

Web Accessibility of the Malaysian Public University Websites

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Abstract: *The accessibility of the Malaysian public university websites is crucial to make sure that all of the staff, students and visitors of the website have equal opportunities to access the university's information. Furthermore, with the objective to achieve high ranking web of universities or webometrics, it is important that the webmasters of the web to ensure that their web accessibility comply with the standards and guidelines. This paper evaluates the accessibility of the 20 public universities in Malaysia based on the Web Content Accessibility Guidelines (WCAG) 2.0 and Section 508 of the United States Rehabilitation Act. The result suggested that although there are some improvements have been made as compared to the findings from the previous studies, some actions need to be taken to ensure that the universities websites are accessible to everyone regardless of their ability, constraint and limitation. Among the issues that are important to be highlighted include distinguishability, keyboard accessibility, navigability, adaptability and text alternative for non-text elements.*

Keywords: Web Accessibility, Malaysian Public University, WCAG 2.0, Section 508

1. INTRODUCTION

Website is one of a must have tools to disseminate information to interested parties for any organisations. For university, among the parties that really interested to access the web are both prospective and current students, staff, visitor and university's alumni.

There has been an increased reliance among potential students on Internet-based information to support their decision making in choosing higher education program (Schimmel et al., 2010). This obviously put a greater demand for the universities to provide website as potential gateway for university communication with various stakeholders, particularly prospective students. Despite availability of relevant information for all stakeholders in general, and students in particular, it is essential for the university to secure universal accessibility to its website (Kamoun & Almourad, 2014).

While the users of the website come from various background and ability as well as their technology constraints and limitations such as the device and the browser that they used and the internet connection type and speed, the website should offer

the flexibility to entertain this issues. In other words, the website should be able to accommodate the accessibility based on the criteria of its user and their technology that they used.

According to Shawn (2006), the accessibility can be defined as the quality of a web site that makes it possible for people to use it - to find it navigable and understandable - even when they are working under limiting conditions or constraints. World Wide Web Consortium (W3C) (2009) defines web accessibility as people with disabilities can perceive, understand, navigate, and interact and that they can contribute to the Web.

Primarily, web accessibility focuses on people with disabilities. However, according to W3C (2005), under certain circumstances, such as a slow Internet connection, temporary disabilities (e.g. a broken arm), or people with changing abilities due to aging would also need to have an access for the website. An accessible website supposed to be designed to meet different user needs, preferences, skills and situations (W3C, 2005).

While previous web accessibility studies have been focusing on different scopes, deploying different

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tools, in which some of the studies are quite outdated, this study seeks to investigate the current state of the web accessibility of the public university's website in Malaysia based on the latest standard as set by W3C, Web Content Accessibility Guidelines (WCAG) 2.0.

This paper is organised as follows. Section 2 covers the literature review which includes the web accessibility standards, available tools as well as a review of past related studies on web accessibility. Section 3 presents the methods used in this study, while Section 4 presents the detailed results. Section 5 summaries the findings, set the limitation of the study and provides the directions for future research.

2. LITERATURE REVIEW

2.1 Web Accessibility Standards

Web Content Accessibility Guidelines (WCAG) has become the de-facto standard for web accessibility (Rømen & Svanæs, 2012). WCAG 1.0 was developed in the late 1990s and has been finalised in 1999 before the WCAG 2.0 has been proposed in 2000 and become official in 2008 by the World Wide Web Consortium (W3C). There are two standards and guidelines that currently being used; the Web Content Accessibility Guidelines (WCAG) 2.0 and Section 508 of the United States Rehabilitation Act.

2.2.1 Web Content Accessibility Guidelines (WCAG) 2.0

WCAG 2.0 covers a wide range of recommendations for making Web content more accessible. WCAG 2.0 states that a website must have content that is perceivable, operable, understandable and robust in order for anyone to use it (Rømen & Svanæs, 2012). WCAG 2.0 has four general principles of accessibility, 12 guidelines and 61 success criteria with three levels of conformance i.e. A (lowest), AA and AAA (highest).

In Malaysian context, Multimedia Development Corporation (MDeC) has fixed several criteria of web accessibility as specified under WCAG 2.0 in formulating Provider-Based Evaluation (ProBE) 2015. A Self-Assessment Manual for all the government websites including the public universities. Although the accessibility falls under the non-mandatory criteria, its requirement is important to increase the web usage and to improve user experiences.

Under that criteria, websites are required to comply with the requirements of Level A of Web Content Accessibility Guidelines (WCAG) 2.0 that allows a disabled person to use the website.

2.2.2 Section 508

With similar objectives of web accessibility, Section 508 of the United States Rehabilitation Act summaries the requirements for making websites accessible to individuals with disabilities. The Act outlines 16 standards that are used to define website accessibility. These standards detail out how different components of web sites need to be designed as to ensure more accessible web content (WebAiM, 2013).

2.2 Web Accessibility Tools

Apart from specifying the web accessibility criteria, specific tools are needed to objectively evaluate accessibility of a website. Presently, there are many tools made available for evaluating website accessibility. Accessibility Valet, AChecker, Cynthia Says, EvalAccess, FAE, MAGENTA, OCAWA, TAW, WAVE and Web Accessibility Checker are the top-10 free tools that are available on the net (Source: <http://usabilitygeek.com/10-free-web-based-web-site-accessibility-evaluation-tools>).

Table 1. Comparison of the Accessibility Tools for Accessibility Standard

Tool	Accessibility Guidelines Referenced			
	WCAG1	WCAG2	Sec508	Other
Accessibility Valet	Yes	No	Yes	No
AChecker	Yes	Yes	Yes	W,B,S
Cynthia Says	Yes	No	Yes	No
EvalAccess	Yes	No	No	No
FAE	No	No	No	I
MAGENTA	Yes	No	No	V,S
OCAWA	Yes	No	No	R
TAW	Yes	Yes	No	M
WAVE	Yes	Yes	Yes	No
Web Acc Checker	Yes	Yes	Yes	B,S

Source: <http://usabilitygeek.com/10-free-web-based-web-site-accessibility-evaluation-tools>

Those tools are very useful to ensure the website meets certain accessibility standards. Table 1 shows the comparison of standards that can be tested using the tools listed above. By using the appropriate tools, any issues related with the website accessibility can be detected. Thus, the webmaster may repair such errors (if any) and ultimately improves the quality and the performance of the website. WAVE is one of the primary tool recommended by Multimedia Development Corporation (MDeC) for checking the web accessibility by Malaysian Government website.

2.3 Past Studies

There are a few recent studies that has been conducted on the Malaysian universities website, such as Abdul Aziz, Wan Mohd Isa and Nordin (2010) who focused on creating awareness of the importance of accessibility and usability criteria. Examination of 120 universities, polytechnics and community colleges websites revealed that most of the websites require serious attention with various issues of web usability and accessibility.

Abuaddous, Jali and Basir (2013), diagnosed the accessibility of the Malaysian public higher institutions website by comparing the accessibility results in 2012 and 2013 based on the Web Content Accessibility Guidelines (WCAG) 1.0 using three accessibility tools namely Accessibility Check, A-Checker and TAW Online automated tools. The results suggest that none of the websites examined was fully accessible with limited improvement over the two years.

There are also other studies that have been conducted in other countries that focus on the university's web accessibility. Chacón-Medina, Chacón-López, López-Justicia, and Fernández-Jiménez (2013) found that none of the 74 Spanish universities' websites exceeded the aspects of priority level A and AA for WCAG 2.0. The study concludes by recommending revisions and adjustments to resolve these problems and to facilitate web accessibility. Similar findings also reported by Laitano (2015) who diagnosed the Argentine public university space based on WCAG 2.0. She suggested that the web accessibility barriers encountered are serious for the most parts especially on the mark-up language syntax, content presentation, non-text content and visual readability of text.

While the above studies focus on the university's website, there are also other related web accessibility studies that would also relevant to be denoted. Ramayah, Jaafar and Mohd Yatim (2010) focused on the web experience and barriers among visually impaired (VIM) users in Malaysia. Using WCAG 2.0, they reported major problems related to images, hyperlinks and page layout. Abdul Latif and Masrek (2010) evaluated the accessibility of the e-Government websites and found that there were no single Malaysian e-government websites that passed the W3C Priority 1 accessibility checkpoints. They further revealed that most webmasters did not fully adhere to the standard of WCAG.

Isa et al. (2011) investigate accessibility level of Small and Medium Enterprise (SME) websites in Malaysia. Twenty-two categories of SMEs, which contains two hundred and twenty websites, were selected from the web portal at www.shoppmy.com.my. The accessibility evaluation was carried out using EvalAccess 2.0 to evaluate the accessibility level according to the WCAG 1.0 guidelines as published by the World Wide Web Consortium (W3C). The study has indicated several accessibility violations for the selected samples of SME websites in Malaysia related to checkpoints from Priority 1, Priority 2 and Priority 3.

3. RESEARCH METHODOLOGY

This study has evaluated the web accessibility of all the 20 public university's website in Malaysia. AChecker and WAVE were employed as web accessibility tools while WCAG 2.0 and Section 508 standards were considered as the guidelines. The website accessibility analysis has been conducted from Monday, 28 September 2015 to Sunday, 4 October 2015.

The results will be compared among the public universities and will be presented based on the tools selected.

4. ANALYSIS OF RESULTS

Table 1 summaries the number of issues detected with the AChecker evaluation tools. There are three types of problems identified under AChecker which are (1) Known Problems, problems that have been identified with certainty as accessibility barriers, (2) Likely Problems, problems that have been identified as probable barriers, but require a human to make a decision and (3) Potential Problems, problems that AChecker cannot identify, thus requires human to decide.

AChecker produces a report of all accessibility problems for a few selected guidelines. Only two websites (UKM and IIUM) have no issue at all regarding the web accessibility and passed all requirements specified by WCAG 2.0 Level A, Level AA and Level AAA as well as requirements of Section 508. Those websites received the conformance seal as placed at their webpage. This provides evidence that the universities serious taking care of their websites so as to conform to the accessibility guidelines. Meanwhile, UTEM website has reported several potential problems and one Likely problem as specified by section 508. The rest of the websites require improvements as suggested by AChecker.

Table 1. AChecker Results

	WCAG 2.0 (Level A)			WCAG 2.0 (Level AA)			WCAG 2.0 (Level AAA)			Section 508		
	Known Problems	Likely Problems	Potential Problems	Known Problems	Likely Problems	Potential Problems	Known Problems	Likely Problems	Potential Problems	Known Problems	Likely Problems	Potential Problems
UMT	8	0	198	30	0	212	30	0	223	11	11	24
UPM	14	5	1211	28	5	1383	28	5	1395	28	29	252
UMP	1	1	786	4	3	810	15	3	816	2	16	119
UTM	29	0	798	35	0	320	35	0	830	8	11	108
UNISZA	2	1	1299	2	1	1327	2	1	1332	10	20	320
USIM	2	0	1138	15	0	1163	15	0	1168	4	28	199
UNIMAS	9	3	861	130	3	877	136	3	882	10	25	191
UTHM	1	0	1126	0	0	465	6	0	470	10	17	217
USM	5	1	531	78	1	556	80	1	561	4	11	98
UUM	41	0	735	102	0	332	144	0	758	7	23	140
UKM	0	0	0	0	0	0	0	0	0	0	0	0
IUUM	0	0	0	0	0	0	0	0	0	0	0	0
UM	22	0	596	37	0	638	37	0	613	42	35	105
UMK	48	0	1236	143	0	1286	143	0	1300	23	34	245
UNIMAP	18	2	1045	18	2	1045	18	2	1050	18	37	163
UPNM	67	0	889	112	0	922	118	0	939	5	20	173
UPSI	49	1	855	179	1	869	198	1	874	46	49	174
UiTM	32	1	598	35	1	629	35	1	635	3	25	126
UMS	3	4	660	4	4	681	4	0	686	8	23	159
UTEM	0	0	3	0	0	3	0	0	3	0	1	2

*Findings as at 4 October 2015

The Known Problems issues that have been identified are recommended to be fixed immediately by the web developer. Among the common issues based on the findings generated by AChecker are presented in Table 2, 3, 4 and 5 respectively based on WCAG 2.0 Level A, WCAG 2.0 Level AA, WCAG 2.0 Level AAA and Section 508.

Table 2. Known Problems as per WCAG 2.0 (Level A)

Known Problems	Total
1.1 Text Alternatives: Provide text alternatives for any non-text content	95
1.3 Ensure that information and structure can be separated from presentation	44
2.1 Keyboard Accessible: Make all functionality available from a keyboard.	115
2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are	92
3.1 Readable: Make text content readable and understandable.	11
3.3 Input Assistance: Help users avoid and correct mistakes.	25
4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies	14
Total	396

Based on the WCAG 2.0 Level A (Table 2), issue that deserves attention is on keyboard accessibility as there were about 115 errors reported for the whole public universities' websites. Secondly, it is also recommended for the web developer to provide text alternatives for any non-text content in the website.

Table 3 shows the known problems as per WCAG 2.0 Level AA. It is noticed that serious attention need to be given on the distinguishable issue in which the

website supposes to be easier for the users to see and hear content including separating foreground from background.

Table 3. Known Problems as per WCAG 2.0 (Level AA)

Known Problems	Total
1.1 Text Alternatives: Provide text alternatives for any non-text content	78
1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.	39
1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.	624
2.1 Keyboard Accessible: Make all functionality available from a keyboard.	85
2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.	92
3.1 Readable: Make text content readable and understandable.	8
3.3 Input Assistance: Help users avoid and correct mistakes.	20
4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.	6
Total	326

While WCAG 2.0 Level AAA focuses on the high level of accessibility, findings as per Table 4 shows that similar issue as per WCAG 2.0 Level AA has been perceived i.e. distinguishable issue in which the total is obviously highest compared to the other problems.

Table 5 shows the known problems as per Section 508. Compared to 16 standards under Section 508, only three issues have been detected: L - script

must have functional text, A - text equivalents and N - accessible forms.

Table 4. Known Problems as per WCAG 2.0 (Level AAA)

Known Problems	Total
1.1 Text Alternatives: Provide text alternatives for all non-text content	84
1.3 Adaptable: Create content that can be presented in different ways without losing information or structure.	38
1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.	684
2.1 Keyboard Accessible: Make all functionality available from a keyboard.	111
2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.	93
3.1 Readable: Make text content readable and understandable	8
3.3 Input Assistance: Help users avoid and correct mistakes.	19
4.1 Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.	7
Total	1044

Table 5. Known Problems as per Section 508

Known Problems	Total
A - text equivalents	79
L - script must have functional text	143
N - accessible forms	17
Total	239

There are 143 errors have been detected regarding the use of scripting. According to Section 508, when websites employ 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.

Another issue is related with non-text element in which an alternative text should be provided for item such as image, applet, embedded media, plug-in, etc. There are 79 errors have been detected.

Lastly, for online form, it 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. 17 errors have been spotted regarding this problem.

4.1 WAVE Results

Table 6 shows the summary of web accessibility errors found using WAVE web accessibility evaluation tool: wave.webaim.org. Overall results revealed that only two universities have no issue with web accessibility. Nine of the universities have 10 or less errors while the rest have reported more

than 10 errors. Three of the websites cannot be evaluated due to an error while accessing the page although the webpage can be accessed directly during the period of testing.

Among the common reasons for the errors are empty link, linked image missing alternative text, missing form label, empty heading, and document language missing.

Table 6. Web Accessibility Errors

Errors	Number of Webs
0 error	2
1-10 errors	9
11-20 errors	1
21-30 errors	2
31-40 errors	2
More than 41 errors	1
Website Cannot be Evaluated	3
Total	20

While those errors affect the accessibility of the website, there is also another issue that need special consideration i.e. Contrast View. WAVE detected the contrast issues for the website based on WCAG 2.0 guidelines. Table 7 shows the summary of the various contrast errors resulted from the WAVE analysis.

Table 7. Contrast Errors

Contrast Errors	Number of Webs
0 error	1
1-10 errors	3
11-20 errors	2
21-50 errors	4
51-100 errors	4
More than 101 errors	3
Web Cannot be Evaluated	3
Total	20

Only one website shows no errors for the contrast view while there are three websites have more than 101 issues related to contrast view. One of them have about 218 issues about contrast view in their website.

Adequate contrast is necessary for all users, especially users with low vision. It is found that most of the web have an issue with a very low contrast between foreground and background colours. It is suggested that the web developer needs to increase the contrast between the foreground (text) colour and the background colour.

Apart from accessibility errors and contrast issues, WAVE also analysed other web accessibility issues such as alerts, features, structural elements and HTML5 and Accessible Rich Internet Applications (ARIA). The summary of findings for each of the public university website is presented in Table 8.

Table 8. WAVE Results Summary

	Errors	Alerts	Features	Structural Elements	HTML5 and ARIA	Contrast Errors
IUM	11	22	12	74	12	23
UKM	10	13	24	52	3	120
UM	23	116	10	45	2	28
UMK	30	74	65	97	4	17
UMP	1	38	45	54	0	58
UMT	0	6	2	12	3	5
UNIMAP	33	424	248	51	0	218
UNIMAS	3	72	47	15	0	17
UNISZA	2	52	130	65	4	0
UPM	0	43	71	118	0	78
UPNM	33	36	71	55	0	73
UPSI	42	29	31	27	1	53
USIM	2	71	70	83	3	37
USM	5	24	53	51	4	110
UTHM	5	217	83	57	0	2
UTM	1	205	45	55	53	2
UUM	7	15	43	46	5	35

*Findings as at 4 October 2015

**Three of the university's websites excluded as it cannot be evaluated by WAVE

5. CONCLUSION

In line with increasing importance of website in disseminating relevant information to various stakeholders, public universities in Malaysia should ensure their websites must be made accessible to both disabled person and normal users. In response, this paper reports current state of the web accessibility of all 20 public university's website in Malaysia using AChecker and WAVE accessibility tools based on WCAG 2.0 and Section 508 guidelines. Although most of the websites demonstrated some improvement as compared to the previous studies, certain measures must be seriously considered by the public universities as to ensure better compliance to the web accessibility standards and guidelines.

Despite meaningful findings reported, readers need to consider a limitation of this study. This study focuses on public universities in Malaysia, and as such the results cannot be extrapolated to other categories of universities or organisations. However, the results and conclusion are relevant to web developers or any organisation that concerns about the issue of the accessibility of their website.

Future research should probably focuses on the different scopes or type of websites to encourage the awareness of web accessibility among web developers. Other tools also can be applied to compare the result among them.

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