

WEB SITE ACCESSIBILITY: A STUDY OF EIGHT INDUSTRIES' WEB SITES

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ABSTRACT

Web sites were analysed for accessibility using BOBBY. BOBBY bases its accessibility analyses on the World Wide Web Consortium's (W3C) Web Accessibility Initiative (WAI) Web Content Accessibility Guidelines 1.0 (WCAG). The study is able to identify number and percentages of failed and approved Web sites, as well as number of errors of Priority 1, Priority 2 and Priority 3 for Web sites of each industry. The study of eight industries' Web sites (Internet and ICT; tourism and hospitality; manufacturing; retailing; construction and real estate; printing and publishing; banking and finance; and education) shows that the percentage of Web sites to achieve the BOBBY Approved consider very low. Out of 372 of the total evaluated Web sites, 307 Web sites (82.53 per cent) failed outright, which means that they pose serious accessibility problems. The total of Priority 1, Priority 2 and Priority 3 errors from 372 samples of Web sites consisted of 76360 errors. Violations of just ten checkpoints (Checkpoint 2.2, 2.1, 3.4, 11.2, 1.1: Priority 1 – User Checks, 7.3, 1.1: Priority 1 – Accessibility Errors by Type, 5.5, 5.2, 5.5) accounted for as many as 59188 (77.5 per cent) of the total number of errors. Web sites that passed without errors in the three priorities for all industries were less than 30 per cent, except for Priority 1 Accessibility errors for banking and finance Web sites, which was 40.91 per cent.

INTRODUCTION

Web site has become such an important resource for information and services. Number of Web sites grew 1758 per cent in 1994 and doubled in size every 53 days by 1995 (The Economist, 1995). By early 1999, the registered domain names numbered 5.3 million and by February 2000, there were about 11 million sites (Tschong, 2000). The number of Web pages on Internet is 2.1 billion and pages added per day around 7.3 million (Murray and Moore, 2000). The total number of Generic Top Level Domains (gTLD) domains registered worldwide in December 15, 2006 is 79,580,008 from six main primary domains, 'com', 'net', 'org', 'biz', 'info' and 'edu' (Zooknic Internet Intelligence, 2006). Even, domain name registration in Malaysia is increasing year by year. The new registration of domain name in 2006 is 15625 compare to 1995 just only 151. The total number registration of 'com.my', 'net.my', 'org.my', 'gov.my', 'edu.my' and 'mil.my' from 1995 to 2006 is 83709 (Mynic, 2007).

The Internet may seem accessible to those using standard equipment such as a monitor, keyboard, and mouse, but in reality many who are using non-standard devices or software to surf the Web will face difficulties accessing information. These alternative methods require

that Web sites be designed to accommodate this need (O'Grady and Harrison, 2003). Since World Wide Web Consortium (W3C) released the first version of the Web content accessibility guidelines (WCAG 1.0), accessibility has slowly but surely turned up on the radar of web managers in most large organisations (Moss, 2007). Accessibility means to the extent by which the web site, including the technology such as hypertext coding, is barrier-free to all users of the information, thus providing enhancements that enable people with disabilities to move towards independence (Foley, 2003; Yates, 2005), and designing a user interface that is not only effective, efficient and achieving user satisfaction, but also inclusive of more people in more situations (Ma and Zaphiris, 2003).

To study the problem of Web sites design in Malaysia, Web sites were analysed for accessibility using BOBBY accessibility tool. This study utilises BOBBY to assess the accessibility of Web sites based on eight industries. The objectives of study are to identify two main areas:

- Number and percentages of failed and approved Web sites.
- Number of errors of Priority 1, Priority 2 and Priority 3 for Web sites of each industry.

LITERATURE REVIEW

Throughout the Web's history, various standards and guidelines for content accessibility have been proposed by both individuals and organisations., examples W3C Web Content Accessibility Guidelines (WCAG), WAI Quick Tips Reference Card, Penn State University's Center for Academic Computing Web Accessibility Check-List, Public Service Commission of Canada: Designing Universal Web Pages, and Captioning and Audio Description on the Web-The National Center for Accessible. However, only one set of accessibility guidelines has been reviewed by more than 300 members of the World Wide Web Consortium (W3C). As part of its commitment to accessibility, the W3C launched the Web Accessibility Initiative (WAI) in April of 1997. The purpose of the WAI was to reinforce the Web's basic platform-independence and to provide Web developers with specific techniques for increasing the accessibility of Web sites. The WAI is a threefold effort, including guidelines for web content, user agents, and authoring tools. Under the auspices of the WAI, the Web Content Accessibility Guidelines (WCAG) were published in May of 1999, to provide both general and specific guidance to Web content developers for assessing and ensuring the accessibility of their content (W3C, 1999; Sullivan and Matson, 2000).

Many business Web sites designed without considering accessibility issues result in loss of revenue. Some countries, such as the US, UK, and Australia has introduced legislation that requires organisations to adhere to accessibility issues (Bousaleh, 2007). Vaas (2000) found that about 95 per cent to 99 per cent of the Web sites are inaccessible. The literature based on number of studies revealed disappointing results regarding Web content accessibility.

Lilly and Van Fleet's (1999) first review of top-rated colleges demonstrated that less than half of the library home pages for these institutions were accessible. In a later study indicated that highly-rated public libraries fared even worse. Of the top-rated public libraries in the USA that also had Web sites, only 19 per cent were found to have accessible Web sites (Lilly and Van Fleet, 2000). A study done on 24 top-rated schools library and information sciences' Web

sites by Schmetzke (2001a) revealed that only 23 per cent of the schools' Web pages were accessible, while the Web sites for the libraries at these institutions did much better, with 59 per cent of their Web pages shown to be accessible.

A study that evaluated the Web pages of 89 departments of special education found that 73 per cent of the Web pages studied had at least one accessibility error (Flowers, Bray and Algozzine, 1999). The second study by Bray, Flowers and Algozzine (2001) on 120 school district Web sites were located using a popular online school directory and evaluated for accessibility. The results indicated that 74.3 per cent of Web sites had accessibility problems (Bray, Flowers and Algozzine, 2001). Another study of 219 home pages of distance education providers, only slightly over 15 per cent of them were found to be free of major accessibility errors (Schmetzke, 2001b). The analysis of the top 50 USA universities' Web sites are ranked very low in terms of accessibility (only 30 per cent of them are BOBBY approved) and low in terms of usability (a rating of 2.16 on a 1 to 3 scale) (Zaphiris and Ellis, 2001).

The 30,000 Cyprus related Web sites were evaluated for accessibility using the BOBBY accessibility tool. The analysis revealed that the Cyprus websites analysed are ranked very low in terms of accessibility (only 20 per cent of them are BOBBY approved). Even though academic and organisation websites were found to be rated significantly better than the governmental and commercial websites still only 25 per cent of them were accessible (Zaphiris and Zacharia, 2001).

The percentage of entry pages passing with no Priority 1 BOBBY errors was low at 18 per cent. The most frequently reported error by a significant margin was a failure to provide alternative text for images (Williams and Rattray, 2003).

Another study on 6 genres (overall most popular, clothing, international, jobs, college and government) found that the tested Web sites that passed without Priority 1 errors, but may still have had user checks, was 33.9 per cent. By passing the automatically-checked Priority 1 phase, these sites do not contain critical usability barriers. Of the total evaluated sites, 66.1 per cent failed outright, which means that they pose serious accessibility problems. The government sites had the highest percentage passing the automatically checked portion (60 per cent), and the sites deemed overall most popular had the poorest showing with 15 per cent passing this same section. These data show that ADA and Section 508 compliance is a significant issue in Web site accessibility, an issue which needs to be widely addressed. The total number of sites that passed without any user checks was 33, which equals 6 per cent of total sample of 549 sites. When looking at the categories of sites, the international sites had the best automatic BOBBY-approval rate with 11 per cent passing, and the Government sites the worst with 1 per cent passing. In terms of individual types of Priority 1, the most common error was "not providing alternative text for images", followed closely by "frame problems". In terms of user checks, the most common type of check was "If you use colour to convey information, make sure that the information is also represented another way", followed by "If an image conveys important information beyond what is in its alternative text, provide an extended description" (Jackson-Sanborn, Odess-Harnish and Warren, 2002).

Jackson's (1999) earlier study looks at three genres of Web sites (education, government, and shopping) and makes comparisons of their design elements. In the 45 Web sites he evaluated (15 from each genre), only about half of the education Web sites (46.7 per cent) and government

Web sites (53.3 per cent) met with BOBBY approval for accessibility. None of the shopping sites he evaluated earned BOBBY approval.

METHODOLOGY

One way to discover whether all the Web sites of the eight industries are accessible is to run them through screening software, the Centre for Applied Special Technology's (CAST) BOBBY. CAST BOBBY bases its accessibility analyses on the World Wide Web Consortium's (W3C) Web Accessibility Initiative (WAI) "Web Content Accessibility Guidelines 1.0 (WCAG)". WCAG document is organised around two general themes and 14 guidelines or general principles of accessible design. The themes ensure graceful transformation and making content understandable and navigable. WCAG contains 14 broadly phrased guidelines that are translated into 91 specific checkpoints that explain how the guidelines should be applied to specific content development scenarios. These checkpoints are organised into three levels of Priority: Priority 1 contains 29 checkpoints must be satisfied; Priority 2 contains 40 checkpoints that should be satisfied; and Priority 3 contains 22 checkpoints that may be satisfied.

- Guideline 1: Provide equivalent alternatives to auditory and visual content.
 - Provide content that, when presented to the user, conveys essentially the same function or purpose as auditory or visual content.
- Guideline 2: Don't rely on colour alone.
 - Ensure that text and graphics are understandable when viewed without colour.
- Guideline 3: Use markup and style sheets and do so properly.
 - Mark up documents with the proper structural elements. Control presentation with style sheets rather than with presentation elements and attributes.
- Guideline 4: Clarify natural language usage.
 - Use markup that facilitates pronunciation or interpretation of abbreviated or foreign text.
- Guideline 5: Create tables that transform gracefully.
 - Ensure that tables have necessary markup to be transformed by accessible browsers and other user agents.
- Guideline 6: Ensure that pages featuring new technologies transform gracefully.
 - Ensure that pages are accessible even when newer technologies are not supported or are turned off.
- Guideline 7: Ensure user control of time-sensitive content changes.
 - Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.
- Guideline 8: Ensure direct accessibility of embedded user interfaces
 - Ensure that the user interface follows principles of accessible design: device-independent access to functionality, keyboard operability and self-voicing.
- Guideline 9: Design for device-independence
 - Use features that enable activation of page elements via a variety of input devices.

- Guideline 10: Use interim solutions
 - o Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly.
- Guideline 11: Use W3C technologies and guidelines
 - o Use W3C technologies and follow accessibility guidelines. Where it is not possible to use a W3C technology, or doing so results in material that does not transform gracefully, provide an alternative version of the content that is accessible.
- Guideline 12: Provide context and orientation information
 - o Provide context and orientation information to help users understand complex pages or elements.
- Guideline 13: Provide clear navigation mechanisms
 - o Provide clear and consistent navigation mechanisms, orientation information, navigation bars and a site map to increase the likelihood that a person will find what they are looking for at a site. Clear and consistent navigation mechanisms are important to people with cognitive disabilities
- Guideline 14: Ensure that documents are clear and simple
 - o Ensure that documents are clear and simple so they may be more easily understood.

A well-known tool for evaluating Web site accessibility is BOBBY, developed by the Center for Applied Special Technology (CAST) and based on the WCAG and Section 508. BOBBY is one step in the process of making a site accessible to as many people as possible. CAST recommends that web developers use BOBBY as the first step to ensure accessible Web page design. The analysis of accessibility is based on W3C's Web Content Accessibility Guidelines (WCAG). All pages on the Web site must meet these requirements to achieve the BOBBY approved. For this study, the observation will be focussed on two aspects: to identify error of Web site development and to identify whether each Web site achieves the approval based on Web site development guidelines as suggested by World Wide Web Consortium (W3C, 1999).

BOBBY divides the accessibility errors into three sections to be tested:

- (i) Priority 1 Errors are problems that seriously affect the page's usability by people with disabilities, in accordance with Priority 1 of WCAG. A BOBBY Approved rating can only be granted to a site with no Priority 1 errors. BOBBY Approved status is equivalent to Conformance Level A for the WCAG.
- (ii) Priority 2 Errors are secondary access problems. If all items in this section including relevant User Checks passed the test, it meets Conformance Level AA for the WCAG.
- (iii) Priority 3 Errors are third-tier access problems. If all items in this section including relevant User Checks passed the test, it meets Conformance Level AAA for the WCAG.

372 Web sites were selected and analysed to identify the quality of their Web site development. When BOBBY analyses a list of Web pages, it stores the dates that those pages were last modified. The selections of Web sites are based on Search Engine (Google, Yahoo, and Cari.com.my), Yellow Pages and Online directories. Only the active Web sites are selected.

Thus, three months were needed to observe all these Web sites. The sampling selection is based on eight industries: Internet and ICT; tourism and hospitality; manufacturing; retailing; construction and real estate; printing and publishing; banking and finance; and education. 50 Web sites from each industry were selected, excepted banking and finance industry with 22 Web sites, due to the small size of industry in Malaysia. The selection of these industries was based on two reasons, performance and income, as well as active use of Web site for business purposes.

FINDINGS AND DISCUSSIONS

The total of Web sites that passing the BOBBY test is 65, which equals to 17.47 per cent of total sample of 372 Web sites. From the total evaluated Web sites, 307 Web sites (82.53 per cent) failed outright, which means that they pose serious accessibility problems. The highest number of failed Web sites is from tourism and hospitality industry. This follows by printing and publishing, Internet and ICT, education, manufacturing, construction and real estate, retailing, and banking and finance. Banking and finance industry Web sites had the highest percentage passing the BOBBY test, which covers 41 per cent. From the total evaluated Web sites (22 Web sites), 9 Web sites passed the BOBBY approved test. Looking at the categories of Web sites, retailing industry Web sites had the best BOBBY approval rate with 12 Web sites or 24 per cent passing, and tourism and hospitality industry Web sites were the worst with 5 Web sites or 10 per cent passing. Beside tourism and hospitality industry Web sites that had worse passing rate of 10 per cent, the other industries that had passing rate less than 20 per cent were the Internet and ICT (6 Web sites), manufacturing (9 Web sites), printing and publishing (6 Web sites), and education (8 Web sites). On the other hand, beside banking and finance, and retailing industry Web sites passed BOBBY approval rate of above 20 per cent, other industry passing that percentage was construction and real estate industry with 20 per cent or 10 Web sites passing the BOBBY approval (see Table 1).

Table 1
Numbers and Percentages of Failed and Approved Web sites

<i>Industry</i>	<i>Number Tested</i>	<i>Number Failed</i>		<i>Number Approved</i>	
		<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Banking and Finance	22	13	59.1	9	40.9
Retailing	50	38	76.0	12	24.0
Construction and Real Estate	50	40	80.0	10	20.0
Manufacturing	50	41	82.0	9	18.0
Education	50	42	84.0	8	16.0
Internet and ICT	50	44	88.0	6	12.0
Printing and Publishing	50	44	88.0	6	12.0
Tourism and Hospitality	50	45	90.0	5	10.0
Total	372	307	82.5	65	17.5

The total of Priority 1, Priority 2 and Priority 3 errors from 372 samples of Web sites consisted of 76360 errors (see Table 2 for summary). Priority 2 had the highest percentage facing the errors, consist of 40309 errors (52.8 per cent). This is followed by Priority 1 with 26953 errors (35.3 per cent) and Priority 3 with 9098 errors (11.9 per cent) from the total errors (see Table 3, 4 and 5 for detail).

Table 2
Summary for the Total of Priority 1, Priority 2, and Priority 3 Errors

<i>Priority</i>	<i>Accessibility Errors</i>	<i>User Checks 1</i>	<i>User Checks 2</i>	<i>Total</i>
Priority 1	4875 (6.4%)	21337 (27.9%)	741 (1.0%)	26953 (35.3%)
Priority 2	12941 (16.9%)	24764 (32.4%)	2604 (3.4%)	40309 (52.8%)
Priority 3	3656 (4.8%)	3582 (4.7%)	1860 (2.4%)	9098 (11.9%)
Total	21472 (28.1%)	49683 (65.1%)	5205 (6.8%)	76360 (100.0%)

* Three levels of conformance:

- Conformance Level "A": All Priority 1 checkpoints are satisfied;
- Conformance Level "AA": All Priority 1 and 2 checkpoints are satisfied;
- Conformance Level "AAA": All Priority 1, 2, and 3 checkpoints are satisfied.

The Internet and ICT industry Web sites had the highest percentage facing the errors, which equals to 20.3 per cent from the total of 15495 errors. The printing and publishing industry Web sites had the second highest percentage errors with 19.5 per cent. This follows by retailing (13.7 per cent), education (12 per cent), manufacturing (9.7 per cent), construction and real estate (9.4 per cent), banking and finance (8 per cent), and tourism and hospitality (7.3 per cent).

Major errors of the Web sites are checkpoint 2.2 (check that the foreground and background colours contrast sufficiently with each other), checkpoint 2.1 (if you use colour to convey information, make sure the information is also represented another way), and checkpoint 3.4 (use relative sizing and positioning (% values) rather than absolute (pixels)). Violations of just ten checkpoints (Checkpoint 2.2, 2.1, 3.4, 11.2, 1.1: Priority 1 – User Checks 1, 7.3, 1.1: Priority 1 – Accessibility Errors by Type, 5.5, 5.2, 5.5) accounted for as many as 59188 (77.5 per cent) of the total number of errors.

Table 3
Priority 1

	<i>CP</i>	<i>I&I</i>	<i>T&H</i>	<i>M</i>	<i>R</i>	<i>C&R</i>	<i>P&P</i>	<i>B&F</i>	<i>E</i>	<i>Total</i>
Accessibility Errors by Type										
Provide alternative text for all images.	1.1	859	347	456	511	302	902	423	575	4375
Provide alternative text for all image map hot-spots (AREAs).	1.1	64	59	51	54	32	12	4	32	308
Provide alternative text for all image-type buttons in forms.	1.1	15	2	2	3	1	3	4	2	32
Each frame must reference an HTML file	1.1	0	0	5	0	0	0	0	0	5
Give each frame a title.	12	22	22	11	14	32	19	6	19	145
Provide alternative text for each APPLETT	1.1	3	1	1	0	0	1	1	1	8
Provide alternative content for each OBJECT	1.1	0	0	0	0	1	1	0	0	2
Total		963	431	526	582	368	938	438	629	4875
User Checks										
If you can't make a page accessible, construct an alternate accessible version	10	50	50	50	49	50	50	36	50	385
If an image conveys important information beyond what is in its alternative text, provide an extended description	1.1	1005	399	566	655	428	918	342	644	4957

table contd.

If a table has two or more rows or columns that serve as headers, use structural mark-up to identify their hierarchy and relationship	5.2	472	148	269	279	164	475	167	191	2165
If you use colour to convey information, make sure the information is also represented another way	2.1	2118	704	956	1622	1004	2482	999	1342	11227
If style sheets are ignored or unsupported, are pages still readable and usable?	6.1	29	21	24	24	28	31	11	32	200
If this is a data table (not used for layout only), identify headers for the table rows and columns	5.1	262	74	112	130	79	233	78	119	1087
Provide alternative content for each SCRIPT that conveys important information or functionality	6.3	31	16	21	29	20	23	16	19	175
Make sure pages are still usable if programmatic objects do not function	6.3	90	25	29	38	53	36	16	53	340
Make sure the page does not cause the screen to flicker rapidly	7.1	5	0	0	2	0	0	1	4	12
If ALT text > 150 characters, consider providing a separate description	1.1	0	2	0	0	1	0	0	0	3
If the Submit button is used as an image map, use separate buttons for each active region	1.1	15	2	3	6	1	5	4	3	39
Make sure programmatic objects do not cause the screen to flicker rapidly	7.1	21	11	12	10	15	16	6	23	114
Design scripts, applets, or objects to provide direct accessibility	6.2, 8.1	90	25	31	19	53	36	16	55	325
Provide text links for all server-side image map hot-spots	1.2	0	0	0	0	0	0	0	1	1
Use a client-side image map instead of a server-side image map	1.1, 1.2, 9.1	0	0	0	0	0	0	0	1	1
Synchronise equivalent alternatives with multimedia presentations	1.4	78	27	31	19	53	32	14	48	302
If possible, use a client-side image map instead of a server-side image map	1.5	0	0	0	0	2	0	0	0	2
Are there text links that duplicate all server-side image map hot-spots?	1.1, 1.2, 1.5, 9.1	0	0	0	0	2	0	0	0	2
Total		4266	1504	2104	2882	1953	4337	1706	2585	21337
User Checks*										
Identify any changes in the document's language	4.1	49	49	50	50	50	50	22	49	369
Use the simplest and most straightforward language that is possible	14	50	50	50	50	50	50	22	50	372
Total		99	99	100	100	100	100	44	99	741
Grand Total		5328	2034	2730	3564	2421	5375	2188	3313	26953

• The following 2 items are not triggered by any specific feature on this page, but are still important for accessibility and are required for BOBBY A Approved status.

Note: CP: WCAG Checkpoint I&I: Internet & ICT, T&H: Tourism & Hospitality, M: Manufacturing, R: Retailing, C&R: Construction & Real Estate, P&P: Printing & Publishing, B&F: Banking & Finance, E: Education

Table 4
Priority 2

	<i>CP</i>	<i>I&I</i>	<i>T&H</i>	<i>M</i>	<i>R</i>	<i>C&R</i>	<i>P&P</i>	<i>B&F</i>	<i>E</i>	<i>Total</i>
Accessibility Errors by Type										
Use relative sizing and positioning (% values) rather than absolute (pixels)	3.4	3532	450	940	1480	899	1626	1082	1046	11055
Create link phrases that make sense when read out of context	13	1	1	0	4	4	3	67	36	116
Use a public text identifier in a DOCTYPE statement	3.2	45	39	42	40	40	38	15	41	300
Make sure event handlers do not require use of a mouse	9.3	138	63	78	163	93	168	42	145	890
Explicitly associate form controls and their labels with the LABEL element	12	11	0	0	2	0	0	7	15	35
Do not use the same link phrase more than once when the links point to different URLs	13	48	9	8	33	46	74	41	38	297
Avoid scrolling text created with the MARQUEE element	7.3	2	2	1	3	4	4	0	1	17
Provide an explicit label for each form control	12	37	16	8	32	5	47	18	10	173
Include a document TITLE	13	2	4	2	5	2	1	2	1	19
Do not cause a page to redirect to a new URL	7.5	2	0	1	0	2	1	1	2	9
Do not cause a page to refresh automatically	7.4	0	3	0	12	0	0	0	1	16
Provide a NOFRAMES section when using FRAMES	6.5	0	2	2	1	4	0	0	2	11
Nest headings properly	3.5	0	0	0	0	0	0	0	1	1
Avoid blinking text created with the BLINK element	7.2	0	0	1	0	0	1	0	0	2
Total		3818	589	1083	1775	1099	1963	1275	1339	12941
User Checks										
Consider grouping long lists of selections into a hierarchy	12	3	3	0	7	0	8	5	6	32
Check that the foreground and background colours contrast sufficiently with each other	2.2	2147	740	993	1651	1040	2476	985	1196	11228
If there are logical groupings of form controls, use FIELDSET with LEGEND on each group	12	20	6	5	13	4	22	38	94	202
If objects use event handlers, make sure they do not require use of a mouse	6.4	27	10	11	12	15	16	7	22	120
Avoid use of obsolete language features if possible	11	838	289	330	949	695	1462	187	624	5374
Is the user made aware that there will be pop-up windows or changes in the active window?	10	117	72	35	68	61	296	52	135	836
Make sure that labels of all form controls are properly placed	10	11	3	4	16	6	14	6	10	70
Make sure that all elements that have their own interface are operable without a mouse	9.2	84	27	32	36	53	34	15	56	337

table contd.

If this gif image is animated, make sure it does not contain fast or distracting motion	7.3	153	0	0	17	0	2	2	79	253
If scripts create pop-up windows or change the active window, make sure that the user is aware this is happening	10	11	0	0	17	0	0	14	11	53
Add a descriptive title to links when needed	13	38	34	37	30	36	40	10	90	315
Mark up any quotations with the Q and BLOCKQUOTE elements	3.7	25	19	12	29	18	20	16	19	158
Use style sheets to control layout and presentation wherever possible	3.3	21	30	26	26	22	20	12	19	176
If programmatic objects create pop-up windows or change the active window, make sure that the user is aware this is happening	10	88	69	40	149	90	133	65	80	714
Do not create a blinking effect with animated gif images	7.3	868	391	561	549	329	910	518	535	4661
Add a description to a frame if the TITLE does not describe its contents	12	22	27	14	15	20	19	5	26	148
As appropriate, use metadata to add computer-understandable information about the page	13	1	3	4	5	3	1	2	1	20
Make sure header elements are not used only for bold text	3.2	1	1	0	0	2	0	0	3	7
Make sure BLOCKQUOTE is used only for quotations, not indentation	3.7	0	1	1	0	0	1	0	1	4
If this table is used for layout only, do not use structural markup to achieve formatting effects	5.3	0	1	1	1	0	0	0	0	3
Only use list elements for actual lists, not formatting	3.6	5	0	0	12	0	36	0	0	53
Total		4480	1726	2106	3602	2394	5510	1939	3007	24764
User Checks*										
Make sure that all link phrases make sense when read out of context	13	50	50	50	50	50	50	22	50	372
Group related elements when possible	12	50	50	50	50	50	50	22	50	372
Make sure your document validates to formal published grammars	3.2	50	50	50	50	50	50	22	50	372
Is there a site map or table of contents, a description of the general layout of the site, the access features used, and how to use them?	13	50	50	50	50	50	50	22	50	372
Is there a clear, consistent navigation structure?	13	50	50	50	50	50	50	22	50	372
Use the latest technology specification available whenever possible	11	50	50	50	50	50	50	22	50	372
Where it's possible to mark up content (for example mathematical equations) instead of using images, use a markup language (such as MathML)	3.1	50	50	50	50	50	50	22	50	372
Total		350	350	350	350	350	350	154	350	2604
Grand Total		8648	2665	3539	5727	3843	7823	3368	4696	40309

* The following 7 items are not triggered by any specific feature on the page, but are still important for accessibility and are required for BOBBY AA Approved status.

Table 5
Priority 3

	<i>CP</i>	<i>I&I</i>	<i>T&H</i>	<i>M</i>	<i>R</i>	<i>C&R</i>	<i>P&P</i>	<i>B&F</i>	<i>E</i>	<i>Total</i>
Accessibility Errors by Type										
Identify the language of the text	4.3	50	48	49	53	52	54	26	47	379
Provide a summary for tables	5.5	481	153	268	311	168	482	167	189	2219
Include default, place-holding characters in edit boxes and text areas	10	27	14	4	16	6	23	8	9	107
Client-side image map contains a link not presented elsewhere on the page	1.5	66	39	47	52	33	7	1	20	265
Separate adjacent links with more than whitespace	11	48	48	38	94	66	178	7	207	686
Total		672	302	406	526	325	744	209	472	3656
User Checks										
Consider furnishing keyboard shortcuts for form elements	9.5	12	3	7	11	6	11	7	8	65
If this document is part of a collection, provide metadata that identifies this document's location in the collection	14	57	50	50	49	48	48	22	44	368
If this is a data table (not used for layout only), provide a caption	5.5	348	153	268	176	165	482	156	179	1927
Consider specifying a logical tab order among form controls, links and objects	9.4	30	18	14	26	18	28	11	23	168
Use the ABBR and ACRONYM elements to denote and expand any abbreviations and acronyms that are present	4.2	47	50	50	49	49	49	21	50	365
If you have grouped links, is there a link at the beginning to bypass the group?	14	14	6	3	16	4	21	10	12	86
If there are logical groups of links, have they been identified and a link to skip the group provided?	14	14	6	3	16	4	21	9	12	85
Consider adding keyboard shortcuts to frequently used links	9.5	43	38	37	35	39	44	13	36	285
Where appropriate, use icons or graphics (with accessible alternatives) to facilitate comprehension of the page	14	32	32	34	31	33	27	12	31	232
If row or column labels are long, provide abbreviations	5.6	0	0	0	1	0	0	0	0	1
Total		597	356	466	410	366	731	261	395	3582
User Checks*										
Is there distinguishing information at the beginning of headings, paragraphs, lists, etc.?	14	50	50	50	50	50	50	22	50	372
If there is a search feature, are there different types of searches for different skill levels and preferences?	14	50	50	50	50	50	50	22	50	372

table contd.

	<i>CP</i>	<i>I&I</i>	<i>T&H</i>	<i>M</i>	<i>R</i>	<i>C&R</i>	<i>P&P</i>	<i>B&F</i>	<i>E</i>	<i>Total</i>
Do you allow users to customise their experience of the web page?	11	50	50	50	50	50	50	22	50	372
Are there navigation bars for easy access to the navigation structure?	14	50	50	50	50	50	50	22	50	372
Is there a consistent style of presentation between pages?	14	50	50	50	50	50	50	22	50	372
Total		250	250	250	250	250	250	110	250	1860
Grand Total		1519	908	1122	1186	941	1725	580	1117	9098

* The following 5 items are not triggered by any specific feature on the page, but are still important for accessibility and are required for BOBBY AAA Approved status.

CONCLUSION

This study shows that the percentage of Web sites to achieve the BOBBY Approved consider very low, also same with most of the studies as shown in the literature section. Out of 372 of the total evaluated Web sites, 307 Web sites (82.53 per cent) failed outright, which means that they pose serious accessibility problems. The total of Priority 1, Priority 2 and Priority 3 errors from 372 samples of Web sites consisted of 76360 errors. Violations of just ten checkpoints (Checkpoint 2.2, 2.1, 3.4, 11.2, 1.1: Priority 1 – User Checks 1, 7.3, 1.1: Priority 1 – Accessibility Errors by Type, 5.5, 5.2, 5.5) accounted for as many as 59188 (77.5 per cent) of the total number of errors. Web sites that passed without errors in the three priorities for all industries were less than 30 per cent, except for Priority 1 Accessibility errors for banking and finance Web sites, which was 40.91 per cent.

Although BOBBY can be used as a first step in an accessibility evaluation, three limitations have been identified with regards to its use. This study also agrees with three studies before, Zaphiris and Zacharia (2001), Zaphiris and Kurniawan (2001), and Zaphiris and Ellis (2001), which also commented, about the limitations on BOBBY. The limitations are stated below:

- There are important elements (such as the web navigation structure, the information's layout, the value of information, or various aesthetic aspects), which are not evaluated by the automatic tools.
- The meaning/significance/appearance of graphics is not evaluated and only the inclusions of ALT tags are taken into consideration by BOBBY.
- Text-only Web sites will get high ranking with both tools regardless of the quality of information or the readability of the fonts.

Other limitations, also highlighted by Williams and Rattray (2003) have been identified are:

- Some of the sites surveyed had alternative text for some images on a page but not all. As BOBBY requires only one missing piece of alternative text on a page to fail at Priority 1 this fail result is not really reflective of the page's accessibility.
- A second issue with the Bobby validator is that as an automated validator it cannot check certain aspects of accessibility that involve qualitative judgement. Thus, an image with alternative text will pass Bobby even if the text given proves to be of little or no use. For example, that alternative might merely say "picture". This provides no real

information (and benefit) for those not “seeing” it as would be the case if a screen-reader or text based browser were being used.

- BOBBY checks have been shown to generate false negative or false positive evaluations. As this is only a marginal problem and a sample of 372 is relatively large these effects are unlikely to detract from the overall assessment figures calculated for accessibility.

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