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NAVIGATION DESIGN AND USABILITY EVALUATION OF THE MALAYSIAN PUBLIC UNIVERSITY WEBSITES

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Abstract: Great proportions of visitors to university website are applicants for admission, or are thinking to becoming applicants. This target audience group usually has a very specific set of goal in finding the information that they require from the website. Their experience in using the university website will verify whether they are impressed by the information from the website or not and this surely will give impact on the university's admissions. To comply with their requirements, the university website must meet certain usability measures. The interface should be navigated smoothly without making the user lost. In this case the navigation design must preserve the consistency without unnecessarily puzzling the user. The aim of this study is to inspect whether the websites of the Malaysian public universities are fulfilling the usability guideline provided by Web site Content Accessibility Guide (WCAG) or not. This study answers the question whether the websites are differs in their usability and accessibility. The usability and accessibility of the eleven Malaysian public universities are compared by using two automatic evaluation tools i.e. Bobby and LIFT. This paper also compares the eleven Malaysian public universities website in term of navigation design. Finally several methods in finding the audience oriented requirement for the website are proposed.

Keywords: Navigation Design, Web Usability; Automatic Evaluation; Evaluation Tool; Accessibility; Malaysian website.

2.0 INTRODUCTION

The term usability is everything regarding ease of use. The aim is to understand how the system of the site works. Website usability is a study to comprehend how the user interact with the web, find what they want, and navigate how they intend without any barrier. The website is destined for the user not for the designer. The problem arises when the designer develop the website without considering user's view and feelings. It ends up with the design burdens the user and finally they decline to use the site. Meanwhile, accessibility is regarding making everybody can access the information freely and easily without considering the disability that the user might have. Once the site is accessible its information can be delivered to any user.

The aim of this paper is to evaluate the Malaysian public university websites in term of usability and accessibility. The potential impact of usability and navigation weakness on the university site is studied. Finally some recommendation is given to be applied.

Several efforts whether published or unpublished are focusing to find the best solution to optimize the usability and accessibility of webpage. The primer work has been done by Zaphiris and Ellis (2001). They compared the top 50 United States university homepages. This study shows that less than 1/3 of the sites are BOBBY approved.

Another study done by Schmetzke (2002) reports that his study of 24 campuses within the University of Wisconsin System. He evaluates the general campus pages, library pages, and the departments of Library and Information Science. His Findings carried out the number of just over half (59%) of library pages and half (50%) of general campus pages obtain BOBBY approval. This paper differs from other previous studies in term of study focus. This paper concentrates on usability improvement in term of navigation design.

In the literature review section, the description is concerning the usability and accessibility of university websites. The discussion initially covers the definition of usability and accessibility and why the university sites must gear the action to make sure that their site are obeying the guideline for accessibility. Next the international standard of guidelines is being introduced. The automatic tools to check for usability and accessibility are listed after that.

Next section describes about the methodology for data collection and the result for the usability and accessibility test is shown after that. The finding and discussion follows later. In this paper, I proposed a new guideline that perhaps if being followed by the site's developer from those universities may lead to the achievement of usable and accessible site. This paper contributes to the primer statistics regarding usability evaluation of the Malaysian Public University website.

2.0 WEB USABILITY AND ACCESSBILITY

Usability is not the thing which only involves web. It actually applies in our daily and seems very essential now and in the near future. Farrell (2002) says "In fact, long before the Internet was a gleam in the Pentagon's eye, computer professionals were already aware of the need for human-computer interaction to be as natural and intuitive as possible." In software development, usability is performing increasingly more vital task **(**Nielsen, 1994**).** This shows that usability is not a new jargon for us nowadays.

UsableNet (2002) defines web site usability as "determined by user satisfaction**,** ease of learning**,** user's ability to remember its organization and functionalities, user effectiveness**,** efficiency and likelihood of errors while performing the tasks the site has been designed for." Therefore web usability is the measurement of quality of user interaction with the web.

The main intention in designing website is to convey the information and deliver it. Designing the web page means presenting the information through the complicated multimedia interface. One of the dilemmas in designing multimedia interfaces like web site is to know whether the site appearance will effectively convey information to the viewers or not (Faraday and Sutcliffe, 2002). In this case, usability is the core matter to be taken into account. This is a new vision, which requires resolution (Berry, 2002). He says that the web present new prospect for creative resolutions that go with users' desires, wishes, and capability.

The laws regarding mandate for web accessibility and usability are multifaceted. The initial one is the Web Content Accessibility Guidelines (WCAG 1.0) developed by the World Wide Web Consortium's (W3C) Web Accessibility Initiative (WAI). WAI is responsible for implementing the World Wide Web Consortium's (W3C) concern to make sure that the Web is accessible to all people (WAI, 2002). Second is the Electronic and Information Technology Accessibility Standards developed by The Access Board as required by Section 508.

Automated usability tools can assist save time and capital in design and users testing, improve constancy and quality of site design, and develop the efficient application of usability standards (Brinck and Hofer, 2002). Two main tools are LIFT and BOBBY. LIFT was developed and deployed by Usablenet Inc.

Usability is everything regarding making the site becomes useable. People can used our design easily if not happily. In that case all people must be able to use it and to interact with our system or design and they can manipulate the site as they wish. The feeling of being utilized by the system should not exist in the user's thought. The restriction of certain type of people only can access to the site must not exist still. That is why the term accessibility is taken into consideration as well in this very place.

3.0 TYPES AND PRINCIPLES OF NAVIGATION SYSTEMS

The term navigation means how to connect the information. Two tough aspects to be thought are how to connect between information and how to connect between user and the information. Hence, navigation system is a vital part in web interfacing and it differ the function of the web application. For the intranet, navigation assists to make possible the information progress inter-servers. But public website its only catering the needs for intra-server information interface transfers (Nielsen, 1997a).

Much segregation has been made to make the discussion about web navigation that seems too complex to be plainer. It is essential to comprehend the navigation systems type especially for the people that involve in information architecture. The types are as follows (Rosenfeld and Morville, 1998):

- *Hierarchical Navigation Systems.* The way we arrange the information by listing it in hierarchy, actually is the primary navigation system. In this case the hierarchy is extremely vital for a web.
- *Global Navigation Systems.* Accolade the hierarchical navigation by producing the list of menu for the whole site navigation. A global or site-wide navigation system often complements the information hierarchy by enabling greater vertical and lateral movement through the entire site
- *Local Navigation System.* This system gives the user ability to jump to other sub-sites.
- *Ad Hoc Navigation.* This links to other feature by representing it as embedded hyperlinks.

One main principle that stands behind the issue of designing the site navigation is that we have to understand that people not and will not memorize the navigation scheme that we intend to deliver (Tiller and Green, 1999). That's why we need consistent and standard system.

3.1 DESIGNING USABLE WEB NAVIGATION FEATURE

Navigation design is one of the most delicate areas of site development (Fleming, 1998). It comprises almost the whole disciplines in web development. This perhaps includes graphic design, usability engineering, information architecture and last but not least the navigation design it self. That's why good navigation requires good technique. Designing navigation systems that perform well is demanding (Rosenfeld and Morville, 1998). It is suggested that the usage of a table of content and index can assist the user. However, the consideration should be put on the potential user confusion caused by multiple options of same links that redundant in the table of content and index.

The user uses the site to find the information they want. But they still need assistance. The designer must help users find what they need (Nielsen, 2002). He further says that a clear starting point of the main task. Then the user can undertake when visiting the site should be emphasized. More common sense approach used by Krug (2000) to web and navigation usability. In his book he stresses the significance of clearer heading and the usage of breadcrumbs (path to arrive at the site) for better navigation system.

Search function should capable enough not to land the user to the page that the want, but also strong enough to give the user chance to use it easily. The phenomenon of searching for the search function should be avoided. That's why Nielsen (2001) advocates the usage of type-in field that wide enough with at least 25 character wide on the home page rather than by linking it to different search page. Moreover, all other page should link to other specific search page.

4.0 NAVIGATION DESIGN FOR UNIVERSITY WEBSITE

Some university in the United States has geared the action to implement usability in their websites. Syracuse University (Syracuse, 2002) for instance has introduces the recommended six elements for official university websites. The aim is to make sure that specified standard being implemented for the other sites that has got connection with the home page. This guideline is proposed to supply the website developers with certain criteria of navigation, layout, graphics, technology, and content.

Not only that, St. Mary's University (St. Mary, 2002) takes full awareness regarding usability in their site. The site was experienced by users all through the prototyping stage, heuristic evaluations were also executed. Some other universities in the US have geared towards implementing usability and accessibility in their website. University of Bradford, UK shows that they are celebrating diversity on campus as well as on the university site. These include people with disability as well. The site for accessing the university information is designed as well for the user with assistive technology.

This action has increase the awareness of usability and accessibility for university website. To improve a web site or product's user experience, designers have to know what is important to the user. They have to understand what the user is trying to achieve. Devoid of this awareness, it is impossible to create something that is usable.

5.0 METHODOLOGY

The evaluation to identify the level of usability and accessibility of the web sites is done by using automatic tools available online. The initial stage in this evaluation is collecting the site address (URL) of the Malaysian public universities. Not all the address has the edu.my extension. The complete list is gathered from Study Malaysia (Study Malaysia, 2002).

For the download time, page size and browser compatibility evaluation, the HTML Netmechanics Toolbox tools (Netmechanics, 2002) has been use. This tool generates the page analysis and gives the rating up to 5 stars. However, in this analysis the star rating given by the analyser is not being considered for evaluation. For this evaluation only two factors are reckoned i.e. browser compatibility and load time.

Later, a table comparing availability of navigation elements among the sites is constructed. Competitive analysis purpose is to compare all the sites, whether having the required important navigation element or not. All the site is checked manually one by one to determine whether specified important elements are present or not.

6.0 FINDINGS AND DISSCUSSIONS

6.1 Usability and Accessibility Evaluation

Modem Speed	UTM	USM	UPSI	Unimas	UKM	IIUM	UM	UPM	UUM	UMS	UiTM
56Kb	8.89	10.65	12.77	13.27	17.91	18.20	23.72	26.24	26.83	32.58	52.94
ISDN	5.05	6.94	6.76	6.43	9.03	7.35	11.61	13.83	12.98	16.64	24.52

Table 1: Page downloads time

Table 1 above shows the page downloads time for the 11 public university website. In the 10th Graphic, Visualization, & Usability Centre's (GVU, 1998). WWW User Survey 1998 there is a question regarding what makes respondents feel dejected while using the internet. More than 60 percents of the respondent say that it takes too long to view or download pages. This shows that download time must be as fast as possible

For simplicity of discussion, let consider the download time for the user with 56K modem. In term of loading time, only one university i.e. Universiti Teknologi Malaysia (UTM) managed to minimize it to below than 10 seconds. This value is only 9% in term of percentage. 10 seconds is the industry standard for the user to wait for the page to be viewed otherwise their tolerant to focus their attention while waiting will lose.

University	USM	UTM	UPSI	UKM	UM	UPM	UUM	IIUM	UMS	Unimas	UiTM
Size (Kb)	46	48	74	110	151	154	172	196	197	385	352

Table 2: Page size

Table 2 shows the page size and the size of the total graphics for the Malaysian public university websites. The table shows the number of images used in the home page as well without taking account whether it is separated or combined images. In discussing the page size, the optimum size proposed as standard is 34 KB for common modem user ((Nielsen, 1997b). From the result in table 2, the average size is 171 KB. This is five times larger (171 / 34 ~ 5) than what being proposed. Not a single site has the size below than 34 KB.

Page load time actually depends on several factors. Obviously the speed is determined by the size of the HTML file besides the number and size of the images. While writing the HTML code, the usage HEIGHT and WIDTH attributes with the IMG and TABLE tags also can be the determiner of the download time.

Universiti Malaysia Sarawak (UNIMAS) site, contrary to Universiti Sains Malaysia (USM) site has the most massive size. The main factor that increases the size is the quantity of images that exist on the site. The whole menu buttons are formed by graphic images. Instead the normal text that may bring same effect may be used hence will scale down the size load.

University	UTM	Unimas	UUM	UMS	UM	UPSI	UPM	IIUM	UKM	USM	UiTM
Incompati-bilities	0	3	3	3	5	5	14	16	16	23	30

Table 3: Browser compatibility

Table 3 and above shows the browser compatibility of the eleven sites. The rating is based on the problems found by the automatic analyzer. The row for number of problems means that these problems affect at least 10% of the visitor. This figure is based on percentage of user according to the browser type. In this case, some browser like the old version of Netscape cannot view properly the tags and attributes of certain values and properties of the style sheet. If a browser does not support a tag, it will disregard it. As a result, the page is not viewed properly as wishes. This concern is regarding accessibility issue on certain user that still use old version of browser.

LIFT test is giving the list of error that fall into each different categories or priorities. Next, from that figure, a table is made to discover which university site is most usable and which is

not. Table 4 below visibly shows that only one out of 11 sites approved by LIFT tool as usable. From that test, only the site that has got 0 significant problem is endorsed. Other than that not a single university sites have meets the requirement of LIFT. This value is as small as 9% of the whole sites.

University	Significant problem	Major problem	Minor problem
Universiti Pendidikan Sultan Idris (UPSI)	0	4	10
Universiti Malaya (UM)	1	0	0
International Islamic University Malaysia (IIUM)	2	3	7
Universiti Malaysia Sabah (UMS)	3	5	9
Universiti Teknologi Malaysia (UTM)	6	1	9
Universiti Malaysia Sarawak (Unimas)	6	1	9
Universiti Putra Malaysia (UPM)	6	1	7
Universiti Sains Malaysia (USM)	7	5	10
Universiti Utara Malaysia (UUM)	8	5	9
Universiti Kebangsaan Malaysia (UKM)	8	4	7
Universiti Teknologi Mara (UiTM)	9	1	8

Table 4: LIFT test result

BOBBY used the hats with wheelchairs icon to indicate Priority 1 accessibility errors that are automatically detectable. A question mark identifies a possible Priority 1 error that Bobby cannot fully automatically check, showing that the user needs to address that question manually. The textual analysis list all the problem by seperating it into Priority 1, 2 and 3 respectively.

University	Priority 1	Priority 2	Priority 3
Universiti Malaysia Sabah (UMS)	7	16	13
Universiti Teknologi Malaysia (UTM)	7	13	12
Universiti Utara Malaysia (UUM)	7	14	9
Universiti Malaya (UM)	8	12	8
Universiti Malaysia Sarawak (Unimas)	8	12	10
Universiti Kebangsaan Malaysia (UKM)	9	12	12
International Islamic University Malaysia (IIUM)	13	25	22
Universiti Sains Malaysia (USM)	14	18	13
Universiti Pendidikan Sultan Idris (UPSI)	17	29	24
Universiti Putra Malaysia (UPM)	17	29	24
Universiti Teknologi Mara (UiTM)	17	27	25

Table 5: BOBBY evaluation result

In term of accessibility, the result from table 5 above shows the worst situation. Not a single site is BOBBY approved. The evaluation is done by counting any accessibility possibilities created by the site. This automatic tool classifies it into three priorities according to the requirement by WCAG.

6.2 Competitive Analysis for Navigation Elements

Feature	IIUM	UKM	UM	UMS	Unimas	UPM	USM	UTM	UiTM	UUM	UPSI
Site Map	•		•								
Search button	•		•			•	•				•
One Click to Home Page											
Breadcrumbs											
Table of content	•	•		•		•	•		•		•
People's contacts	•	•	•	•		•	•	•		•	•

Table 6: competitive analysis

Table 6 shows the competitive analysis among the eleven sites. The main navigation tool i.e. the search function is still missing from most of the site. Sadly, not more than 50% out of the eleven sites has got the search feature. Search button is a must for a site especially university site.

The situation for site map is worst. Only two out of eleven sites have got it. Anyway, the directory for people's e-mail and contacts is available almost on all the sites. It seems that the designer from most of the universities never gives any attention on the navigation system of the site. This chronic situation needs immediate therapy to make sure that the target user will not being frustrated after using the site.

7.0 RECOMMENDATIONS FOR IMPROVEMENT

The Malaysian public university website should implement these recommendations to improve its navigation usability.

- *Search Function.* Since not all the university sites have got the search capability, it is strongly advised for the developer from respective university to have it one. The scripting and software engineering part for the engine might be a hurdle. But for a moment just simply uses the free search engine feature which is available throughout the Internet.

- *Table of Content.* This navigation feature can be used as a homepage but not too crowded. The site of Universiti Putra Malaysia (UPM) or Universiti Malaysia Sabah (UMS) website for example may invite trouble for the user when they refuse to read each list that being dump in a homepage. In this case information chunk may be applied.

- *Index.* Not a single website offers this feature which is very vital.

- *Site Map.* The usage of site map is also important especially when the user need to find the way when they getting lost.

- *Breadcrumbs.* This path to the page list is valuable in term of answering the question of where else the use can go besides that page.

- *One-click-away home page*. The home page should be link to other page, irrespective of how deep is that page from the home page. The suggestion is to make the university logo or top graphic of the page to be clickable.

8.0 CONCLUSIONS AND FUTURE WORK

In a nutshell, The Malaysian public university websites are still very low in term of usability and accessibility. The analysis discloses that only one (1) university site accomplish the requirement of Usability i.e. Universiti Pendidikan Sultan Idris (UPSI) website. The result discussed here basically gives the draft ideas about what is the situation of the Malaysian public university websites. Most of the result shows poor score.

The result should accelerate the responsible web designer of the respective university to perk up the usability and accessibility of their respective website. They should at least start with evaluating the weakness through both automatic tools, which is available on-line. This paper has brought a new agenda for advancement among the Malaysian public university websites.

Further study should involve manual testing as well, rather than just using automatic tools. Meantime, in improving the data gathered statistically, more advance analysis should be conducted statistical theory like ANOVA analysis can be used. Other additional techniques are proposed to be employed to fully evaluate the usability of a site. Other advancement may include the combination of heuristic evaluation and user testing. The coverage should include the university, which is under the level of University College. Not forgetting the private college as well.

Main research point may include the evaluation for the effectiveness of the evaluation methodology as well. Future works should try to formulate new testing methodology and approving that new invention is the better solution. In this dissertation some of the evaluation is fully depend on the result by the automatic tools. These automatic tools such as BOBBY and LIFT are very capable and the evaluation that is produced is reliable. But for advance work, the consideration should try to evaluate that tool and finally new better tool perhaps can be developed.

The area of user behavior should be covered as well. This an interesting area that from this dissertation more elaboration could be made for studying how the disable student behave and use the university site to acquire the information they require. The research component is the development of new design methodology based on the disable user behaviors.

The navigation design consideration may be increases to be more specific and sophisticated. The discussion should cover how to design the navigation system that is totally new that what is being used nowadays. The scope of the study should be extended beyond the university site and the number of sample perhaps might be increased and not restricted to certain geographical area.

The interdisciplinary study is suggested to see how web usability and navigation can give great impact on the other area of application. For instance, future study could see how web navigation should be designed for live telecast for the medical operations or football match. This consideration is vital to make sure the user gets the benefit from these applications. The usability feature of navigation is mostly required for such application, not only from computer network aspect, but from the page design as well.

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