A Web Usability Evaluation Model for Higher Education Providing Universities of Asia

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Abstract

There are many advantages in using the web as a learning medium. Out of these, some of the most important are that students are able to find their required data efficiently and according to their individual rhythm; time is not wasted as students use it as they want. However, it is not an easy task to accomplish this all even sometimes it can lead to frustration. There is a need to design usable educational website, where the students can participate in educational activities. We realise that often our students go to the sites but they leave because they do not manage to find what they are searching for. An informational web structure, proper page layout, easy navigation and accessibility features provide the comfort to students and they feel pleasant when interacting with the academic websites.

This study is a reflection on a usability evaluation of educational websites for the subject of modeling web usability guidelines for educational websites. This paper investigates usability of higher educational websites in Asia. First, an online Google application survey form was designed using Google Forms and used for the evaluation of web usability and student response. After a thorough analysis, a concise model was designed to evaluate the usability of educational websites called "Web Usability Evaluation Model" (WUEM). We evaluated ten top-ranking engineering universities in Asia against the features listed in the WUEM. The evaluation analysis shows that the academic websites are partly usable in their informational structure, navigation and also weak in accessibility. The evaluation shows a detailed structural description of what needs to be improved in these websites to enhance their usability. The proposed WUEM helps in an effective and easy evaluation of websites by the web developers. The research will help academic web developers to enhance the usability of their websites by considering such simple features listed in WUEM.

Keywords: Higher education websites, Web usability, Design layout, Navigation, Accessibility.

1. Introduction

The usage of websites is increasing rapidly due to advancement in technology. Usability and accessibility are two important factors to be considered in websites and play a significant role in accessing the websites (Petrie and Kheir, 2007). The most efficacious way of delivering educational content on the web is through World Wide Web (WWW), through which the user can access the web content online. Khan (1997) study revealed that hypermedia-based educational programs, which utilise the resources and characteristics of the WWW, to develop a significant educational environment where learning is promoted. Web users vary with age and education expertise have different goals for accessing the websites and may have disabilities like visual problems. All these factors motivate organisations to develop such websites which are more accessible and usable for the users (Petrie and Kheir, 2007).

The users will always be satisfied if the websites conform to the required functionality with desired quality attributes (Petrie and Kheir, 2007). The academic websites are supposed to be designed in a way that could help the users to increase their knowledge and other expertise. It has been commonly observed that an institute's

website is lacking in these attributes as a result of which the web user does not feel contended in visiting their university's website. The key reason is that the web designers do not follow the proper usability guidelines which consequently frustrates and thus drive away the students.

The main purpose to conduct this research is to improve the usability of academic websites and designing a usability model "Web Usability Evaluation Model" (WUEM) evaluates the usability of websites easily and quickly. The model provides a quick evaluation of websites followed by simple features. The main motive of an academic website is to provide information to its users, and it can be achieved by designing a well-organized. The emphasis is on web usability of higher education in Asia and assessed the usability of chosen websites. However, a large number of websites of higher education are missing usability factor, which is not constructive in building the students' career. The websites were evaluated in two phases, first we conducted a survey in three different universities to find out the views of the students and after that, we designed a feature list that is a "Web Usability Evaluation Model" (WUEM) that was used to investigate the usability of the websites. We evaluated ten Asian universities' websites by using the WUEM and reported the result obtained from this paper.

1.1 Web Design

The higher educational websites should be usable to their students and other staff. The websites must contain all the basic features/components in them. The following usability features were considered in the web design category:

- *Sitemap:* A sitemap provides an outline of all the resources of the website with navigation. It is organised with pages information, arranged by topic or categories. Thus, it provides a quick view of the website to the students. It also helps students to find the specific information path under certain categories of web content.
- *Contact information:* The contact webpage contains the contact information of the university's faculty. This information should be visible to students. We prefer to add contact information in the main menu so that students

may find it easily and access the required person's information quickly.

- *Print option:* The printing facility enables the students to take prints directly from web pages whenever they require. Therefore, web pages on a web site should be print friendly.
- *Concise News and Events:* The News & Events page provides the latest updates about the university's activities. The website should provide clear and concise news & events details on a separate webpage instead of adding the complete description in the home page and provide the link in the main menu also.
- *URL Clarity:* The URL (Universal Resource Locator) is the unique website address. The web address must depict the concise name of the university and it should be memorised easily. We also recommend not to use hyphen or underscore which increase complexity in the URL and cannot be memorised easily.
- *Multiple Language Support:* The website can be translated in different languages to make it more usable for its users. The international websites should contain web translator option in their websites.

1.2 Page Design Layout

The structure of the webpage should be accurate. There must be relevant information in each web page according to web content, page heading, page titles and other features. The following usability features were considered in it:

- *Accurate Page title:* To enhance the usability of the website, the web developer should consider these small issues occurring in the websites and should provide an accurate page title which depicts the whole content of the webpage.
- *Page headings:* A web developer should also give serious consideration to page headings. He should therefore, develop web pages with clear headings which portray the whole theme of their web pages.
- *Avoid Page scrolling:* The Page Scrolling option is used to move the page up and down. The website should contain the "top" and "bottom" option which will provide the ease to access the web content quickly.
- *Design Consistency:* it is necessary to design a consistent web page in order to increase the usability of the website. Therefore, there is need to follow the same design layout and color

scheme for the entire website. It prevents the user to distract his attention which causes frustration (Ahuja & Webste, 2001).

1.3 Navigation

A better navigation structure helps students to find their required data easily with less effort. The usability features mentioned below were considered in navigation:

- *Navigation (max 3 level):* Links connect web pages and other related information with each other and from one page to another. The web pages can be connected internally or externally. The main menu needs to be created upto a maximum of 3 levels' hierarchy and the links should not be broken.
- *Clarity in navigation/links labeling:* The label of links shows that where you will be directed after a click on it. The links should be labeled with great attention and provide accurate labeling for each link. For example, if a link is labeled as "Contact Us" and after the click it directs you to any other page, can frustrate users as they will not be able to access their desired data.
- *Link logo to homepage:* All the web pages of a website should provide logo linked to the website's home page for quick access.
- *Home page navigation in the main menu:* A website should provide a link to the home page in the main menu. It will help users to access the website's main page easily. The reason behind this is that, because most of the users are familiar with home page as the main page and they access it more frequently.

1.4 Accessibility

An educational website should be accessible to students; this helps them in their learning process.

- *Adequate text-to-background contrast:* The website should be designed in such a way that there must be an effective text to background contrast. The background colour should not be sharp which creates an obstacle in reading the text.
- *Font size/spacing is easy to read:* The font size and font spacing increase the usability of the website by increasing the legibility. The 10 pt font size should be used for the paragraph and 12 pt for the headings of the webpage.

- *Images have appropriate ALT tags:* The "Alt" is an attribute of an image tag which defines the description of the image. There is a need to add "Alt" attribute to clearly describe the image or motive of the image.

Related Work

The popularity of the educational websites is increasing day by day because they provide the students an informational platform where they come to know about the educational activities and other information. If we want our users to interact with the website efficiently, we should care the design of the website and should develop usable websites for the students to help them in accessing the educational data easily.

The importance of designing a higher education website, keeping the usability factor as the primary consideration, is a challenging task for all institutions. Mostly, web designers do not bother themselves about these usability features when designing such academic websites, as a result, the students suffer and hence the website fails to achieve its main objective. Researchers understand the severity of these issues and consider it seriously. They are working on designing usability standards for educational websites, which need to be considered.

Usability is an important quality attribute that has gained a well-recognized consideration for web development. Usability can be defined in different contexts like ease of use, task performance and ease of learning (Nielsen, 1993).

Macleod and Rengger (1993) designed software for analysing the user based evaluations of websites, called, "Diagnostic Recorder for Usability Measurement" (DRUM). According to that model usability can be measured by metrics.

Nielson (1994) defined usability as "Usability is a quality attribute that assesses how easy user interfaces are to use".

Eason's (1988) definition of usability was, "the degree to which users are able to use the system with the skills, knowledge, stereotypes and experience they can bring to bear".

Keevil (1998) has worked on the usability evaluation of websites and used a very simple checklist approach, using the feature inspection method. The attributes of the checklist had a dichotomous scale ("Yes" or "No") and the score

is calculated by the sum of these checked features.

Rowland and Smith (1999) had researched on accessibility of the websites and found that accessibility of educational content on the web is still a major problem.

Bitler and his colleagues investigated navigational structure and suggested that visible and accurate links which are accessible from the main page or home page can be a best practice to increase the usability of website (Bitler et al., 2000).

Carter and his colleagues stated in their paper that creating a complex navigation structure cannot be a decent approach to use for students in academic websites (Carter et al., 2003).

Christoun and his fellows worked on the usability of academic websites providing higher education. They conducted an online survey to measure the student's satisfaction with regards to their institutional website. The online survey consists of three major areas of usability such that content, aesthetic and updated technology implementation. They survey analysis resulted that 89.4% students were satisfied with selected websites (Christoun et al., 2006).

Krug (2006) investigated that usability is simply being certain that something functions well, thus can be used without creating frustration.

The web users belonging to different categories like age, educational expertise, etc., and have different goals for accessing the websites. Such factors motivate the organizations to develop such types of websites, which are more usable and accessible for the users (Petrie and Kheir, 2007).

Robert and his colleague evaluated the interface design of website. They selected students and evaluated the websites against the colour of the font, multimedia and graphics, navigation, content, web performance, etc., and suggested few points to increase the usability of those websites (Robert and Paul 2007).

Lencastre with his fellow emphasised in his research on providing learning environment through web. A questionnaire was designed to evaluate the usability of the websites focussing on web interface, navigation, content, feedback,

errors, consistency and control. At the end, they gave the recommendation to improve the usability of the website (Lencastre and Chaves, 2008).

Bairamzadeh and Bolhari (2010) observed that many schools are switching to modern web framework. They also categorised the students into different categories according to their level of interest and their roles. According to Chen et al. (1999) the students can be divided into two major areas such that prospective and current students. He defined that both of these categories of student have their own interest and roles. Therefore, the website should be designed by considering their interest in the web and what type of information they expect from the university website.

Şengel and Öncü (2010) worked on usability of the Uludag university's website. He investigated that the students' gender also affects on usability evaluation. They proposed some usability evaluation methodologies for further evaluation to improve the usability of Uludag websites.

İsman (2010) studied the distance education and usability of these educational websites. He found that gender, age, the department, geographical area, university year also affect on the usability evaluation of the websites. He concluded his research by giving some recommendation to improve the usability of the website.

Abdul Aziz with his fellows worked on the usability of Malaysian university website. They evaluated the usability focusing on usability features; page size, broken links and web performance. They concluded that still there are many issues to be considered in these websites and also given the recommendation to increase the usability of website disable and normal users (Abdul Aziz et al., 2010).

Asiimwe and Lim (2010) researched on government websites of Uganda and its usability. They evaluated the usability of four Uganda websites focusing on three usability factors; navigation, design and privacy of the websites. In order to increase the usability of the web, he designed a web framework for the web developers to implement it on the web.

For having a usable, website designers must not neglect web usability challenges, (Hussain et

al., 2011) compared three web accessibility guidelines with respect to web usability and readability challenges and found that, by using WCAG 2.0 guidelines, a developer can enhance usability of website for users of all age groups.

Hussain et al. (2011) proposed that usability of any website could be increased by converting the text of a web page into plain language. They proposed a plain language by using the English alphabets. They observed that by converting the text of web pages into the plain language, the usability and readability of a site increases significantly.

Further, Hussain et al., (2011) identified eight usability factors and compared them among the different age group of people to check how these groups react by varying those eight factors. It was observed that varying color contrast and animation affects users of all age group.

According to Manzoor and Hussain (2012) the websites containing a number of broken links, lack of proper information and site performance related issues are common in academic websites of Asia.

Naidu (2005) newsletter reported the usability issues in educational websites designed for children. They assessed the usability of website focusing on location of information, navigation and length of the web page and given recommendations to enhance the usability of website.

3. Methodology

The purpose of this research is to observe the usability level of higher educational websites in Asia and evaluating their usability. We evaluated the websites in two phases for better results. In the first phase, we conducted a survey among the thirty graduate students of three different universities. The reason to do this was to acquire information from the students and to know the problems they face when they interact with the websites. The first author examined the websites carefully in developing an online survey form and conducted the survey to examine the usability of the websites and students' response. The most common but very important questions were added in the questionnaire and designed it very simple, so that the students may answer these questions easily. The usability features, we tried to cover in our online survey form are: web structure or design, webpage design, navigation and accessibility. The following questions were asked from the students.

- Are you familiar with the homepage?
- Do you find any problem in website navigation?
- Do you find your university website address easy to memorise?
- Can you easily read the text of the webpages?
- Does your university provide you with the latest news and event updates?
- Does your website provide multi-language support?
- Does your website maintain accurate webpage headings and titles?
- Does your website maintain a consistent design style?
- Suggestions for websites.

In the second phase, we analysed the survey results and examined the websites thoroughly for two months. Finally, we designed a model (WUEM) to evaluate the usability of the websites which is an easy approach towards increasing their usability and can be carried out by anyone. You don't need to be an expert in evaluating website usability and can develop a usable website for the students. We evaluated the usability of top ten engineering universities in Asia, by using the features of our proposed WUEM. The idea of WUEM has been taken from Jakob Nielson's book. The WCAG 2.0 standard was taken for web accessibility, which defines a wide range of attributes to make the website accessible. The usability assessment was done by the main author, having two years experience of website development and also teaching web engineering course in the university for two years. The selected ten websites are top-ranked universities of Asia selected from "http://www.timeshighereducation.co.uk/world-university-rankings/2011-2012/asia.html". The purpose to select them was to check the extent of their usability for the students. Following is the detail of each category of WUEM.

The following universities are selected to evalaute according to our proposed frameowrk and represented as "W1", "W2" consecutively.

Below is a list of the top ten engineering universities in Asia:

- W1 = The University of Tokyo - http://www.u-tokyo.ac.jp/en/index.html
- W2 = Tsinghua University - http://www.tsinghua.edu.cn/publish/then/
- W3 = National University of Singapore (NUS) - http://www.nus.edu.sg/
- W4 = Kyoto University - http://www.kyoto-u.ac.jp/en
- W5 = Tokyo Institute of Technology - http://www.titech.ac.jp/english/
- W6 = KAIST - http://www.kaist.edu/english/index.php
- W7 = The Hong Kong University of Science and Technology http://www.ust.hk/eng/index.htm
- W8 = Seoul National University - http://www.useoul.edu/
- W9 = Shanghai Jiao Tong University - http://en.sjtu.edu.cn/
- W10 = Nanyang Technological University (NTU) - http://www.ntu.edu.sg/Pages/default.aspx

4. Experimental Results

The survey results in which 30 students efficiently participated from following three universities of Balochistan, Pakistan, are summarised and the response is shown in percentage in Table 1.

- SBK University www.sbkwu.edu.pk
- BUITEMS University www.buitms.edu.pk
- Balochitan University www.uob.edu.pk

Table 1. Survey results of websites

No.	Questions	Score in percentage
1.	Are you familiar with the homepage?	98 %
2.	Can you easily access the home page of your university's website?	87%
3.	Do you find any problem in website navigation?	60 %
4.	Do you find your university website address easy to memorise?	85%
5.	Can you read the text of the webpages easily?	78 %
6.	Does your university provide you with the latest news and event updates?	96 %
7.	Can you easily access the news and events page of your university's website?	65 %
8.	Does your website provide multi language support?	40%
9.	Does your website maintain an accurate webpage heading and title?	70 %
10.	Does your website maintain a consistent design style?	81 %

The results clearly show that how much the websites are usable to their students and where they want further improvements. Most of the students declared that they face problems while visiting the home page and news and events of web pages because of navigation problems. The majority of the students reported the complete absence of multi language support facility on their university's website. The students also gave some suggestions regarding access to website's content.

The evaluation results of the above mentioned websites are summarised in the Table 2. We have evaluated the websites for each feature defined in WUEM to check whether the websites contain all these attributes or not while evalautating the usability.

Table 2. Usability evaluation results of Asian academic websites.

	Features	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	Score in %
A	**Web Design**											
	Sitemap	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	90
	Contact information	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Print option	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	10
	Clear News & Events	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	80
	URL clarity	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓	80
	Multiple Language support	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	90
B	**Page Design**											
	Accurate Page title	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	80
	Page headings	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Page scrolling	✓	✗	✓	✓	✗	✗	✓	✗	✗	✗	40
	Consistent Design Style	✗	✓	✓	✗	✗	✓	✗	✓	✓	✓	60
C	**Navigation**											
	Navigation (max 3 level)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Clear & concise navigation labelling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Link logo to homepage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Provide Link of Home page in main menu	✗	✓	✓	✗	✗	✓	✗	✗	✓	✗	40
D	**Accessibility**											
	Adequate text to background contrast	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Proper font size/spacing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	100
	Images having appropriate ALT tags	✗	✗	✗	✗	✗	✗	✓	✗	✗	✗	10

Note: The universities' websites are represented here as W1, W2 as was done in table 1.

The results show the over all avalability of the features through which we can analyse the usability of the websites and we can focus on individual features to improve the usability of the universities' websites. To measure these factors you just need to visit 4 to 5 pages websites and you analyse the usability of the websites. The model provides a quick analysis towards web usability.

5. Discussion

The survey results showed a clear picture as to what extent the websites are usable for the students and what they want in them. The lowest score in the survey was 40%, where the students stated that their university websites do not provide multi language support. They also face problems in webpage navigation to find the desired data because of complex navigation and, sometimes, they are unable to access the "News and Events" updates page. They also suggested to design printable web pages and appreciated the "Top" and "Bottom" option to avoid too much scrolling in the webpage. The students emphasised to include "Home" page link in the main menu for easy navigation.

However, the evaluation of these websites showed fair results. All ten websites have a contact information page, which can be easily accessed by students. Moreover, they have clear navigation labeling, proper page headings, the banner having a logo linked with the "Home" page, accurate text to background contrast, proper font size and spacing. It was observed that nine out of ten websites have sitemap and the multi-language support feature in them. Eight out of ten have a proper and easy to find "News and

Events" web page, clear web address (which is easy to remember) and an accurate page title with respect to the page content. Six websites were found to have a consistent design style while four websites were as such, which avoid page scrolling problems and provide the "Top" and "Bottom" option for easy scrolling. The surveyed websites also provide Home page link in their main menus for easy navigation. However, only one website was found to have print friendly web pages and provided images with the "Alt" attribute for detail description of the images.

6. Conclusion

The research assessed the usability of ten higher educational websites in Asia. The websites are evaluated using "Web Usability Evaluation Model" (WUEM) of 17 measures. We evaluated thoroughly the features of these websites in terms of website contents, webpage design, navigation and accessibility. The analysis shows that the chosen websites are partly usable for their students. The lowest score was ten, scored by two attributes, first was lack of print option in web pages and second was images were missing "Alt" attribute in them. The average scores were 40 and 60 for providing "Top" and "Bottom" option for scrolling and for having the "Home" page link in the main navigation, respectively. The websites were also inconsistent in design and had different styles on different web pages. The websites were found to have simple URL, a better three level navigation and provided easily accessible contact information. In order to improve the usability of website, the web designers working on academic websites are recommended to focus on web usability by following the usability standard to reduce the usability related issues. Features like print option on individual pages, images having "Alt" attribute, "Top" and "Bottom" option for easy scrolling, consistent design style and provision of the link of "Home" page in the main menu should be considered by web developers in order to enhance the web usability. We recommend this WUEM model to higher educational authorities and web developers to check the usability of their websites. This feature template is not only feasible for higher educational websites in Asia but can also be followed by any educational website to evaluate the usability of the websites.

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