STUDY OF THE ACCESSIBILITY DIAGNOSIS ON THE PUBLIC HIGHER INSTITUTIONS WEBSITES IN MALAYSIA

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ABSTRACT. University web pages play a central role in the activities of all students. In order to assess the current state of university web site accessibility, we performed an automated evaluation of the home pages of 20 Public Higher Educational Institutions of Malaysia. Two experiments were made in 2012 and 2013 to see if there is a significant change in the results. Three Online Automated tools were used along the two experiments to see the differences between numbers of accessibility issues discovered by each tool. The results showed significant issues and no big improvements have been made to the websites from 2012 to 2013.

Keywords: Accessibility, WCAG 1.0,Accessibility Check, A-Checker, TAW

INTRODUCTION

Websites are widely used in most areas of society and daily life. Therefore, it is essential that the Web be accessible in order to provide equal access and equal opportunity to people with disabilities. According to W3C Web accessibility basically means that people with disabilities can use the Web (W3C/WAI, 2005a). More specifically, Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web (W3C, 2009).Web accessibility also benefits others, including older people with changing abilities due to aging. As more accessible Web sites and software become available, people with disabilities are able to use and contribute to the Web more effectively. In this paper we evaluated accessibility perspective of Malaysian Public Higher Educational Institutions websites. For universities, accessibility is an important issue to be considered in their websites, since the main goal of their websites is to offer appropriate services and to inform students about the latest news. Any accessibility issues could limit this goal.

Here, we conducted two accessibility evaluations for twenty universities in Malaysia using Accessibility Check , A-Checker and TAW Online automated tools. The first was held in 19th October, 2012 and followed by 24th April 2013 for the second evaluation. Both experiments used the same automated tools along the same websites. Our goal is to see the differences between numbers of accessibility issues discovered by each tool. Moreover, we want to observe if there is significant change in the results when holding experiments in different intervals of time. This could give a light indication about the accessibility condition in the Malaysian universities. Also, the evaluation reveals the awareness about accessibility issue when designing their websites. In this paper we checked the conformance to WCAG 1.0 which is organized around guidelines that have checkpoints, which are priority 1, 2, or 3.

WCAG 1.0 consists of 14 separate guidelines, each of which has an associated set of one or more individual checkpoints.

RELATED WORK

This section of literature review reflects the researchers' attitudes in adopting many methods to evaluate the website accessibility of different domains in Malaysia.

In 2010 Abdul Aziz et al. (2010) assessed the accessibility and usability of 120 samples of higher education institution websites in Malaysia. The accessibility evaluation was done by using EvalAccess 2.0 automatic evaluation tool to access the accessibility level according to WCAG 1.0 guideline. Usability evaluation was also done on page size, speed and broken link. Their study revealed several accessibility and usability errors ranging from priority 1 to priority 3. Jati and Dominic (2008) evaluated the accessibility of 90 Malaysian websites using Tawdish on-line tool in 2008. The websites included education, government, and business websites, with the assumption that those websites should have good accessibility. The results of this study showed that majority of Malaysian websites did not meet Web Content Accessibility Guidelines (WCAG 1.0) criteria. The accessibility level of Malaysian websites was very low as 93%, 87% and 87% of education, government and business websites, respectively, contained error priority 1, whilst, all of the websites surveyed in this study contained error priority 2 and 3.

Isa et al. (2011) evaluated the accessibility level of Small and Medium Enterprise (SME) website in Malaysia in 2011. Twenty two categories of SMEs, which contains two hundred and twenty websites, were selected from the web portal at www.shoppy.com.my. The accessibility evaluation was done by using EvalAccess 2.0 to evaluate the accessibility level according to the WCAG 1.0 guideline published by the World Wide Web Consortium (W3C). The study revealed several accessibility violations for the selected sample of SME websites in Malaysia related to checkpoints from Priority 1, Priority 2 and Priority 3.

Our motivation to do this experiment was the lack of accessibility in Universiti Sains Islam Malaysia (USIM) home page, with 28 errors regarding Priority1 in 2012 using Taw tool. We want to see if there are another Malaysian Universities that suffer from the same problems. In our paper we want to make something different by comparing evaluation conducted in different intervals of time; to see if the accessibility awareness increases or not. We are not concerned about the type of accessibility barriers, since a previous study already done it (Abdul Aziz et al, 2010).

EXPERIMENT PLAN

Two experiments were held to evaluate the home pages of 20 Public Higher Educational Institutions in Malaysia. The first one was held in 19th October, 2012 and the second one in 24th April, 2013. Three Online Automated tools were used along the two experiments are: Accessibility Check (Accessibility Check Tool), A-Checker (A-Checker Tool) and TAW Online (TAW Tool) automated tools.

Both experiments used the same automated tool along the same websites. Our goal is to see the differences between numbers of accessibility errors detected by each tool; if there is a difference this will be interesting since all the three tools adhere to the same WCAG1.0 guidelines. Moreover, we want to observe if there is significant change in the results when holding experiments in different intervals of time because the content displayed on a web page may change due to the updated information. This is a concern for web pages with dynamic page content, which may appear to become more or less accessible between visits even if the underlying web page has not changed.

This experiment could give a light indication about the accessibility condition in the Malaysian universities. Also, the evaluation will reveal the awareness about accessibility issue when designing the websites.

Selection of Websites

Web sites were chosen from the list of public universities under the Ministry of Higher Education In Malaysia (MOHE). The lists consist of 20 Public Higher Educational Institutions and were divided into three categories: Research Universities, Comprehensive Universities and Focused Universities. We analyzed the home page of each university in the list. We are focusing on the home pages as the home pages are viewed by many current and prospective students and because the homepage is a consistent feature across sites. Dedicated pages such as research directory, expert directory, graduate school, career and others will be done in our next future works.

Automated Evaluation Tool

An automatic evaluation tool plays a major role in assisting developers to evaluate websites for accessibility and *help* determine if a Web site meets accessibility guidelines. An automatic evaluation tool can help in finding certain types of design difficulties, such as pages that will load slowly, missing links, use of jargon, potential accessibility problems, and other problems. Many tools were suggested by W3C (W3C/WAI, 2005b), yielding different results with different levels of quality (Abou-Zahra, 2008).

In this paper we have decided to use three open source website accessibility evaluation tools that comply with WCAG 1.0; since these tools approximately cover the same accessibility barriers like not using alternative text for images. This will help us in comparing the number of accessibility barriers discovered by each tool. These tools are: Accessibility Check (version 1.0) (also known by Etre's Accessibility Check), A-Checker (version 0.8.6), and TAW Online (version 3.08). These tools are online tools and available for free.

FINDINGS

In 19ᵗʰ October, 2012 we recorded the number of Priority 1, 2, and 3 violations produced by each of the tools for twenty universities in Malaysia then in 24ᵗʰ April, 2013 we repeated the same experiment in order to compare the results. After calculating scores using each tool, we added these scores together to produce a combination of Priority 1, 2, and 3 scores for each tool. Table 1 represents the total number of errors for all priorities (p1-p3) of twenty public universities in Malaysia using the three automated tools for the two experiments. The last column represents the average of errors found of the three tools. We discarded the page of **UPNM** from the comparison; since the page was not found when performing the first experiment in 19ᵗʰ October.

The word **Unable** that sometimes appears in Accessibility Check tool means that unfortunately it hasn't been possible to parse the page that was submitted. It may be because the page is generated dynamically and the tool server was unable to request the data for analysis. When calculating the mean of errors we will replace this value by zero since no error has been actually found. Table 1 only shows the known problems regarding the three priorities that were detected automatically by the tools and do not need human reviews. Potential and likely problems are not listed. In order to see if there is significant change between the total numbers of errors for the three automated tools a Friedman Test was made for both experiments. The results as follow:

For the first experiment (**19th October, 2012**), At the (p-value ≈ 0.001 ≤ 0.01 = α) level of significance there exists enough evidence to conclude that there was a statistically significant difference in total number of errors discovered by each tool., χ^2(df=2,N=19) = 14.000.

For the second experiment (**24th April, 2013**), At the (p-value ≈ 0.000 ≤ 0.01 = α) level of significance there exists enough evidence to conclude that there was a statistically significant difference in total number of errors discovered by each tool., χ^2(df=2,N=20) = 17.200. Figure 1 and 2 show the result of Friedman Test and the difference of total number of errors discovered by each tool.

Table 1. The Cumulative Number of Errors for all Priorities for Twenty Universities in Malaysia in 19th October,2012 and 24th April,2013

University Category	University	Accessibility Check Total number of errors		TAW Total number of errors		A-Checker Total number of errors		Average of Errors	
		2012	2013	2012	2013	2012	2013	2012	2013
Research	UM	241	212	435	400	72	104	249.33	238.67
	USM	0	0	53	57	3	2	18.67	19.67
	UKM	66	66	108	126	59	62	77.67	84.67
	UPM	310	308	704	678	62	63	358.67	349.67
	UTM	19	20	87	92	99	103	68.33	71.67
Comprehensive	UiTM	6	6	27	27	34	34	22.33	22.33
	UIA	5	4	15	22	12	18	10.67	14.67
	UMS	Unable	0	123	84	2	2	41.67	28.67
	UNIMAS	Unable	0	28	49	2	2	10.00	17.00
Focused	UUM	241	0	121	18	45	2	135.67	6.67
	UPSI	16	16	36	34	53	49	35.00	33.00
	UTHM	35	29	96	88	50	53	60.33	56.67
	UTeM	49	48	350	375	21	20	140.00	147.67
	UniMAP	33	3	144	71	0	44	59.00	39.33
	UMT	26	26	0	112	91	91	39.00	76.33
	UMP	309	280	311	308	29	2	216.33	196.67
	USIM	75	76	143	7	57	26	91.67	36.33
	UniSZA	27	40	149	113	54	16	76.67	56.33
	UMK	Unable	18	80	119	2	22	27.33	53.00

This lead us to a conclusion that despite the tools adhere to the same WCAG 1.0 their results could vary. This may due to that accessibility tools vary in their interpretation of WCAG 1.0 and depending on the interpretation and the algorithms that was used, accessibility tools can give users some automated results that require human judgment. We suggest that automated evaluation tools may underestimate or overestimate the number of accessibility errors on a web page.
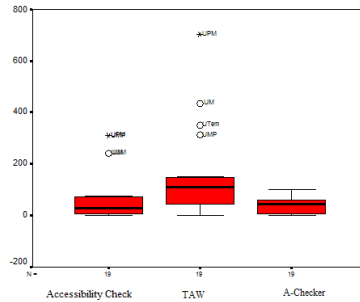
Figure 1. Friedman Test Results for the First Experiment in 2012 and Show a Significant Change between the Tools' Results
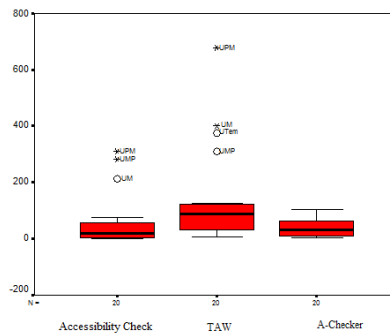

Figure 2. Friedman Test Results for the First Experiment in 2013 and Show a Significant Change between the Tools' Results

Web pages contents may dynamically change, which may affect accessibility between visits. Our second goal was to see if there is a significant changes between the average number of errors discovered in two different visits 2012 and 2013. This could reflect the accessibility condition of these websites and whether it is improved. We performed two-paired samples t-test to analyze the differences between the average numbers of errors (Mean) for the first experiment and the corresponding second experiment. The difference in average number of errors between the two experiments was not statistically significant (t = 1.253, p = 0.226> 0.05 =α). However, we observed that the mean of error was greater in 2012 (M=91.49,SE=21.29) than to 2013(M=81.53,SE=20.73)**.** This shows slight improvements in accessibility condition and less accessibility barriers in the websites. Figure 3 shows the difference between average numbers of errors (Mean) for each university for every visit.

From Figure 3 we noticed a fluctuation in accessibility barriers. Some universities faced improvements and less accessibility barriers while others faced regression. For example UNIMAS University has the least average number of errors (10 errors) in 2012 while in 2013 the average number of errors increased to 17 errors. On the other side UMP University scored the greatest average number of errors (216 errors) in 2012, which then decreased to 196.67 errors in 2013. These results show many violations to accessibility issue and lack of accessibility awareness, since having at least one error regarding priority 1 makes the website inaccessible according to WCAG 1.0.
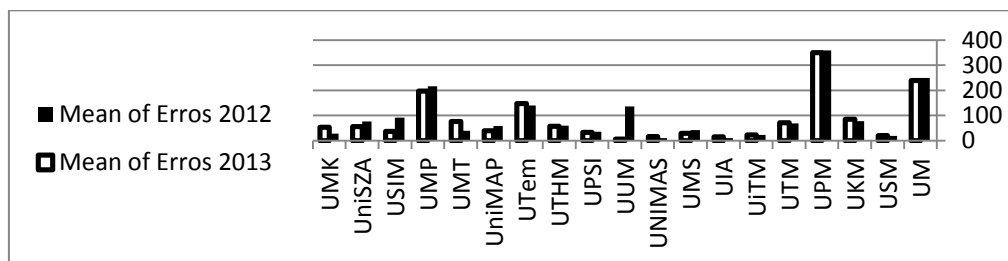
Figure 3. Average Number of Errors for each University in Different Visits 2012 and 2013

CONCLUSION AND FUTURE WORK

Two experiments were conducted in 2012 and 2013 using Accessibility Check, A-Checker and TAW online automated tools for twenty public universities in Malaysia in order to evaluate the overall accessibility of these universities and to compare the results of the selected tools. Unfortunately, none of the websites was fully accessible according to the mentioned tools. Moreover, the results obtained from the tools are varied. This may due to accessibility tools vary in their interpretation of WCAG 1.0 and depending on the interpretation, accessibility tools can give users some automated results that require human judgment. Also there were no big improvements in accessibility condition from 2012 to 2013. As a conclusion despite the importance of web accessibility, the lack of accessibility still exists in many educational institutions websites. Therefore we are planning to conduct future research to discover the most common accessibility barriers that limit the accessibility of the Public Universities in Malaysia and also evaluating against WCAG 2.0.

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