Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Applied Sciences 10 (23): 2954-2966, 2010
ISSN 1812-5654

Web Site Accessibility and Web Site Development in Malaysia

Chai Lee Goi
Department of Marketing and Management, School of Business,
Curtin University of Technology, CDT 250, 98009 Miri, Sarawak, Malaysia

Abstract: This study focuses on two parts. First part of the study is to identify the major problems of web site content in Malaysia using bobby web accessibility tool. The second objective is to study perception of marketers on web site development in Malaysia based on four factors (planning and preparation; development and design; management and maintenance and security, privacy and trust). The outcome of first part of this study found that number of web sites has achieved the bobby test is very low, which is 17.5%. The major errors of the web sites mainly are related to text, colour, animation, image, pixel and table. For the second part of study, even a test of web site development model is not a good-fit model, however, an overall of the study shows that all factors of web site development are important.

Key words: Web site accessibility, bobby, web site development

INTRODUCTION

The number of web sites grew 1758% in 1994 and doubled in size every 53 days by 1995 (The Economist, 1995). It has increased more than six times in just one year from January 1994 to January 1995 (Levy, 1996). New web sites on the internet have been appearing at the rate of one per minute (Schwartz, 1997). A few studies found that the number of the domain name and web site has increased day by day. This can be referred to from the following studies:

- In the subsequent six years, the web grew from 130 separate web servers to more than 7 million servers (Zakon, 1999)
- The average number of total bytes at a random sample of web sites grew from about 3.5 million to 6.3 million in one year. Individual web sites seem to be almost doubling in size each year (Koehler, 1999)
- The publicly indexable web contains an estimated 800 million pages as of February 1999, encompassing about 15 terabytes of information or about 6 terabytes of text data on about 3 million servers after removing HTML tags, comments and extra whitespace (Lawrence and Giles, 1999)
- The number of web pages on the Internet is 2.1 billion and pages added per day is 7.3 million (Murray and Moore, 2000)
- By early 1999, the number of registered domain names was 5.3 million and by February 2000, there were about 11 million sites (Tschong, 2000)
- The total number of Generic Top Level Domains (gTLD) domains registered worldwide in April 15, 2009 is 107,235,401 from five main primary domains (Biz, Info, Org, Net and Com) (Zooknic, 2009)
- Internet domain survey found that the total domain in January 2009 was increased to 625,226,456 compared to January 1993 which was just 1,313,000 (Internet Systems Consortium, 2009)

Refer to Malaysia context, acceptance of web site by Malaysians is increasing year by year. Very few com.my domain names were registered prior to 1995 under MYNIC that was only 100 registrations. However, the new domain name registrations were increased to 64841 registrations in November 2009. The total number registration of my, com.my, net.my, org.my, gov.my, edu.my, mil.my and name. my in November 2009 is 89798 (MYNIC, 2009).

Several underlying forces coming together have caused web site explosion of utilisation. The four reasons that caused web site explosion are mentioned below (Kiani, 1998):

- The development of graphical and user-friendly browsers based on point-and-click like Mosaic and the Netscape
- The development of software and hardware tools that can be used to create rich content; the emergence of open standards in development tools and at the network protocol level
- The growth in support services such as web business design, hosting and gateway services that help accelerate adoption
- The development of critical processes such as ordering, billing and payment

The quality of web site designs depends on task, performance and development (Brajnik, 2001). It is important to understand what skills (technical, business and analytical) and knowledge are required for successful web site development to work, how such skills and knowledge are used in actual practice and how such skills and knowledge can be improved (Taylor *et al*., 2001). However, web-based business models are still in the nascent stage as is research into the design and utilisation of commercial web sites. Given the early stage of research in web site development for business purposes, there are no obvious criteria to evaluate the effectiveness of commercial web sites.

The first objective is mainly to identify the major problems of web site content in Malaysia. By using bobby web accessibility tool, the study is focusing on two aspects of web site:

- To identify number and percentages of failed and approved web sites
- To identify number of errors of Priority 1, 2 and 3 for web sites of each industry

The second objective is to study perception of marketers on web site development in Malaysia based on four factors (planning and preparation; development and design; management and maintenance and security, privacy and trust).

The Web Content Accessibility Guidelines (WCAG) are the most important single resource for web developers seeking to make their sites accessible (Slatin, 2001). Accessibility evaluation studies carried out during the last decade or so significantly widened the literature-base on accessibility. Researchers from different fields carried out small and large scale studies to find out the level of web accessibility of web sites of their choice (Wijayaratne and Singh, 2010).

Sullivan and Matson (2000) found that if content accessibility is defined in a continuous, rather than dichotomous manner, 29 of 50 of the web's most popular sites can still be classified as inaccessible. Most of the studies as shown in Table 1 have found that the accessibility is very less, even less than 50%. Most of the studies are related to education and library (Schmetzke, 1999, 2001a, b; Rowland and Smith, 1999; Flowers *et al*., 1999, 2001; Lilly and Van Fleet, 2000; Guitierrez and Long, 2001; Zaphiris and Ellis, 2001; Spindler, 2002; Kelly, 2002; Anonymous, 2003; Opitz *et al*., 2003; Alexander, 2004; Zaparyniuk and Montgomerie, 2005; Anonymous, 2006; Wijayaratne, 2008; Green and Huprich, 2009; Klein *et al*., 2003), most popular web sites (Sullivan and Matson, 2000), Fortune 100/500 (Romano, 2002a, b; Loiacono, 2004), health and aging (Zaphiris and Kurniawan, 2001), government (Potter, 2002; Hackett and Parmanto, 2005; Hong *et al*., 2008; Kuzma, 2010), geographical-based (Zaphiris and Zacharia, 2001), difference mixed industries (Jackson-Sanborn *et al*., 2002; Lewis *et al*., 2007; Freedman, 2007) and non-profit's web sites (Loiacono and McCoy, 2004). In Hackett *et al*. (2004) study, they have found that the accessibility problems seem to have worsened in the last few years.

The issue at the heart of web accessibility is that many web sites are not designed with equal access in mind. In other words, lack of web accessibility is more a result of faulty design rather than inadequate technologies. The most common accessibility barriers mainly related to images without alternative text, misleading use of structural elements on a web page, uncaptioned audio or undescribed video, tables that are difficult to decipher when linearised, sites with poor colour contrast, poorly written code underlying the web design, poor navigational design, missing headings or titles and alternative text for images.

Brown *et al*. (2010) suggested that to achieve the accessibility, web site need to be equitable use (does it disadvantage any of our user groups), flexibility (the design accommodates a wide range of individual preferences and abilities), simple and intuitive use (design is easy to understand, regardless of user's experience, knowledge, language skills or concentration levels), perceptible information (design communicates necessary information effectively to the user, regardless of ambient conditions or user's) sensory abilities, tolerance for error (the design minimises hazards and adverse consequences of accidental or unintended actions) and low physical effort (the design can be used effectively and comfortably and with a minimum of fatigue).

A review of previous studies (Anonymous, 2006; Wijayaratne, 2008; Loiacono, 2004) have found that most of the problems of web sites related to text, frame, image, type of button in form, broken link, relative size and position and site often used JavaScript, which sometimes fails to work with certain assistive technology (Table 2).

Smith *et al*. (2004) highlighted three key issues underpinning usable web site development in a global context are considered in detail, which are requirements for design, tools for design (interpreting requirements) and strategies for evaluation. Lu and Yeung (1998) stated that the most critical factor for web site usefulness is functionality.

Web site design starts with the planning and preparation that refer to the corporate objectives as the guideline (Clyde, 2000). In the web site development, two important characteristics need to be focussed, content

Table 1: Previous study on bobby test

Author	Sample	Finding
Schmetzke (1999)	13 university home pages and first layer of library pages for the University of Wisconsin state system	69% had severe accessibility barriers
Rowland and Smith (1999)	400 home pages of U.S. postsecondary institutions	78% had some accessibility barriers
Flowers *et al* (1999)	89 home pages of special education programs at U.S. universities	73% had accessibility barriers
Lilly and Van Fleet (2000)	100 Yahoo most wired U.S. colleges	60% had severe accessibility barriers
Sullivan and Matson (2000)	50 Most popular web sites	Only 18% had achieved bobby test.
Flowers *et al.* (2001)	120 school district web sites were located using a popular online schooldirectory and evaluated for accessibility.	74.3% of web sites had accessibility problems
Guitierrez and Long (2001)	392 home pages of AACSB-accredited universities	68% had some form of accessibility barriers
Schmetzke (2001a)	The first set used 219 web sites of postsecondary distance education web sites, and the second set used 12 major national organizations concerned with distance learning	In the first set, 15% of the homepages were free of accessibility errors. Of the 3,360 pages linked to the homepages, only 23% were free of accessibility errors. In the second set, only one of the 12 home pages was free of accessibility errors and only 18% of the linked pages were free of accessibility errors
Schmetzke (2001b)	The top 24 US news and world report ranked schools of library and information science	4 of the library web sites were free from accessibility errors while only 1 of the schools of library and information science sites was error free
Zaphiris and Ellis (2001)	50 Top USA universities	Only 30% had achieved bobby test
Zaphiris and Kurniawan (2001)	89 Health and aging web sites	Only 28% had achieved bobby test
Zaphiris and Zacharia (2001)	Web site Content Accessibility of 30,000 Cypriot Web Sites	Only 20% had achieved bobby test
Potter (2002)	65 selected state of Alabama government Web sites	19% of the evaluated sites rated confirmation A and 16% achieved section 508 approval.
Romano (2002a, b)	Fortune 100 companies	70% had accessibility problems.
Romano (2002a, b)	Top 250 of fortune 500 firms	75% had severe accessibility barriers
Spindler (2002)	188 home pages of U.S. universities with enrolments between 5000-10,000	74% of the home pages had some form of accessibility barrier
Jackson-Sanborn *et al.* (2002)	6 genres (overall most popular, clothing, international, jobs, college and government)	Only 33.9% had achieved bobby test
Kelly (2002)	13 UK university web sites	Only four entry points appeared to provide AA compliance by having no Priority 1 or Priority 2 errors. These were the University of Bristol, the University of East London, the University of Sheffield and Writtle College
Anonymous (2003)	100 home pages of British universities	33% failed to meet basic accessibility requirements
Klein *et al.* (2003)	157 Web sites of public high schools in Iowa	94.3% did not pass the bobby Priority 1 check and 98.1% did not pass priority 2 check.
Opitz *et al.* (2003)	50 homepages for the Department of Education and their corresponding special education pages in the USA	Only 26% had an accessible web site
Loiacono and McCoy (2004)	96 non-profit organisations	87% had severe accessibility barriers
Loiacono (2004)	Top 100 of fortune 500 firms	20% had severe accessibility barriers; 6% had no barriers
Alexander (2004)	45 Australian University Web sites	98% of Web sites failed to meet Web accessibility
Zaparyniuk and Montgomerie (2005)	350 home pages of Canadian postsecondary institutions	80% had some severe accessibility barriers
Anonymous (2006)	436 European public service Web sites	Only 3% met full conformance with WCAG guidelines
Lewis *et al.* 2007)	99 Instructional Web sites of departments	88% of the instructional Web sites had accessibility barriers
Freedman (2007)	10 British Web sites - newspaper, shopping, airline, banking and telecoms sites	20% had an accessible web site
Hong *et al.* (2008)	4 Korean government Web sites were compared to four comparable U.S. government Web sites	The accessibility error rates for priorities 1 and 2 checkpoints of the 4 Korean government Web sites are 3.2 and 11.5%, respectively, two times higher than the corresponding error rates of the four US government Web sites, which are 1.6 and 4.7% for priorities 1 and 2 checkpoints, respectively. The overall accessibility error rates of the Korean and the US government websites are 14.8 and 6.2%, respectively
Wijayaratne (2008)	Homepages of institutional and library Web sites of the Open Universities of the Commonwealth-28 university Web sites and 18 library Web sites	6 University Web sites and 4 library Web sites were able to receive the bobby approval
Green and Huprich (2009)	12 top ranked schools of library and information science	Only 2 of 12 schools had no Section 508 errors on their library Web site
Kuzma (2010)	130 MP members in the House of Commons	Only 23% met WCAG level 1.0

and design. Both characteristics were measured by means of features (objectively) and perceptions (subjectively) (Huizingh, 2000). Web site quality has a direct and positive impact on customer satisfaction and that

Table 2: Previous study on checklist errors

Author	Sample	Finding
Anonymous (2006)	436 European public service web sites	• Failure to provide alternative text (alt tags) for non-text elements • Frameset technology, the omission of frame titles • Failure to provide a no-frames alternative • Sites often used JavaScript, which sometimes fails to work with certain assistive technology
Shi (2006)	30 province-level Chinese government web sites and the 8 state-or territory-level Australian government web sites	• No alternative text was provided for images (96.7%) • No alternative text was provided for all image map hot spots (46.7%) • No alternative text was provided for all image-type buttons in forms (43.3%) • Each frame was not given a title (40.0%) • Provide a text equivalent for every non-text element (e.g., via alt, longdesc, or in element content) (96.7%) • Title each frame to facilitate frame identification and navigation (56.7%) • Ensure that equivalents for dynamic content are updated when the dynamic content changes (6.7%)
Wijayaratne (2008)	Homepages of institutional and library web sites of the Open Universities of the commonwealth-28 university web sites and 18 library web sites	• Elements missing Alt text • Elements missing height and width attributes • Broken links/ broken anchors
Thompson *et al.* (2007)	192 member states of the United Nations	• Navigation and orientation (only about one-quarter of the items assessed on this criterion received a pass rating) and Scripting (nearly all of these items failed on accessibility)
Loiacono (2004)	Top 100 of fortune 500 firms	• Failure to include alternate tags for images • Failure to use relative sizing and positioning • Failure to assure that the functionality of the page is independent of a particular input device
Klein *et al.* (2003)	157 Web sites of public high schools in Iowa	• Provide alternative text for all images • Do not use fixed font size

Table 3: Development model, tasks and usability methods for web sites

Stage	Usability method
Establish the need-before the Web is adopted as a solution	
Information providers business objectives	One-to-one meetings
Whether a Web site is the right solution	Brainstorming
Define success	
Gather information-before any web development takes place	
Competitive analysis	Competitive analysis
Key users	Focus groups
Key user characteristics	Interviews
Key user tasks	Surveys
Information objects	Questionnaires
Relevant published research	Scenarios
Reusable content resources	Customer pathways
Appropriate guidelines and heuristics	Review appropriate existing studies of user information-related behaviour
	Design team brainstorming
Develop and evaluate-before creating the complete site	
Design look and feel	Web design guidelines
Structure and chunking	Card sorting
Create prototypes	Focus groups
Evaluate prototype usability	Prototype testing
Evaluate prototype accessibility	Online feedback forms
Evaluate conformance to guidelines	Questionnaires
	Scenarios
	Think-aloud methods
	Direct observation
	Interviews
	Structural analysis
	Inspection/walkthrough methods
Implement-once all design decisions have been finalised	
Validate	Continuing competitive analysis
Check internal and external links	Online questionnaire
Launch	Email feedback
Publicise	Search terms analysis
	Log analysis
Maintain-continuously after site has been launched	
Monitor site use	Search terms analysis
Check external links	Log analysis
Gather user feedback	Online questionnaire
Monitor changing business objectives	E-mail feedback
Monitor changes in technology	Continuing competitive analysis
Continue competitive analysis	
Continue to understand key users	

Cunliffe (2000)

customer satisfaction has a direct and positive impact on purchase intentions (Bai *et al*., 2008).

The management and maintenance process that needs to be focussed are ensuring that new pages meet the quality and usability requirements, indexing and full maintenance (Bevan, 1999).

The study of web site development models has found that web developer has focusing on planning and preparation; development and design; management and maintenance and security, privacy and trust. A study by Cunliffe (2000) found that an informal web site development model covers establish the need before the web site is adopted as a solution; gather information before any web site development takes place; develop and evaluate before creating the complete site; implementation should be done once all design decisions have been finalised and maintain (Table 3).

MATERIALS AND METHODS

The analysis will be based on two parts: All web sites were analysed with web site evaluation tool, bobby and all data from qualitative study were analysed with SPSS and AMOS.

Data collection: Three hundred and seventy two web sites have been selected and tested for accessibility with bobby. 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. Three months were needed to observe all these web sites. The sampling selection is based on eight industries, which are Internet and ICT; tourism and hospitality; manufacturing; retailing; construction and real estate; printing and publishing; banking and finance and education. Fifty 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.

For the second part of the study, questionnaire is use to study perception of marketers on web site development in Malaysia. One hundred marketers were randomly selected and involved in this study. Questionnaires have been distributed to marketers who are involved in eight industries.

Data analysis

CAST bobby test: CAST bobby bases its accessibility analysis on the World Wide Web Consortium's (W3C) Web Accessibility Initiative (WAI) Web Content Accessibility Guidelines 1.0 (WCAG). WCAG contains 14 as shown in Table 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

Table 4: Web content accessibility guidelines 1.0

Guideline	Description
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
Don't rely on colour alone	Ensure that text and graphics are understandable when viewed without colour
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
Clarify natural language usage	Use markup that facilitates pronunciation or interpretation of abbreviated or foreign text
Create tables that transform gracefully	Ensure that tables have necessary markup to be transformed by accessible browsers and other user agents
Ensure that pages featuring new technologies transform gracefully	Ensure that pages are accessible even when newer technologies are not supported or are turned off.
Ensure user control of time-sensitive content changes	Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped
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
Design for device-independence	Use features that enable activation of page elements via a variety of input devices
Use interim solutions	Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly
Use W3C technologies and guidelines	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
Provide context and orientation information	Provide context and orientation information to help users understand complex pages or elements
Provide clear navigation mechanisms	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
Ensure that documents are clear and simple	Ensure that documents are clear and simple so they may be more easily understood

checkpoints must be satisfied; Priority 2 contains 40 checkpoints that should be satisfied and Priority 3 contains 22 checkpoints that may be satisfied (Table 4).

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

- **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
- **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
- **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

SPSS and AMOS: For the second part of study, all data were analysed with SPSS and AMOS. SPSS is used for statistical analysis, mainly mean score and correlation of coefficient. AMOS is one of the Structural Equation Modelling (SEM) software. In this study, AMOS enables to build models that more realistically reflect complex relationships with the ability to use observed variables. At the same time, model fitness will be tested.

To determine the number of the sampling units, literature suggests ten to fifteen of participants in the case of homogeneous group. The experience indicates that few new ideas are generated within a homogeneous group once the size exceeds 30 well-chosen participants . The size of the samples is also determined according to literature by the size of samples would be 10 to 20 samples. Malhotra suggested that the minimum sampling size for problem solving research is 200 samples. Based on these literatures, the size of the sampling unit is between 10 and 200. Thus, the total samples for this research will be 100 samples.

RESULTS AND DISCUSSION

Bobby test: The total of web sites that passing the bobby test is 65, which equals to 17.47% of total sample of 372 web sites. From the total evaluated web sites, 307 web sites (82.53%) 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%. 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% passing and tourism and hospitality industry web sites were the worst with 5 web sites or 10% passing. Beside tourism and hospitality industry web sites that had worse passing rate of 10%, the other industries that had passing rate less than 20% 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%, other industry passing that percentage was construction and real estate industry with 20% or 10 web sites passing the bobby approval (Table 5).

Table 5: Numbers and percentages of failed and approved web sites

		No. failed		No. approved	
Industry	No. tested	N	%	N	%
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 analysis with bobby test will be focused on accessibility errors and user checks. User checks 1are triggered by any specific feature on certain page and user checks 2 are not triggered by any specific feature on certain page, but are still important for accessibility and are required for bobby approved status. The total of Priority 1, 2 and 3 errors from 372 samples of web sites consisted of 76360 errors (Table 2). Priority 2 had the highest percentage facing the errors; consist of 40309 errors (52.8%). This is followed by Priority 1 with 26953 errors (35.3%) and Priority 3 with 9098 errors (11.9%) from the total errors (Table 6).

Checkpoint errors: Violations of just ten checkpoints accounted for as many as 59188 (77.5%) of the total number of errors (76360 errors) (Table 7). First three major problems are related to Checkpoint 2.2. Check that the foreground and background colours contrast sufficiently with each other (11228 errors or 14.7%), Checkpoint 2.1. If you use colour to convey information, make sure the information is also represented another way (11227 errors

Table 6: Total of priority 1, 2 and 3 error

Priority	Accessibility errors	User checks 1	User checks 2	Total
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

Table 7: Checkpoint most reported errors

Priority	Checkpoint	Accessibility errors	Total
2	2.2	Check that the foreground and background colours contrast sufficiently with each other	11228
1	2.1	If you use colour to convey information, make sure the information is also represented another way	11227
2	3.4	Use relative sizing and positioning (% values) rather than absolute (pixels)	11055
2	11.2	Avoid use of obsolete language features if possible	5374
1	1.1	If an image conveys important information beyond what is in its alternative text, provide an extended description	4957
2	7.3	Do not create a blinking effect with animated gif images	4661
1	1.1	Provide alternative text for all images	4375
3	5.5	Provide a summary for tables	2219
1	5.2	If a table has two or more rows or columns that serve as headers, use structural mark-up to identify their hierarchy and relationship	2165
3	5.5	If this is a data table (not used for layout only), provide a caption	1927
Total			59188

Table 8: Mean score for web site development factors

Factor and variable	Mean	SD
1: Planning and preparation	3.9067	0.54036
1.1: Establish the need	4.1500	0.55732
1.2: Gather information	4.0600	0.48866
1.3: Prototype creation	3.5100	0.94810
2: Development and design	4.1340	0.55926
2.1: Specification for business function	4.2500	0.60927
2.2: Specification for target users	4.0400	0.68046
2.3: Accuracy and consistency of web site	4.3400	0.62312
2.4: Web site structure and attractiveness	4.2400	0.63755
2.5: Implementation: Validate of web site	3.8000	0.80403
3: Management and maintenance	3.6133	0.64913
3.1 Continue competitive analysis	3.7100	0.71485
3.2: Monitor changes in technology	3.4400	0.86830
3.3: Frequency of web site updated	3.6900	0.88415
4: Security, privacy and trust	4.4633	0.61390
4.1: Security on online activities (communication, transaction and distribution)	4.4900	0.64346
4.2: Privacy on online activities	4.4800	0.64322
4.3: Trust on online activities	4.4200	0.68431

or 14.7%) and Checkpoint 3.4. Use relative sizing and positioning (% values) rather than absolute (pixels) (11055 errors or 14%). This follows by other seven major errors, Checkpoint 11.2. Avoid use of obsolete language features if possible, Checkpoint 1.1. If an image conveys important information beyond what is in its alternative text, provide an extended description, Checkpoint 7.3. Do not create a blinking effect with animated gif images, Checkpoint 1.1. Provide alternative text for all images, Checkpoint 5.5. Provide a summary for tables, Checkpoint 5.2. If a table has two or more rows or columns that serve as headers, use structural mark-up to identify their hierarchy and relationship and Checkpoint 5.5. If this is a data table (not used for layout only), provide a caption. Thus, major problems of web sites are related to text, colour, animation, image, pixel and table.

Web site development: One hundred questionnaires were returned from marketers. 96% of the questionnaires are from retailing (43), manufacturing (29) and ICT (24). The rest of the questionnaires are from printing and publishing (2), construction and real estate (1) and banking and finance (1). No questionnaire returned from education and tourism and hospitality.

All factors of web site development are important. From the feedback of respondents proved that the mean score for all four factors is above 3.00. The highest mean score is security, privacy and trust (4.4900). This followed by development and design (4.1340); planning and preparation (3.9067) and management and maintenance (3.6133), as shown in Table 8.

Using pearson correlation coefficients, the study shows that all factors are significant at the 0.01 and it is

Table 9: Correlations-web site development factors

Factor		1	2	3	4
1. Planning and preparation	Pearson correlation	1.000	0.664**	0.709**	0.555**
	Sig. (2-tailed)		0.000	0.000	0.000
2. Development and design	Pearson correlation	0.664**	1.000	0.712**	0.698**
	Sig. (2-tailed)	0.000		0.000	0.000
3. Management and maintenance	Pearson correlation	0.709**	0.712**	1.000	0.586**
	Sig. (2-tailed)	0.000	0.000		0.000
4. Security, privacy and trust	Pearson correlation	0.555**	0.698**	0.586**	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	0.000

**Correlation is significant at the 0.01 level (2-tailed)

Table 10: Correlations-all variables

Variables	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	4.1	4.2	4.3
1.1 PC	1.000	0.634**	0.504**	0.573**	0.224*	0.550**	0.438**	0.361**	0.465**	0.217*	0.341**	0.582**	0.502**	0.336**
Sig. (2-tailed)		0.000	0.000	0.000	0.025	0.000	0.000	0.000	0.000	0.03	0.001	0.000	0.000	0.001
1.2 PC	0.634**	1.000	0.326**	0.424**	0.418**	0.430**	0.407**	0.288**	0.368**	0.366**	0.207*	0.387**	0.422**	0.407**
Sig. (2-tailed)	0.000		0.001	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.039	0.000	0.000	0.000
1.3 PC	0.504**	0.326**	1.000	0.581**	0.297**	0.524**	0.397**	0.665**	0.668**	0.522**	0.624**	0.497**	0.439**	0.274**
Sig. (2-tailed)	0.000	0.001		0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
2.1 PC	0.573**	0.424**	0.581**	1.000	0.560**	0.758**	0.468**	0.598**	0.470**	0.325**	0.483**	0.638**	0.619**	0.472**
Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
2.2 PC	0.224*	0.418**	0.297**	0.560**	1.000	0.539**	0.630**	0.624**	0.460**	0.585**	0.172	0.347**	0.371**	0.528**
Sig. (2-tailed)	0.025	0.000	0.003	0.000		0.000	0.000	0.000	0.000	0.000	0.087	0.000	0.000	0.000
2.3 PC	0.550**	0.430**	0.524**	0.758**	0.539**	1.000	0.682**	0.641**	0.518**	0.449**	0.395**	0.739**	0.723**	0.586**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.4 PC	0.438**	0.407**	0.397**	0.468**	0.630**	0.682**	1.000	0.666**	0.376**	0.519**	0.366**	0.523**	0.504**	0.508**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.5 PC	0.361**	0.288**	0.665**	0.598**	0.624**	0.641**	0.666**	1.000	0.654**	0.648**	0.537**	0.582**	0.559**	0.503**
Sig. (2-tailed)	0.000	0.004	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
3.1 PC	0.465**	0.368**	0.668**	0.470**	0.460**	0.518**	0.376**	0.654**	1.000	0.728**	0.384**	0.488**	0.504**	0.437**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
3.2 PC	0.217*	0.366**	0.522**	0.325**	0.585**	0.449**	0.519**	0.648**	0.728**	1.000	0.232*	0.442**	0.486**	0.604**
Sig. (2-tailed)	0.03	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000		0.020	0.000	0.000	0.000
3.3 PC	0.341**	0.207*	0.624**	0.483**	0.172	0.395**	0.366**	0.537**	0.384**	0.232*	1.000	0.412**	0.353**	0.201*
Sig. (2-tailed)	0.001	0.039	0.000	0.000	0.087	0.000	0.000	0.000	0.000	0.02		0.000	0.000	0.045
4.1 PC	0.582**	0.387**	0.497**	0.638**	0.347**	0.739**	0.523**	0.582**	0.488**	0.442**	0.412**	1.000	0.890**	0.767**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
4.2 PC	0.502**	0.422**	0.439**	0.619**	0.371**	0.723**	0.504**	0.559**	0.504**	0.486**	0.353**	0.890**	1.000	0.777**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
4.3 PC	0.336**	0.407**	0.274**	0.472**	0.528**	0.586**	0.508**	0.503**	0.437**	0.604**	0.201*	0.767**	0.777**	1.000
Sig. (2-tailed)	0.001	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.000	0.000	

Note: PC = Pearson correlation; **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed)

between moderate positive correlation (0.5) and strong positive correlation (0.75) (Table 9). Refer to variables for each factors (Table 10), all correlations, except variable 3.3 and 2.2 are significant either at the 0.01 or 0.05. Majority of these variables are between moderate positive correlation and strong positive correlation (46.2%), as well as weak positive correlation and moderate positive correlation (44%). 5.5% are between no correlation and weak positive correlation. It shows that only correlation between security on online activities (4.1) with privacy on online activities (4.2) and trust on online activities (4.3) and privacy on online activities (4.2) and trust on online activities (4.3) are in the category of strong positive correlation and perfect positive correlation.

The Chi-square value (CMIN) is 360.746, which is highly significant ($p \leq 0.000$). However, that this does not mean the model is good. In fact it is the opposite, from the point of view of statistical significance. We may say that the model is badness-of-fit.

Goodness-of-fit are based on fitting the model to sample moments, which means to compare the observed covariance matrix to the one estimated on the assumption that the model being tested is true. These measures thus use the conventional discrepancy function. The Chi-square value should not be significant if there is a good model fit, while a significant Chi-square indicates lack of satisfactory model fit. That is, Chi-square is a badness of fit measure in that a finding of significance means the given model's covariance structure is significantly different from the observed covariance matrix. If model Chi-square <0.05, the model is rejected. Hoelter's critical N is the size the sample size must reach for the researcher to accept the model by Chi-square, at the 0.05 or 0.01 levels. This throws light on the Chi-square fit index's sample size problem. Hoelter's N should be greater than 200 (Garson, 2006). Carmines and McIver (1981) state that relative Chi-square should be in the 2:1 or 3:1 range for an acceptable model. Kline says 3 or less is

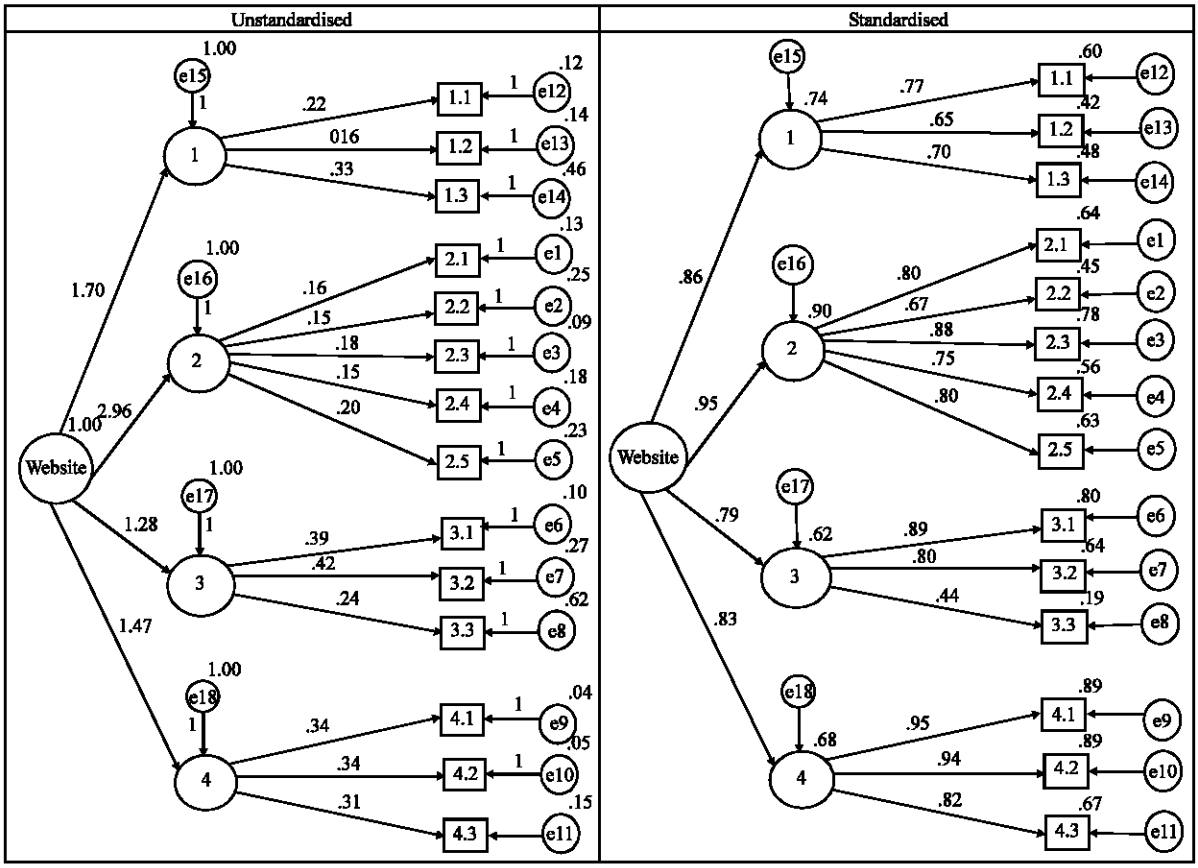

Fig. 1: Path model

acceptable. Some researchers allow values as high as 5 to consider a model adequate fit, while others insist relative Chi-square be 2 or less. Hoelter, at the 0.05 or 0.01 levels is 26 or 10, which is less than 200 as suggested by Garson (2006) and relative chi square (CMIN/df) less than 5, which is 4.942.

For GFI and AGFI, coefficients closer to unity indicate a good fit, with acceptable levels of fit being above 0.90 (Marsh *et al*., 1988). AGFI can yield meaningless negative values. AGFI >1.0 is associated with just-identified models and models with almost perfect fit. AGFI <0 is associated with models with extremely poor fit. The closer the RMR to 0 for a model being tested, the better the model fit (Garson, 2006). Garson (2006) also agree that for CFI, IFI and TLI, coefficients closer to unity indicate a good fit, with acceptable levels of fit being above 0.90. NFI, TLI, CFI and RFI are varies from 0 to 1. NFI, TLI, CFI and RFI close to 1 indicate a very good fit. The fit indices of GFI and AGFI were 0.666 and 0.519, respectively, suggesting that this model not provides a good fit. NFI (0.708), RFI (0.638), IFI (0.752), TLI (0.686) and CFI (0.748) were less than 0.90, which can be considered as not a good-fit model.

Parsimony measures are used in goodness-of-fit measures. The higher parsimony measure represents the better fit. For RMR and RMSEA, evidence of good fit is considered to be values less than 0.05; values from 0.05 to 0.10 are indicative of moderate fit and values greater than 0.10 are taken to be evidence of a poorly fitting model. The closer model is to the saturated model, the more PNFI and PCFI is penalised. There is no commonly agreed-upon cut-off value for an acceptable model (Garson, 2006). The value of RMR is 0.061, which is between 0.05 and 0.10. It can be categorised under moderate fit. For RMSEA, the value is 0.200, which is greater than 0.10. Thus for this part, it is can be considered as a poorly fitting.

PNFI and PCFI were 0.568 and 0.600. The closer model is to the saturated model (<0.001), the more PNFI and PCFI is penalised (Garson, 2006). The result shows that GFI (0.666), RMSEA (0.200), AGFI (0.519) and NFI (0.708), which does not achieve the recommended values.

Finally, the study of regression weights found that all factors (planning and preparation; development and design; management and maintenance and security, privacy and trust) are significant at the 0.05 significance level. This study has proved that all four factors have

a statistically impact on web site development (Fig. 1, Table 11 and 12).

Even the analysis found that each of the factors have a statically impact on web site development, but, an overall of the model, which is combination of all 4 factors have shows that it is not a good-fit model. This study has agreed that web-based business models are still in the nascent stage as is research into the design and utilisation of commercial web sites as stated. Each marketer has their own point of view on web site

Table 11: Regression weights

			Estimate	S.E.	C.R.	p-value
1	←	Website	1.704	0.575	2.964	0.003
2	←	Website	2.956	1.058	2.795	0.005
3	←	Website	1.283	0.277	4.631	***
4	←	Website	1.468	0.253	5.800	***
1.1	←	1	0.217	0.070	3.110	0.002
1.2	←	1	0.160	0.054	2.994	0.003
1.3	←	1	0.332	0.078	4.283	***
2.1	←	2	0.155	0.051	3.072	.002
2.2	←	2	0.146	0.050	2.907	.004
2.3	←	2	0.175	0.056	3.109	.002
2.4	←	2	0.152	0.051	2.993	.003
2.5	←	2	0.204	0.066	3.076	.002
3.1	←	3	0.390	0.063	6.239	***
3.2	←	3	0.423	0.066	6.439	***
3.3	←	3	0.237	0.058	4.116	***
4.1	←	4	0.341	0.039	8.646	***
4.2	←	4	0.339	0.040	8.507	***
4.3	←	4	0.313	0.041	7.554	***

Table 12: Testing of model fit

Fit Measure	Default model	Saturated model	Independence model	Macro
Discrepancy	360.746	0.000	1234.202	CMIN
Degree of freedom	73.000	0.000	91.000	DF
p-value	<0.001		<0.001	P
No. of parameters	32.000	105.000	14.000	NPAR
Discrepancy/df	4.942		13.563	CMIN/DF
Root mean square residual	0.061	0.000	0.237	RMR
Goodness of fit index	0.666	1.000	0.227	GFI
Adjusted goodness of fit index	0.519		0.108	AGFI
Parsimony goodness of fit index	0.463		0.197	PGFI
Normed fit index	0.708	1.000	0.000	NFI
Relative fit index	0.636		0.000	RFI
Incremental fit index	0.752	1.000	0.000	IFI
Tucker-lewis index	0.686		0.000	TLI
Competitive fit index	0.748	1.000	0.000	CFI
Parsimony ratio	0.802	0.000	1.000	PRATIO
Parsimony adjustment to the normed fit index	0.568	0.000	0.000	PNFI
Parsimony adjustment to the competitive fit index	0.600	0.000	0.000	PCFI
Noncentrality parameter	287.746	0.000	1143.202	NCP
Lower boundary of a two-sided 90% confidence interval for the population NCP	232.228	0.000	1033.451	LO 90
Upper boundary of a two-sided 90% confidence interval for the population NCP	350.794	0.000	1260.371	HI 90
Minimum discrepancy function F	3.644	0.000	12.467	FMIN
Estimated population discrepancy	2.907	0.000	11.547	F0
Lower boundary of a two-sided 90% confidence interval for the population F0	2.346	0.000	10.439	LO 90
Upper boundary of a two-sided 90% confidence interval for the population F0	3.543	0.000	12.731	HI 90
Root mean square error of approximation	0.200		0.356	RMSEA
Lower boundary of a two-sided 90% confidence interval for the population RMSEA	0.179		0.339	LO 90
Upper boundary of a two-sided 90% confidence interval for the population RMSEA	0.220		0.374	HI 90
P for test of close fit	0.000		0.000	PCLOSE
Akaike information criterion	424.746	210.000	1262.202	AIC
Browne-cudeck criterion	436.175	247.500	1267.202	BCC
Bayes information criterion	508.112	483.543	1298.674	BIC
Consistent AIC	540.112	588.543	1312.674	CAIC
Expected cross validation index	4.290	2.121	12.750	ECVI
Lower boundary of a two-sided 90% confidence interval for the population ECVI	3.730	2.121	11.641	LO 90
Upper boundary of a two-sided 90% confidence interval for the population ECVI	4.927	2.121	13.933	HI 90
MECVI	4.406	2.500	12.800	MECVI
Hoelter 0.05	26.000		29.000	Hoelter 0.05
Hoelter 0.01	10.000		11.000	Hoelter 0.01

development. Thus, there are no obvious criteria to evaluate the effectiveness of commercial web sites.

CONCLUSIONS

Out of 372 of the total evaluated web sites with bobby, 307 web sites (82.53%) failed outright. The total of Priority 1, 2 and 3 errors from 372 samples of web sites consisted of 76360 errors. The highest number of failed web sites is tourism and hospitality industry. This follows by printing and publishing, Internet and ICT, education, manufacturing, construction and real estate, retailing and banking and finance. Top errors are check that the foreground and background colours contrast sufficiently with each other, if you use colour to convey information, make sure the information is also represented another way, use relative sizing and positioning (% values) rather than absolute (pixels), avoid use of obsolete language features if possible, if an image conveys important information beyond what is in its alternative text, provide an extended description, do not create a blinking effect with animated gif images, provide alternative text for all images, provide a summary for tables, if a table has two or more rows or columns that serve as headers, use structural mark-up to identify their hierarchy and relationship' and if this is a data table (not used for layout only), provide a caption.

The study shows that all four factors of web site development are important and significant at the 0.01. All factors are significant between moderate positive correlation (0.5) and strong positive correlation (0.75). However, the study of model fitness based on four factors shows that it is not a good fit model. This can be referred to GFI (0.666), RMSEA (0.200), AGFI (0.519) and NFI (0.708), which is less than recommended values (0.900).

This research hopefully will help Internet marketer and web developer to identify the major problems of the web site and development processes at the first stage. Further research should be carried out in the future to solve and to focus more on text, colour, animation, image, pixel and table aspects.

REFERENCES

Alexander, D., 2004. How accessible are Australian university web sites. http://www.ariadne.ac.uk/issue38/alexander/intro.html.

Anonymous, 2003. University sites barely reach basic levels of accessibility. New Media Age, 12 June, 15. http://www.highbeam.com/doc/1G1-104621223.html.

Anonymous, 2006. Europe-wide survey finds public sector websites are not designed to be accessible. The British J. Healthcare Computing and Information Management. http://www.bjhcim.co.uk/news/1/2006/n602005.htm.

Bai, B., R. Law and I. Wen, 2008. The impact of website quality on customer satisfaction and purchase intentions: Evidence from Chinese online visitors. Int. J. Hospitality Manage., 27: 391-402.

Bevan, N., 1999. Usability issues in web site design. Proceedings of 6th UPA., Nov. 99, Interactive Publishing, pp: 803-806.

Brajnik, G., 2001. Towards valid quality models for websites. Paper Presented at 7th Conference on Human Factors and the Web, Madison, Wisconsin. June 2001. http://users.dimi.uniud.it/~giorgio.brajnik/papers/hfweb01.html.

Brown, D.J., D. McHugh, P. Standen, L. Evett, N. Shopland and S. Battersby, 2010. Designing location-based learning experiences for people with intellectual disabilities and additional sensory impairments. Comput. Educ., (In Press). 10.1016/j.compedu.2010.04.014

Carmines, E.G. and J.P. McIver, 1981. Analysing Models with Unobserved Variables. In: Social Measurement: Current Issues, Bohrnstedt, G.W. and E.F. Borgatta (Eds.). Sage Publications, London, pp: 65-115.

Clyde, L.A., 2000. Libraries and the web: A strategic planning approach to web site management. Electronic Library, 18: 97-108.

Cunliffe, D., 2000. Developing usable web sites: A review and model. Internet Res.: Elect. Network. Appl. Policy, 10: 295-307.

Flowers, C.P., M. Bray and R. Algozzine, 1999. Accessibility of special education program home pages. J. Special Educ. Technol., 14: 21-26.

Flowers, C., M. Bray and R.F. Algozzine, 2001. Content accessibility of community colleges web site. Community College J. Res. Practice, 25: 475-485.

Freedman, C., 2007. Disabled people favour accessible sites. Ability Net State of the eNation Reports. http://www.abilitynet.org.uk/enation9.

Garson, D., 2006. Structural Equation Modeling. NC State University, Raleigh, North Carolina.

Green, R.A. and J. Huprich, 2009. Web accessibility and accessibility instruction. J. Access Services, 6: 116-136.

Guitierrez, C. and N. Long, 2001. Web site accessibility of AACSB-accredited universities: Meeting the requirements of the law(s). J. Educ. Technol. Syst., 30: 69-84.

Hackett, S., B. Parmanto and X. Zeng, 2004. Accessibility of Internet Websites through Time. Association for Computing Machenary, Atlanta, USA.

Hackett, S. and B. Parmanto, 2005. A longgitudinal evaluation of accessiblity: Higher education web sites. Internet Res., 15: 281-294.

Hong, S.G., P. Katerattanakul and D.H. Lee, 2008. Evaluating government website accessibility: Software tool human experts. Manage. Res. News, 31: 27-40.

Huizingh, E.K.R.E., 2000. The content and design of Web sites: An empirical study. Inform. Manage., 37: 123-134.

Internet Systems Consortium, 2009. ISC Internet domain survey. Internet Systems Consortium, Jan. http://ftp.isc.org/www/survey/reports/2009/01.

Jackson-Sanborn, E., K. Odess-Harnish and N. Warren, 2002. Web site accessibility: A study of six genres. Library Hi Tech, 20: 308-317.

Kelly, B., 2002. Web watch: An accessibility analysis of UK university entry points. Ariadne. http://www.ariadne.ac.uk/issue33/web-watch.

Kiani, G.R., 1998. New game, new rules: Will traditional mentality work in the marketspace?. Manage. Res. News, 21: 1-9.

Klein, D., W. Myhill, L. Hansen, G. Asby, S. Michaelson and P. Blanck, 2003. Electronic doors to education: Study of high school website accessibility in Iowa. Behav. Sci. Law, 21: 27-49.

Koehler, W.C., 1999. An analysis of web pages and web site constancy and permanence. J. Am. Soc. Inform. Sci., 50: 162-180.

Kuzma, J.M., 2010. Accessibility design issues with UK e-government sites. Govern. Inform. Q., 27: 141-146.

Lawrence, S. and L. Giles, 1999. Accessibility and distribution of information on the Web. Nature, 400: 107-109.

Levy, S., 1996. The year of the internet. Newsweek, 1 January, pp: 21-30.

Lewis, K., D. Yoder, E. Riley, Y. So and S. Yusufali, 2007. Accessibility of instructional Web sites in higher education. EDUCAUSE Quarterly, 30: 29-35.

Lilly, E.B. and C. Van Fleet, 2000. Measuring the accessibility of public library home pages. Reference User Services Q., 40: 156-165.

Loiacono, E.T., 2004. Cyberaccess: Web accessibility and corporate America. Commun. ACM, 47: 83-87.

Loiacono, E. and S. McCoy, 2004. Charity begins at the homepage: Providing access to the Web for people with disabilities. Commun. Assoc. Inform. Syst., 13: 471-485.

Lu, M.T. and W.L. Yeung, 1998. A framework for effective commercial web application development. Internet Res., 8: 166-173.

MYNIC, 2009. Statistics. MYNIC. http://www.domainregistry.my/statistics.php.

Marsh, H.W., J.R. Balla and R.P. McDonald, 1988. Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. Psychol. Bull., 103: 391-410.

Murray, B.H. and A. Moore, 2000. Sizing the internet. Cyveillance, 10 July. http://www.cyveillance.com/web/corporate/white_papers.htm.

Opitz, C., W. Savenye and C. Rowland, 2003. Accessibility of state department of education home pages and special education pages. J. Special Educ. Technol., 18: 17-27.

Potter, A., 2002. Accessibility of Alabama government Web sites. J. Govern. Inform., 29: 303-317.

Romano, N.C.Jr., 2002a. Customer relationship management for the Web-access challenged: Inaccessibility of Fortune 250 business Web sites. Int. J. Electronic Commerce, 7: 81-117.

Romano, N.Jr., 2002b. Customer relationship management for the Web-access challenged: Inaccessibility of the Fortune 100 Web sites. Proceedings of the 35th Annual Hawaii International Conference on System Sciences, Jan. 7-10, Washington, DC, USA., pp: 176-176.

Rowland, C. and T. Smith, 1999. Website accessibility: The power of independence. Center for Persons with Disabilities, Utah State University.

Schwartz, E.I., 1997. Webonomics. Broadway Books, New York.

Schmetzke, A., 1999. Web page accessibility on university of wisconsin campuses: A comparative study. University of Wisconsin-Stevens Point. http://library.uwsp.edu/aschmetz/Accessible/UW-Campuses/contents.htm.

Schmetzke, A., 2001a. Online distance education-Anytime, anywhere but not for everyone. Information Technology and Disabilities. http://people.rit.edu/easi/itd/itdv07n2/axel.htm.

Schmetzke, A., 2001b. Web accessibility at university libraries and library schools. Library Hi Tech, 19: 35-49.

Shi, Y., 2006. E-government web site accessibility in Australia and China: A longitudinal study. Social Sci. Comput. Rev., 24: 378-385.

Slatin, J.M., 2001. The art of ALT: Toward a more accessible web. Comput. Composition, 18: 73-81.

Smith, A., L. Dunckley, T. French, S. Minochad and Y. Chang, 2004. A process model for developing usable cross-cultural websites. Interact. Comput., 16: 63-91.

Spindler, T., 2002. The accessibility of web pages for mid-sized college and university libraries. Reference User Services Q., 42: 149-154.

Sullivan, T. and R. Matson, 2000. Barriers to use: Usability and content accessibility on the webs most popular sites. Proceedings on the 2000 Conference of Universal Usability, Nov. 16-17, Arlington, ACM, VA., pp: 139-144.

Taylor, M.J., D. England and D. Gresty, 2001. Knowledge for web site development. Internet Res., 11: 451-461.

The Economist, 1995. The accidental superhighway. (The internet survey). 1 July, Special Supplement. http://www.encyclopedia.com/doc/1G1-17196960.html.

Thompson, T., S. Burgstahler, E. Moore, J. Gunderson and N. Hoyt, 2007. International Research on Web Accessibility for Persons with Disabilities. In: Managing Worldwide Operations and Communications with Information Technology, Khosrow-Pour, M. (Eds.). IGI Global, Hershey, Pennsylvania, pp: 1341-1344.

Tschong, M., 2000. Iconocast macroview. 24 February, Iconocast. http://www.iconocast.com/issue/20000224.html.

Wijayaratne, A., 2008. Web accessibility: Does it have a role in delivering distance education. Proceedings of the Fifth PAN Commonwealth Forum on Open Learning, July 13-17, The University of London, UK., pp: 1-9.

Wijayaratne, A. and D. Singh, 2010. Is there space in cyberspace for distance learners with special needs in Asia? A review of the level of Web accessibility of institutional and library homeInt. Inform. Library Rev., 42: of AAOU members. Int. Inform. Library Rev., 42: 40-49.

Zakon, R.H., 1999. Hobbes Internet timeline V 4.2. Internet Society. http://info.isoc.org/guest/zakon/internet/history/hit.html.

Zaparyniuk, N. and C. Montgomerie, 2005. The status of web accessibility of Canadian universities and colleges: A charter of rights and freedoms issues. Int. J. E-Learning, 4: 253-268.

Zaphiris, P. and G. Zacharia, 2001. Website content accessibility of 30,000 Cypriot web sites. Proceedings of the 8th Panhellenic Conference on Informatics, Nov. 8-10, Nicosia, Cyprus, pp: 128-136.

Zaphiris, P. and R.D. Ellis, 2001. Website usability and content accessibility of the top USA universities. Proceedings of Web Net 2001Conference, Oct. 23-27, Orlando, FL, USA., pp: 1-6.

Zaphiris, P. and S. Kurniawan, 2001. Usability and Accessibility of Aging/Health-Related Web Sites. HCI International, New Orleands, LA, USA.

Zooknic, 2009. History of gTLD domain name growth. Zooknic. http://www.zooknic.com/Domains/counts.html.