automated tools to business?
2. **Technical accessibility skills training**
 - Architects, designers, developers, and testers
 - Assume the skills and resources are available
 - Costs are still impact
 - Opportunity for government to provide training?
3. **Technology accessibility enabled**
 - Newer technologies and proprietary toolkits may not yet be enabled
 - Newer technologies and proprietary toolkits may be better enabled
 - Alternative or redundant solutions driving costs to 50% and beyond.
4. **Return on Investment (ROI) not factored into model framework**
 - Increased sales, increased employee productivity, etc.
 - Studies and pilots needed

Costs assumed outside model framework – continued

Project level overhead costs

5. **Schedule**

- Model framework assume its part of an existing project - so no schedule delay/costs due to additional accessibility testing for example.

6. **Project overhead**

- - its part of an existing project - so no additional costs for project management, regression testing, etc.

Organizational/Enterprise costs

7. **User Accommodations & support**

- Costs for ensuring that employees, citizens, and end users have a reasonable level of supporting assistive technology, internet access, latest enabled browsers, and a supporting operating system platform and the amount of training required to configure and use the technology efficiently.

8. **Periodic Audits**

- Not included in the cost model, but are recommend to better maintain compliance. Measurements (scanning & testing) and reporting (including executive dashboards) drives accessibility compliance for the organization / province.

9. **Application portfolio management**

- Should include accessibility and other attributes such as quality, privacy, security, internationalization, etc. - assumed are in place

10. **Document Management**

- Additional costs depending on business/organization.

Policy Considerations

Ownership of the problem / content – will require applicability guidance

- Content vs hosting vs links
 - Own content but not hosting environment (uncaptioned video on YouTube)
 - Own hosting environment but not content (documents & web services from others)
 - Own both (applicable) and/or links (not applicable)
- 3rd party services and components/widgets (who and when in life cycle)

Evolving technologies – will require updates to policy

- Mobile devices (platforms, service providers, content owners, etc.)
- HTML 5 (?)
- 3D Internet (i.e., Second Life – it's peaked)

Conformance claims guidance

- **Platform:** Which OS and browser to test? (Usage, ubiquity; which browser to recommend?)
- **Testing tools:** Which tools to use to make claims? (Cost, ease of use, supporting AA criteria)
- **Assistive Technology:** Which AT to make claims? (JAWS, ZoomText, AT failure, down level versions, etc.)

Canadian Accessibility Regulations

Ontario: Accessibility for Ontarians with Disabilities Act

- Covers BOTH public and private sector
 - 380,000 obligated organizations
- **Customer service** (like ADA)
- **Information and communication** (like ADA & S508)
 - All government (public sector) – WCAG 2.0 A now, AA phased in
 - Businesses with > 50 employees must provide WCAG 2.0 (A, later AA) web sites for customers
- **Employment**
 - I/T must support employees with disabilities, or organization must provide reasonable accommodation

Government of Canada

- WCAG 2.0 AA for all federal departments & agencies

The project identified challenges and opportunities

Our project challenges reflect the realities to be faced by web site owners

- Insufficient testing tools, under developed testing methods, uncertainty with guidelines, challenges with issue summarization, coordination of resources

Project challenges present policy governance opportunities

- Standardize on a testing/measurement tool. Use for government-approved enforcement and self-assessment
 - Robust; adaptable; role-based; clear output; reduced false positives
- Provide an intermediary checklist or tool for testing; such a tool could include a template for capturing issues
- Offer suggested methods and procedures
- Provide targeted and progressive education and goals
 - Priority and Severity

Do most businesses have the internal skills to maintain their own web sites?

In a word ... no.

87% of businesses have fewer than 20 employees (Statistics Canada 2009)

- Most of these organizations will not have an I/T person on staff
- They would typically outsource their web site development and maintenance (based on interviews with 5 web development companies)
- If the site is implemented in an accessible CMS, content can be well-maintained locally (consistent, accessible, and following the rules)
- I/T and related technology based businesses may have internal skills available – (see report under IT capacity & skills)

5.2 % of companies have 50 or more employees

- Reasonable to assume these companies may have I/T staff capable of developing and maintaining the web site.

Challenges & recommendations

Training - there's a significant learning curve – WCAG standards are complex to learn and use effectively.

- Colleges and Universities – fundamental inclusive design curriculum
- Practical & relevant training for web developers

Tools – for development and testing – different tools give different results

- Recommendations for candidate tools, potentially sponsor test tool(s)
- Work with vendors and open-source community (e.g. Drupal CMS)

Processes – templates

- A library of resources, especially helpful to small organizations
- Collaborate with international partners on reusable assets (e.g. G3ict.org)

Questions?



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