Accessibility of Websites for People with Disabilities (PWD) in Malaysia: An Empirical Investigation

Maslina Abdul Aziz[1], Wan Abdul Rahim Wan Mohd Isa[2], Nurul Syahirah Mohd Fadzir[3]

[1,2,3] *Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA (UiTM) Shah Alam, Selangor, Malaysia.*
Tel.: [1]+60-355211215, [2]+60-355211214, E-mail: [1]maslina@tmsk.uitm.edu.my, [2]wrahim2@tmk.uitm.edu.my

Abstract— **According to a report by Department of Social Welfare Malaysia (http://www.jkm.gov.my), there are approximately 277, 509 registered disabled people in Malaysia since November 2009. The growing number of people with disabilities in Malaysia indicates the importance of safeguarding the interest by this special underserved group in Malaysia. Thus, this study aims to investigate the accessibility of website for disabled user in Malaysia. A total of 100 websites were chosen from four Malaysia portals; (i) Malaysian Information Network on Disabilities (MIND), (ii) Malaysian Christian Association for Relief (Malaysian CARE), (iii) Kiwanis Disability Information and Support Centre (KDISC) and (iv) Hati. The study revealed several issues pertaining to website accessibility for people with disabilities in Malaysia. We end our study with few recommendations for to improve few of the accessibility criteria that may be overlooked by website developers.**

Keywords— **Accessibility, People with Disabilities in Malaysia, Community Informatics, Human Computer Interaction, .**

I. INTRODUCTION

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) estimated that 10 percent of the world's population which is 650 million people live with a disability [45]. In Malaysia for example, there are 277, 509 disable people registered with Department of Social Welfare, last November 2009 (http://www.jkm.gov.my). The growing number of disable group among Malaysia's citizens indicates the importance towards full protection and safeguarding the interest by this special underserved group.

Thus, with this awareness, the government and private sector had taken initiatives to safeguard the special needs of the people with disabilities so that they are not to be marginalized by implementing ICT programs [31]. As stated by Social Welfare Department of Malaysia (JKMM), they stride along with other agencies such as Malaysia Communications and Multimedia Commission (MCMC have take various efforts in line with the government to embrace ICT in the country, such as developing a website in the era of information and communication technology (ICT). The next section discusses the literature review, research method, results, analysis and conclusion.

II. LITERATURE REVIEW

Many Web sites are not accessible to disability communities mostly especially those visually-impaired and deaf. As the interactive nature of the Web continues to expand, those with physical disabilities or speech disabilities may have trouble with immersive virtual reality systems that require walking, reaching, and grasping, or human-to-computer voice responsesystems that require clear speech [32].

At the international level, the Biwako Millennium Framework for Action towards an Inclusive [1], Barrier-free and Rights-based Society for Persons with Disabilities in Asia and the Pacific was adopted by the High-level Intergovernmental Meeting to Conclude the Asian and Pacific Decade of Disabled Persons, 1993-2002, which had been proclaimed by the Commission in 22 May 2002 (UNESCAP, 2007) [45].

All website developers or website owners have responsibility for making their websites accessible. There are internationals standards that developers can use to know what they need to do for web accessibility which is from W3C Web Accessibility Initiative (WAI) [3]. WAI works with organizations around the world to develop guidelines, strategies and resources in order to make the web accessible to

all includes people with disabilities. The main accessibility guideline from the W3C WAI is the Web Content Accessibility Guidelines 1.0 (WCAG 1.0).

There are total of 65 checkpoints in WCAG 1.0. For each guideline, it includes one or more checkpoints. Based on the impact on accessibility, checkpoints are categorized into three priority levels. Checkpoint under the same guideline may be categorized into different priority level. Each checkpoint has a priority level assigned by the Working Group based on the checkpoint's impact on accessibility (W3C, 2005).

2.1 People with Disabilities (PWD) Worldwide

The Americans with Disabilities Act (ADA) (1990) defines ''disability'' as a physical impairment that substantially limits the life activities of such individual. While The Disability Discrimination Act (DDA) defines a disabled person as someone who has a physical or mental impairment that has a substantial and long-term undesirable effect on his or her ability to do day-to-day activities [32]. There are today a growing number of international portals especially for disable user as shown in Table 1. Table 2 shows the summary of studies on people with disabilities worldwide.

TABLE 1
LIST OF INTERNATIONAL DISABILITY'S PORTAL

Country	Portal's Name	Type
South Africa	iBility http://www.ibility.org.za	Profit Organization
Singapore	Centre for Enabled Living Ltd (CEL) http://www.cel.sg	Non-Profit Organization
	Ministry of Community Development, Youth and Sports http://app.mcys.gov.sg	Government
USA	Think Quest http://library.thinkquest.org	Non-Profit Organization
	World Association of Persons with Disabilities (WAPD) http://www.wapd.org	Non-Profit Organization
	World Institute on Disability (WID) http://www.wid.org	Non-Profit Organization
	Disability Resources Monthly (DRM) http://www.disabilityresources.org	Non-Profit Organization
India	Punarbhava http://punarbhava.in	Non-Profit Organization
Australia	Commonwealth Respite and Carelink Centre http://www9.health.gov.au	Non-Profit Organization
	Public Libraries Enabling Accessible Services Encompassing Disability (PLEASED) http://www.pleased.net.au	Non-Profit Organization
	Australian Government http://www.australia.gov.au	Government

World Wide Web Consortium (W3C) has listed of some disabilities and their relation to accessibility issues on the Web such as visual impairments, hearing impairments, physical disabilities and cognitive disabilities [46].

TABLE 2
STUDIES ON PEOPLE WITH DISABILITIES WORLDWIDE

Country	Studies	Source
Scotland	Evaluating Web Resources for Disability Access	[37]
Portugal	Accessibility and visually impaired users	[6]
Taiwan	Usability of E-Government Web-Sites for People with Disabilities	[15]
Canada	Web Accessibility in the Development of an e-Learning System for Individuals with Cognitive and Learning Disabilities	[10]
	Disability, Aging and Sport in Canada and Malaysia	[26]
Iran	Necessity of Accessibility to E-Government Websites for Disabled People	[39]
Poland	The Analysis and Assessment of Adjustment of Selected Web Sites and Web Browsers to the Needs of People with Disabilities	[35]
Philippine	Disabled People and Development	[8]
Japan	A Case Study for Reaching Web Accessibility Guidelines for the Hearing-Impaired	[30]
United States of America	Comparative Study of Methods for Assessing Web Page Accessibility for the Blind	[29]
	Assessing Section 508 compliance on federal e-government Web sites: A multi-method, user-centered evaluation of accessibility for persons with disabilities	[17]
	Designing universal access: web-applications for the elderly and disabled	[22]
	The Disability Divide in Internet Access and Use	[7]
	Disability-accessibility of airlines' Web sites for US reservations online	[12]
	Access This: Why Institutions of Higher Education Must Provide Access to the Internet to Students with Disabilities	[11]
	Web accessibility for people with disabilities	[32]
	Online accessibility and information needs of disabled tourists: a three country hotel sector analysis	[47]
	Federal Web Site Accessibility for People with Disabilities	[28].
	Managing usability for people with disabilities in a large web presence	[24]
	The Many Uses of ICTs for Individuals with Disabilities	[22]

There are some scenarios that show people with different types of disabilities using assistive technologies to access the Web. In some cases the scenarios show how the Web can make some tasks easier for people with disabilities. Below is a

list of scenarios and accessibility solutions according to W3C [46]:

i) *Online shopper with color blindness - user control of style sheets*

ii) *Reporter with repetitive stress injury - keyboard equivalents for mouse-driven commands; access-key*

iii) *Online student who is deaf - captioned audio portions of multimedia file.*

iv) *Accountant with blindness - appropriate mark up of tables, alternative text, abbreviations, and acronyms; synchronization of visual, speech, and Braille display.*

v) *Classroom student with dyslexia - use of supplemental graphics; freezing animated graphics; multiple search options.*

vi) *Retiree with aging-related conditions, managing personal finances - magnification; stopping scrolling text; avoiding pop-up windows*

vii) *Supermarket assistant with cognitive disability - clear and simple language; consistent design; consistent navigation options; multiple search options.*

viii) *Teenager with deaf-blindness, seeking entertainment - user control of style sheets; accessible multimedia; device-independent access; labelled frames; appropriate table mark up.*

2.2 People with Disabilities (PWD) in Malaysia

Table 3 below shows the composition of disabilities type in Malaysia. Based on the table above, out of 277, 509 disable people registered with Department of Social Welfare, last November 2009 (http://www.jkm.gov.my), 38.7% are people with learning disability, 33.4% are physical disabilities, 13.7% are hearing impaired, 9.2% are visual impaired and 1.3% are cerebral palsy. The rest is other disabilities with 3.8%. Summary of studies on people with disabilities in Malaysia is as shown in the table 4.

TABLE 3
NUMBER OF PEOPLE WITH DISABLE REGISTERED WITH DEPARTMENT OF SOCIAL WELFARE MALAYSIA, MAY 2009

Type of disability	2009	Percentage (%)
Visual Disability	23,378	9.2
Hearing Disability	35,368	13.7
Physical Disability	86,485	33.4
Learning Disability	100,180	38.7
Cerebral Palsy	3,250	1.3
Others	9,897	3.8
Total	258,918	100

Source: http://www.jkm.gov.my/

TABLE 4
STUDIES ON PEOPLE WITH DISABILITIES IN MALAYSIA

Country	Research Title	Source
Malaysia	Accessibility Research in Malaysia	[13] [50]
	The Experiences of Blind & Visually Impaired Users with the Malaysian Government Ministries Website	[27]
	Website accessibility performance evaluation in Malaysia	[18]

III. RESEARCH METHOD

A total of 100 websites were chosen from four Malaysia portals for disabled people in Malaysia; (i) Malaysian Information Network on Disabilities (MIND), (ii) Malaysian Christian Association for Relief (Malaysian CARE), (iii) Kiwanis Disability Information and Support Centre (KDISC) and (iv) Hati as shown in Table 5. The association, society, club, home, welfare institution and relevant hospitals websites for people with disabilities were among websites found in the listing of those four portals. The websites were then sorted according to federal or states websites for classification purpose based on whether the websites are being managed by federal or states level.

TABLE 5
LIST OF DISABLED USER PORTAL IN MALAYSIA

No	Portal's Name
1	Malaysian Information Network On Disabilities (MIND); http://www.mind.org.my
2	Malaysian Christian Association For Relief (Malaysian CARE); http://www.malaysiancare.org
3	Kiwanis Disability Information and Support Centre (KDISC); http://disabilitymalaysia.com
4	Hati; http://www.hati.org.my

The evaluation period takes about one week to complete between 1 March 2010 and 9 March 2010. The time of evaluation is between 5 pm and 2 am. Those 100 websites are comprised of federal and state of disabled user website. It consists of 24 websites which is from state disabled user website whereas the rest which is 76 websites are from federal disabled user websites. There are 13 states in Malaysia but not all states are included. From the disabled user portal, the states included are Sabah, Sarawak, Kuala Lumpur, Selangor, Melaka, Negeri Sembilan, Pulau Pinang and Johor. Table 6 below shows the composition of the 100 websites in term of their administrative level.

Based on the guidelines of the accessibility evaluation, the study will focus on priority level 1 and 2 of WCAG 1.0 only. The automatic web evaluation tool that has been use is called EvalAccess 2.0. It is an on-line web accessibility evaluation tool which has been developed by the Laboratory of HCI for Special Needs at the University of the Basque Country. EvalAccess 2.0 web service checks web pages accessibility, based on the WAI's WCAG 1.0 guidelines. It has been implemented as a web service to allow any other application

to use it. This research focus only on error issues on accessibility.

TABLE 6
COMPOSITION OF DISABLED USER SITES IN MALAYSIA (FEDERAL & STATE)

Administrative level	Frequency	Percentage (%)
Federal	76	76
State	24	24
Total	100	100

IV. RESULTS AND ANALYSIS

Table 7 below shows the summary of the accessibility analysis of websites for people with disabilities. The description of the error can be seen in Table 8. From the report collected from EvalAccess 2.0, it shows the detail about checkpoint that has been violated by each websites together with their number of errors for every checkpoint. This number of errors indicates how severe certain checkpoint is being violated.

TABLE 7
ACCESSIBILITY ANALYSIS ON DISABLED WEBSITE

Priority	Checkpoint with HTML element and attribute	Number of websites violates this checkpoint
1	1.1 Image, Alt	62
	1.1 Area, Alt	9
	1.1 Applet, Alt	0
	1.1 Button, Alt	2
	1.1 Frame, Longdesc	5
1	12.1 Frame, Title	4
2	3.4 Table, Border	61
	3.4 Table, Cell padding	61
	3.4 Table, Width	55
	3.4 Frameset, Rows	4
	3.4 Frameset, Margin width	2
	3.4 Frameset, Margin height	3
	3.4 Frameset, Cols	1
2	6.4 A, On click	12
	6.4 A, On mouse out	12
	6.4 A, On mouse over	14
	6.4 A, On mouse down	0
	6.4 A, On mouse up	0
	6.4 Area, On click	0
	6.4 Area, On mouse out	2
	6.4 Area, On mouse over	2
	6.4 Input, On click	5
	6.4 Input, On key press	0
	6.4 Input, On mouse out	0
	6.4 Input, On mouse over	0
	6.4 Select, On click	2
2	6.5 Frameset	5
2	7.2 Blink	0
2	7.3 Marquee	8
2	7.4 Meta, Http-Equiv	5
2	10.1 A, Target	37

	10.1 Area, Target	4
2	11.2 Applet	0
	11.2 Base, Font	1
	11.2 Font	45
	11.2 Center	17
	11.2 U	10
2	12.4 Input, Id	19
	12.4 Label, For	1
2	13.2 Title	3

TABLE 8
DESCRIPTION OF EACH CHECKPOINT THAT HAS BEEN VIOLATED

Priority	Checkpoint	Description
1	1.1	Provide a text equivalent for every non-text element
1	12.1	Title each frame to facilitate frame identification and navigation.
2	3.4	Use relative rather than absolute units in mark-up language attribute values and style sheet property values.
2	6.4	For scripts & applets, ensure that event handlers are input device-independent.
2	6.5	Ensure that dynamic content is accessible or provide an alternative presentation or page.
2	7.2	Until user agents allow users to control blinking, avoid causing content to blink
2	7.3	Until user agents allow users to freeze moving content, avoid page movemen
2	7.4	Until user agents provide the ability to stop the refresh, do not create periodically auto-refreshing pages
2	10.1	Until user agents provide the ability to stop auto-redirect, do not use mark-up to redirect pages automatically. Instead, configure the server to perform redirects.
2	11.2	Avoid deprecated features of W3C technologies.
2	12.4	Associate labels explicitly with their
2	13.2	Provide metadata to add semantic information to pages and sites.

4.1 Listing of disabled user website with high error on checkpoint 1.1 (Image, Alt)

TABLE 9
DISABLED USER WEBSITES WITH HIGH CRITICAL ERROR FOR CHECKPOINT 1.1 (IMG, ALT)

No	Type of websites	No of error
1	Federal	131
2	State	109
3	Federal	71
4	State	32
5	Federal	30

Table 9 below shows five checkpoints that mostly being violated by disabled user websites. For each checkpoint, we list the name of websites based on the highest number of error it produced based on the websites categories. The name of websites will be remained anonymous.

The federal category website lead the ranking disabled user websites with high critical error for checkpoint 1.1 (Img, Alt) followed with state category website with 109 number of errors. The rest is from federal, state and federal categorical website with 71, 32 and 30 numbers of errors respectively. In summary, three websites come from federal disabled user website whereas two websites from state disabled user website.

4.2 Listing of disabled user website with high error on checkpoint 3.4 (Table, Border)

Table 10 shows the checkpoint 3.4 (Table, Border) together with websites that have been violate with their number of errors. Again, federal website leads the highest error that violated this checkpoint with the total error is 243. The subsequent list followed with also federal category website with 145, 115, 25 and 23 numbers of errors respectively. Websites from federal disabled user websites dominate this entire checkpoint that has been violated.

TABLE 10
DISABLED USER WEBSITES WITH HIGH CRITICAL ERROR ON CHECKPOINT 3.4
(TABLE, BORDER)

No	Type of websites	No of error
1	Federal	243
2	Federal	145
3	Federal	115
4	Federal	25
5	Federal	23

4.3 Listing of disabled user website with high error on checkpoint 3.4 (Table, Cell padding)

TABLE 11
DISABLED USER WEBSITES WITH HIGH CRITICAL ERROR ON CHECKPOINT 3.4
(TABLE, CELL PADDING)

No	Type of websites	No of error
1	Federal	243
2	Federal	134
3	Federal	115
4	Federal	25
5	Federal	23

Table 11 shows the same website from checkpoint 3.4 (Table, Border), this checkpoint is have been violated by the same websites that violates checkpoint 3.4 Table, Websites from federal disabled user websites also dominate this entire checkpoint that has been violated same with checkpoint 3.4 Table, Border .

4.4 Listing of disabled user website with high error on checkpoint 3.4 (Table, Width)

Based on Table 12, Federal website violated this checkpoint with the highest error which is 115 errors. The

subsequent lists include total numbers of 43, 16, 11 and 11 errors reported for federal websites. All websites is from federal disabled user website.

TABLE 12
DISABLED USER WEBSITES WITH HIGH CRITICAL ERROR ON CHECKPOINT 3.4
(TABLE, WIDTH)

No	Type of websites	No of error
1	Federal	115
2	Federal	43
3	Federal	16
4	Federal	11
5	Federal	11

4.5 Listing of disabled user website with high error on checkpoint 11.2 (Font)

TABLE 13
DISABLED USER WEBSITES WITH HIGH CRITICAL ERROR ON CHECKPOINT 3.4
(FONT)

No	Type of websites	No of error
1	Federal	203
2	Federal	154
3	Federal	138
4	Federal	127
5	Federal	127

Table 13 above shows five websites which is all from federal category websites for disabled user that violated checkpoint 3.4

V. CONCLUSIONS

Websites (regardless federal or states level) may need to consider the accessibility criteria provided by WCAG to ensure the right to access the website for people with disability in Malaysia. Thus, further improvement should be done based on accessibility WCAG criteria. The finding from this study my provide motivations for web developers to give more priority on accessibility aspect during website development for websites targeted for disabled user in Malaysia. The scope of this study is limited to only WCAG 1.0 guideline instead of the latest version WCAG 2.0 due to the limitation of automated evaluation tools. United States is currently approving specific legislation to enforce web accessibility [49]. Malaysia government may need to safeguard the interest of underserved groups such as people with disability by regulating and enforcing legislations to enforce web accessibility in Malaysia.

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