Web Content Accessibility of Disabled Community Sites in Korea

CHANG-KYO SUH, EUN-JU CHO
School of Business Administration
Kyungpook National University
1370 Sangyeok-dong, Buk-gu, Daegu, 702-701
KOREA
http://cafe.naver.com/knucio.cafe

Abstract: - This research study tries to provide an overview of the accessibility of disabled community to web sites in Korea. One hundred and seventy-two websites were examined to find out how accessible they are with reference to the Web Content Accessibility Guidelines 1.0. Using the web accessibility tool, Bobby 5.0, and Markup validation service from the World Wide Web Consortium (W3C), the study finds a disappointingly low level of website accessibility, and thus many disabled Koreans may have substantial problems in accessing sites set up for the disabled community.

Key-Words: Web Content Accessibility Guideline 1.0, Bobby 5.0, Disabled Community,

1 Introduction

As the Web continues to become a part of everyday life for us, more disabled persons will use computers in their daily life [1]. The power of the Web is in its universality. Access by everyone regardless of disabilities is an essential aspect [2]. Accessibility means access to information for all – focusing on people with disabilities and senior citizens. Ensuring accessibility improves the quality of life for such people by removing barriers that prevent them from taking part in many important life activities [13].

The World Wide Web Consortium (W3C) hosts the Web Accessibility Initiative (WAI). The WAI developed the Web Content Accessibility Guidelines (WCAG) to explain how to make web content accessible to people with disabilities. There are at least three main reasons for making websites accessible to people with disabilities [1]. First, making websites accessible is the right thing to do. Second, making websites accessible opens vast potential markets. Third, making websites accessible has spillover effect for all users.

Several pieces of research have been done to evaluate the web accessibility of various websites around the world. However, universal accessibility of websites has only become an issue in Korea recently. In our study, we analyzed website accessibility of Korean disability-related organizations, to which the majority of visitors should be the disabled.

2 Literature Review

2.1 Web Content Accessibility Guidelines 1.0 [13]

The Web Content Accessibility Guidelines (WCAG) explain how to make web content accessible to people with disabilities. The primary goal of these guidelines is to promote accessibility for all users, whatever user agent they are using or constraints they may be operating under. Following these guidelines will also help people find information on the Web more quickly. WCAG 1.0 contains fourteen guidelines, or general principles of accessible design, and sixty-five checkpoints for the guidelines. The checkpoint explain how the guidelines apply in typical content development scenarios.

A priority level has been assigned to each checkpoint based on the checkpoint's impact on accessibility:

[Priority 1]

A Web content developer ***must satisfy*** this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents. (See Appendix 1)

[Priority 2]

A Web content developer ***should satisfy*** this checkpoint. Otherwise, one or more groups will

find it difficult to access information in the document. Satisfying this checkpoint will remove significant barriers to accessing Web documents.

[Priority 3]

A Web content developer ***may address*** this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document. Satisfying this checkpoint will improve access to Web documents.

2.2 Markup Validation [14]

Validity is one of the quality criteria for a Web page. The process of verifying whether a document using Markup languages actually follows the rules for the language(s), such as grammar, vocabulary and syntax, is called validation. The Markup Validator, which is maintained by the W3C, checks the syntax of Web documents, written in formats such as (X)HTML. It compares HTML documents with the defined syntax of HTML, and reports any discrepancies. A document is valid when it is correctly written in accordance to the formal grammar.

2.3 Web Page Accessibility Research

Several pieces of research have been done to evaluate web page accessibility. Loiacono [7] conducted a study that specifically examined the web accessibility of the home pages of the Fortune 100. Many home pages contained some type of accessibility barriers. Only 6% were Bobby-approved based on Section 508 of the U.S. Code, while none were fully approved under the WAI guidelines. Williams & Rattray [10] studied the accessibility of UK-based hotel websites. The 100 were selected from around the UK on the basis of a search string. Utilizing the Bobby software as well as making some additional manual accessibility checks, the study found disappointingly low levels of website accessibilities. In addition, Williams & Rattray [11] compared web content accessibility of US and UK-based hotel sites. They ran the Bobby on the sample of hotel websites. Of these sites only 13 percent of the 85 UK and 6 percent of the 88 US sites passed those Priority 1 checkpoints Bobby was able to assess. Jaeger [4] also assessed Section 508 compliance of federal e-government websites. By employing policy analysis, user testing, expert testing, automated testing, and a survey of federal Web developers, his study provided a multidimensional, user-centered portrait of the levels of accessibility of federal e-government websites, reasons for the current levels of accessibility, and perceptions towards accessibility. Shi [8] examined three hundred and twenty-four Chinese local government websites to find out how accessible they were with reference to the WCAG 1.0. He found that all the surveyed Chinese e-government websites failed one or more W3C's accessibility measures, and thus concluded that many disabled Chinese people may have substantial problems in accessing them.

Although study of web accessibility in Korea has not been popular so far, universal accessibility to web sites is becoming critical in Korea. Lee [6] analyzed the accessibility of major 20 Korean websites and 12 local government websites based on W3C's WCAG 1.0. The results showed that the average number of accessibility errors per website is 2.77, much higher that that of US ones. Hong et al. [3] also compared Korean and US government web site accessibility. They used A-Prompt software to analyze web sources and applied manual tests by Home Page Reader. They found 565 errors and 79 errors from 4 Korean and 4 US government websites respectively. Lee et al. [5] also used A-prompt software to analyze the web accessibility of the education contents that government approved and private cyber universities provided. The results showed that most of the contents were not good in terms of recognition, operation, easy understanding and progression in technology.

3 Methodology

3.1 Research Objects

Previous studies have usually analyzed the web accessibility of e-government [3, 4, 6, 8], corporate companies [6, 7, 10, 11], and cyber universities [5]. WCAG 1.0 aims to make web content accessible to people with disabilities. Hence, examining the accessibility of websites for the disabled has its own practical significance. We intended to analyze websites whose major objectives are to provide information to the disabled. The Korean Society for Rehabilitation of Persons with Disabilities (KSRPD) (http://www.freeget.net) provides an address book for 5,442 public and private sector organizations for the disabled. From the directory of KSRPD we got general information such as address, phone number and URL for 521 associations and 391 schools on July 10, 2007. Among 912 organizations, 84 associations' websites

and 88 schools' websites can be accessed by Internet Explorer(IE) 6.0 running under Windows XP.

3.2 Evaluation Tools

Although there are many web accessibility testing tools available, the Bobby Web Accessibility Checker was run on the web pages of the sample of sites.

Bobby is a comprehensive web accessibility checker to desktop tool designed to help expose barriers to accessibility and encourage compliance with existing accessibility guidelines, including Section 508 of the US Rehabilitation Act and the W3C's WCAG [9]. Each homepage of the 172 websites was checked using Bobby Online Free Portal under IE 6.0. All the homepages were examined successfully between July 16 and July 20, 2007. Table 1 shows the composition of the examined 172 websites.

<Table 1> Examined Korean the disability-related websites (n = 172)

Organization	Frequency	Percent
Associations	84	48.8%
Schools	88	51.2%
Total	172	

In addition to the web accessibility testing, we used the free service of Markup Validator by W3C that helps check the validity of Web documents. Validating Web documents is an important step which can dramatically help with improving and ensuring their quality.

4 Results

The most common error of Priority 1 checkpoints is that they provide no alternative text for each non-text element (checkpoint 1.1): 171 websites (99.4%). Web sites had this problem with an average 23.8 instances per site. Only one website did not have this type of error. The second common error of Priority 1 checkpoints is that no title is given for each frame to facilitate frame identification and navigation (checkpoint 12.1): 100 websites (58.1%). Web sites had this problem with an average 2.0 instances per site.

For Priority 2 checkpoints, all websites failed to clearly identify the target of each link (checkpoint 13.1): 172 websites (100%). Web sites had this problem with an average 9.1 instances per site. The second common error of Priority 2 checkpoints is that they do not use relative rather than absolute units in markup language attribute values and style sheet property values (checkpoint 3.4): 141 websites (82.0%). Web sites had this problem with an average 59.4 instances per site. (See Table 2 and Appendix 2 for details)

<Table 2> Top 5 errors of Priority 1 and 2 checkpoints

	Checkpoints	Sites with errors	
		No.	%
Priority 1	1.1 Provide a text equivalent for every non-text element	171	99.4%
	12.1 Title each frame to facilitate frame identification and navigation	100	58.1%
	11.4 Provide a link to an alternative page that uses W3C technologies	40	23.3%
	6.2 Ensure that equivalents for dynamic content are updated when the dynamic contents changes	39	22.7%
	1.2 Provide redundant text links for each active region of a server-side image map	1	0.6%
Priority 2	13.1 Provide metadata to add semantic information to pages and sites	172	100%
	3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.	141	82.0%
	3.2 Create documents that validate to publish formal grammars	130	75.6%
	9.3 For scripts, specify logical event handlers rather than device-dependent event handlers	68	39.5%
	12.4 Associate labels explicitly with their controls	64	37.2%

<Table 3> Average Priority 1 and 2 error types

	Organization	Error types		Error instances	
		Mean	SD	Mean	SD
Priority 1	Associations	1.50	0.87	24.96	33.76
	Schools	1.56	0.86	26.00	31.64
Total		2.00	0.86		
Priority 2	Associations	3.14	1.51	80.00	105.0
	Schools	3.10	1.34	53.00	73.00
Total		3.12	1.44		

Table 3 shows the average Priority 1 and 2 error types and instances relating to Associations and Schools. On average, Schools have more Priority 1 errors than Associations, whereas Schools have fewer Priority 2 errors than Associations.

<Table 4> Markup Validation errors

	Associations	Schools	Total
PASS	3(4%)	0	3(2%)
ERROR	59(70%)	66(75%)	125(73%)
FAIL	22(26%)	22(25%)	44(26%)
Total	84(100%)	88(100%)	172(100%)

Table 4 summarizes the Markup Validation. Only 3 associations (4%) passed W3C's Markup Validation Service, whereas none of the schools passed. Disappointingly 44 websites (26%) even failed to validate the documents. The most common reason for this failure was that the documents contained one or more bytes that the Markup Validation tool could not interpret as the registered character encodings.

5 Discussion

We assessed the accessibility of registered websites using the directory of KSRPD. We found surprisingly low levels of website accessibility. The accessibility of those websites was even worse than that of government [6] and corporate websites [3]. Failing to provide a text equivalent for every non-text element is the most common problem identified. The simple method to remedy this error is to use the ALT attributes. This would cost almost nothing, but take some time [8]. The result of Markup Validation was also disappointingly low. Only 3 websites (2%) passed the validation. A valid web page is not necessarily a good web page, but an invalid web page has little chance of being a good web page [14].

In summary, there is long way to go before Korean disabled community websites reach Tim Berners-Lee's ideal: Any user, anywhere, at any time of terminal, should be able to access information [9]. Therefore, it is highly recommended that the Korean disabled community should actively test the accessibility of websites with assistive tools and improve accessibility by adopting the recommendations from the automatic tools.

References:

[1] Carter, J. & Markel, M., "Web accessibility for people with disabilities: an introduction for web developers,"*IEEE Transactions on Professional Communication*, 44(4), 2001, pp. 225-233.

[2] Gillen, L., "The web accessibility initiative," *Intercom*, 2004, 51(1), pp. 25-26,

[3] Hong, S., Cho, J. & Lee, D. "Government website accessibility: comparison between Korea and the United States," *Information Systems Review*, 7(1), 2005, pp. 81-96. (in Korean)

[4] Jaeger, P. T., "Assessing section 508 compliance on federal e-government web sites: a multi-method, user-centered evaluation of accessibility for persons with disabilities,"*Government Information Quarterly*, 23, 2006, pp. 169-190.

[5] Lee, J., Lee. B., & Jang, B. "Analysis and evaluation of web accessibility for cyber education contents," *The Journal of Educational Information and Media*, 12(3), 2006, pp. 177-195. (in Korean)

[6] Lee, Y., "Web accessibility of major Korean web sites," *Journal of Information Technology Applications & Management*, 12(4), 2005, pp.33-44. (in Korean)

[7] Loiacono, E. T., "Cyberaccess: web accessibility and corporate America,"*Communications of the ACM*, 47(12), 2004, pp. 83-87.

[8] Shi, Y., "The accessibility of Chinese local government web sites: an exploratory study," *Government Information Quarterly*, 24(2), 2007, pp. 377-403.

[9] Watchfire Corporation, Bobby™ 5.0 Web Accessibility Testing, Available at: http://www.watchfire.com

[10] Williams, R. & Rattray, R., "UK hotel web page accessibility for disabled and challenged users,", *Tourism and Hospitality Research*, 5(3), 2004, pp. 255-267.

[11] Williams, R. & Rattray, R., "UK and US hotel web content accessibility: mandates for action,", *International Journal of Contemporary Hospitality Management*, 17(1), 2005, pp. 78-87.

[12] World Wide Web Consortium (1999). Checklist of Checkpoints for Web Content Accessibility Guidelines 1.0. Retrieved July 20, 2007, from http://www.w3.org/TR/WCAG10/

[13] World Wide Web Consortium (1999). Web Content Accessibility Guidelines 1.0: W3C Recommendation 5-May-1999. Retrieved July 20, 2007, from http://www.w3.org/TR/WCAG10/

[14] World Wide Web Consortium (2007). Markup Validation Service. Retrieved July 20, 2007, from http://validator.w3.org/

Appendix 1: Checklist of Priority 1 checkpoints for web content accessibility [12]

In General (Priority 1)
1.1 Provide a text equivalent for every non-text element
2.1 Ensure that all information conveyed with color is also available without color, for example from context or markup.
4.1 Clearly identify changes in the natural language of a document's text and any text equivalents (e.g., captions).
6.1 Organize documents so they may be read without style sheets.
6.2 Ensure that equivalents for dynamic content are updated when the dynamic content changes.
7.1 Until user agents allow users to control flickering, avoid causing the screen to flicker.
14.1 Use the clearest and simplest language appropriate for a site's content.
And if you use images and image maps (Priority 1)
1.2 Provide redundant text links for each active region of a server-side image map.
9.1 Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape.
And if you use tables (Priority 1)
5.1 For data tables, identify row and column headers.
5.2 For data tables that have two or more logical levels of row or column headers, use markup to associate data cells and header cells.
And if you use frames (Priority 1)
12.1 Title each frame to facilitate frame identification and navigation.
And if you use applets and scripts (Priority 1)
6.3 Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page.
And if you use multimedia (Priority 1)
1.3 Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation.
1.4 For any time-based multimedia presentation (e.g., a movie or animation), synchronize equivalent alternatives (e.g., captions or auditory descriptions of the visual track) with the presentation.
And if all else fails (Priority 1)
11.4 If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page.

Appendix 2: Priority 1 and 2 error types and instances (n = 172)

		Instances	Web sites with errors		Instances/site
			No.	%	
Priority 1	1.1 Provide a text equivalent for every non-text element	4068	171	99.4%	23.8
	1.2 Provide redundant text links for each active region of a server-side image map.	1	1	0.6%	1.0
	6.2 Ensure that equivalents for dynamic content are updated when the dynamic content changes.	47	39	22.7%	1.2
	11.4 Provide a link to an alternative page that uses W3C technologies.	68	40	23.3%	1.7
	12.1 Title each frame to facilitate frame identification and navigation.	201	100	58.1%	2.0
Priority 2	3.2 Create documents that validate to published formal grammars.	270	130	75.6%	2.1
	3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.	8378	141	82.0%	59.4
	6.5 Ensure that dynamic content is accessible or provide an alternative presentation or page.	25	25	14.5%	1.0
	7.4 Provide the ability to stop the refresh, do not create periodically auto-refreshing pages.	25	18	10.5%	1.4
	9.3 For scripts, specify logical event handlers rather than device-dependent event handlers.	773	68	39.5%	11.4
	12.4 Associate labels explicitly with their controls.	290	64	37.2%	4.5
	13.1 Clearly identify the target of each link.	1563	172	100.0%	9.1
	13.2 Provide metadata to add semantic information to pages and sites.	10	10	5.8%	1.0