

Development of a Framework for Improving the Usability and Accessibility of Universities' Postgraduate Websites

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Abstract— The usability and accessibility of Universities websites is paramount to the user hence it is expected to be friendly. This study focuses on development of a framework for improving some Nigerian University postgraduate websites. The methodology implemented involves the use of questionnaire for data gathering and automated tools for evaluating the internal attributes of the websites. The improved interfaces were developed following the Web Content Accessibility Guide (WACG) developed by World Wide Web Consortium (W3C), using html as the front end and MYSQL as the backend. C – Sharp(C#) was used as the programming language and Microsoft Visual studio was used as the Integrated Development Environment (IDE). A comparative study was carried out on the selected Universities and was found out that some of the universities have large image size while some have large html size. This resulted into delay in response time which increases the download time of the websites. The results of the questionnaire showed that the user interface of the websites should be improved on the course registration, fee payment and helpdesk interfaces. Usability metric results showed that the users of University of Ibadan and BOWEN University postgraduate websites did not derive the desired satisfaction using the websites, hence a web portal optimization tool was developed to solve the problem of large images and html files.

Keywords— Accessibility, postgraduate websites, portal optimization tool, and usability.

I. INTRODUCTION

Human-computer interaction (HCI) is a field of research and practice that emerged in the early 1980s, initially as an area in computer science demonstrating cognitive science and human factors engineering. To a considerable extent, HCI now aggregates a collection of semi-autonomous fields of research and practice in human-centred informatics. However, the continuing synthesis of disparate conceptions and approaches to science and practice in HCI has produced a dramatic example of how different epistemologies and paradigms can be reconciled and integrated in a vibrant and productive intellectual project [1].

The goals of HCI research are to evaluate existing systems, invent or design new systems, discover and test relevant scientific principle, and establishing standards. Lives now depend on HCI in most cases such as life support systems. Without HCI none of these technologies would be able to function effectively or maybe even exist. Ivan Sutherland developed a program that would change the way people could interact with their computers and this was called 'the Sketchpad. It allowed the user of the computer to draw

directly on the computers monitor and it incorporated GUI properties and the ability to zoom. According to ISO 9241-11, usability is defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" This project will be focussing on comparative study of usability and accessibility of some Universities postgraduate websites with the view of developing a tool/framework that will improve the user interface. The universities are University of Ibadan, Obafemi Awolowo University, Lagos State University, Ladoke Akintola University of Technology, Bowen University and Covenant University.

Literature Review

[3] Worked on the evaluation of universities website of Jordan universities from the usability perspective. Two online automated tools, namely html toolbox and web page analyzer were used along with a questionnaire directed towards users of the website. Tools were used to measure the website internal tools which cannot be perceived by users such as html code error, download time and size of html page. In his study, two website evaluation methods were used: the questionnaire and automated tools In order to select the appropriate website evaluation usability criteria for the questionnaire-based evaluation method, he identified and analyzed the usability aspects in terms of user satisfaction, readability, navigation and others related to the websites of Jordanian universities. [4] Researched on exploring the role the internet and university WebPages play in students' decision to consider and attend any university. The findings of this study supported other studies on the increased use of internet in decision making process and selection of universities by potential students. It emphasizes the need for universities to have attractive and clearly understood pages with readily navigable information on such characteristics as programs, courses offering, location, and relevant accreditations. This is critically important as visiting a webpage was found as a precursor to attending the university campus. The demographics on age also showed that utilization of the internet is more popular among the younger students than the older generation. [5] Worked on a comprehensive analysis of Harvard university website as at that year the research was undertaken. Through the course of the study, utilization of several analytical methods has determined that the site successfully fulfilled the business goals and objectives of Harvard University such as recruiting

new students, recruiting new staff and promotes community involvement through outreach and university sponsored athletics. There were also some recommendations that were made to improve the university website. [6] Worked on evaluation websites of universities in the Arabic region. Usability and Search Engine Optimization (SEO) were the research topics that were investigated in this study. Eighty websites of universities in the Arabic region were been evaluated in this study. The major goal for the study and evaluation is to discover whether there is a relevancy between usability and search engine optimization. According to the usability evaluation criteria of the study, three internal attributes were selected: HTML errors checking, load time, and browser compatibility problems. Three tools (HTML ToolBox, PageRank Checker, and SEO PageRank) were used to conduct the evaluation. Results showed that those three Website internal attributes do not usually correlate well with each other, since some universities ranked at the top according to one of these attributes, and ranked at the bottom according to the others. Many techniques are used to improve SEO. While usability is very important to Websites in many aspects, however, it does not necessary improve SEO. Finally a set of recommendations were presented to increase the usability for Websites while at the same time taking SEO PageRank into consideration. [7] Worked on evaluating selected private school undergraduate portals by the users which are the students of the respective schools. This evaluation research focused on how the web portals of the respective schools are able to respond to the students’ academic needs. One of its research questions was “How do undergraduate students in the respective universities access their e-portals in term of use”. It was found out that over 50 percent of the students found the e-portals very complex to use and navigate. The results of the evaluation university administrators should provide more internet facilities, ensure adequate training and support services for students.

Evaluation of Previous Studies in the Research Domain

The research by [3] on the evaluation of universities website of Jordan universities from the usability perspective revealed that the overall usability level of the websites was acceptable although some aspects in the design, interfaces and performance levels can be improved on. He suggested an improvement on several design guidelines to ensure that the users are more satisfied with the services provided by the websites. The drawbacks of the research was that it only focused on usability evaluation and only evaluated the websites but did not give ways to improve the websites. This research focuses not only on evaluation but on using the evaluation to improve the website design so that the results of the evaluation can be used to improve the websites.

II. MATERIALS AND METHOD

Think aloud techniques were used to perform the usability evaluation of the universities websites as this would help us to get the users’ point of view on the usability of the universities portals. The results of the literature review enabled us to prepare usability questionnaire and conduct interviews. The

questionnaire helped us to collect information from the users that assisted us to evaluate the website better. Usability methods that are conducted by humans with questionnaire and interviews can access only the external attributes of the websites such as readability of the contents of the website, availability of contents on the website rather than its internal attributes such as textual duplicates of links embedded in images etc. The internal attributes of the website were tested by using automated website testing software, two of which were used in this research.

Analysis of Postgraduate Websites

Two postgraduate universities websites which are University of Ibadan and Bowen University were evaluated with the use of questionnaire and automated tools, other four universities postgraduate websites namely: LAUTECH, OAU, Covenant and LASU post graduate websites were evaluated using only the automated tools. The methodology used for the evaluation of the universities websites was done by reviewing previous works which are related to evaluation of websites. The result of this preliminary study was then used to select the techniques which we used to evaluate the websites. The websites were studied intensively to determine the problems which we think the websites have and what each website should have then questionnaire were developed for the users to analyze the universities websites while automated tools were used to evaluate these websites. The results from the evaluation by the automated tools and the questionnaire were used to compute the results of the combined evaluation.

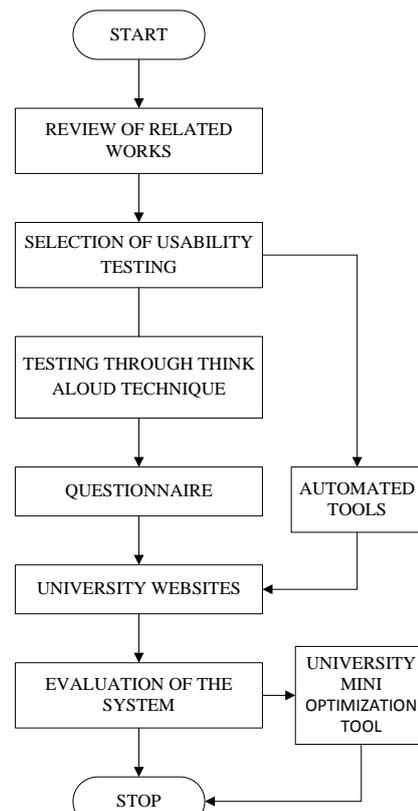


Fig. 1. Methodology flow chart.

Criteria for Usability Evaluation of Universities Website

The criteria by which we based the evaluation of this websites according to the usability testing are: Content Organization and Readability, Navigation and links, User Interface Design, Performance and effectiveness. Questionnaire is an important instrument of research and it is the cheapest tool which is used to collect data easily. The main function of designing the questionnaire is measurement and the purpose was to get the user’s view of the universities website. Automated tools (Accessibility Valvet and Accessibility Checker) examine the source code of web pages to determine the compatibility of web pages with specified deadlines. These guidelines could either be universally accepted guidelines or specific guidelines of different local areas. This approach depends on the characteristics of the HTML element.

Use Case Diagram

Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors). Each use case should provide some observable and valuable result to the actors or other stakeholders of the system.

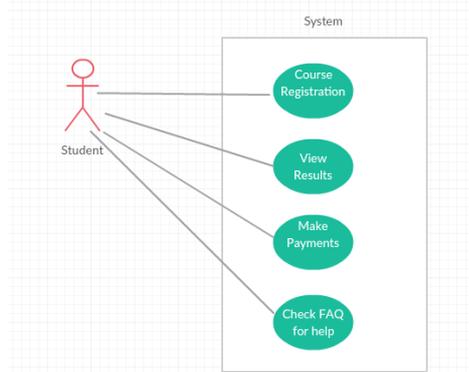


Fig. 2. Use case diagram for the interface design.

Web Portal Optimization

The web portal optimization is done to improve the usability and accessibility of the Postgraduate website.

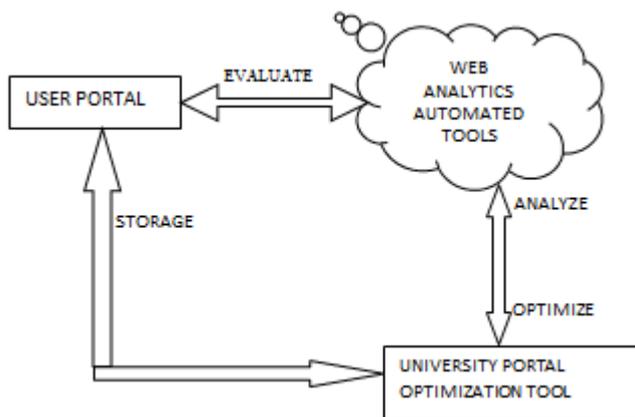


Fig. 3. Web portal optimization model.

After the preprocessing stage where the postgraduate website has been evaluated and the results analyzed, based on the result gotten the optimization can now take place so as to improve the usability and accessibility of the Websites. having seeing that the website performs better after optimization has taken place, it can then be used as a bases to develop an optimized website.

III. RESULTS AND DISCUSSION

The table summarizes all the results for the different sub sections which are being referred to as categories (CAT):

- Content organization and readability (CAT1)
- Navigation and links (CAT2)
- User experience (CAT3)
- Performance and effectiveness (CAT4)
- Educational information (CAT5)

TABLE I. Summary of the results.

	University of Ibadan (%)			Bowen (%)		
	Agree	Disagree	Unsure	Agree	Disagree	Unsure
CAT1	62.1	28.6	8.3	45.3	39.6	15.33
CAT2	59.11	37.33	3.78	44.89	31.55	25.78
CAT3	49.73	46.53	3.64	31.2	35.46	33.86
CAT4	38.2	47	14.8	20	41.6	38.4
CAT5	42	57.6	0.4	42	40	18
Total	50.2	43.4	6.2	36.7	37.6	26.3

TABLE II. Results of the usability testing of the website based on the responses gotten from the questionnaire.

Usability Metrics	University of Ibadan (%)			Bowen (%)		
	Agree	Disagree	Unsure	Agree	Disagree	Unsure
Ease of use	61.3	33.8	5.0	46.9	29.8	23.3
Consistency	55.3	40.5	4.3	41.5	33.3	25.2
Satisfaction	44.0	53.6	2.4	13.2	40.7	46.1
Effectiveness	59.2	36.0	4.8	45.2	38.4	16.4
Efficiency	50.6	46.0	3.4	54.3	35.1	10.6
Average %	54.0	41.9	3.9	40.2	35.5	24.3

The percentage of dissatisfaction is greater than the percentage of satisfaction. This could be as a result of the various constraints or difficulties that the users experienced when interacting with the sites. Satisfaction has to do with the users’ experience. Therefore, there is need to improve greatly on the website interfaces for user to be able to use the site satisfactorily.

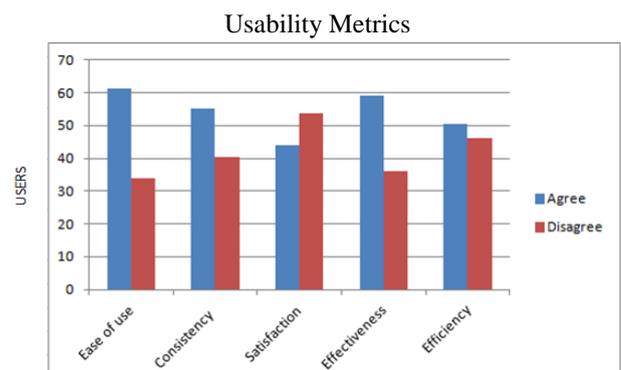


Fig. 4. Bar chart showing usability metrics of University of Ibadan postgraduate website based on the users’ responses.

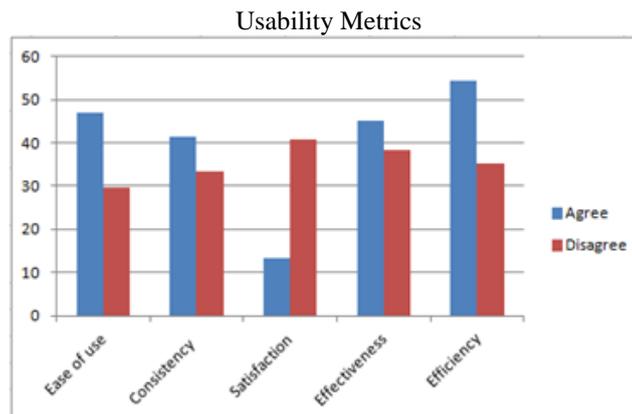


Fig. 5. Bar chart showing usability metrics of BOWEN University postgraduate website based on the users' responses.

TABLE III. WebPage analyzer reports for the six universities.

	Elements to be Measured								
	HTML Load Time		HTML Size (Bytes)	Images Load Time		Total Images (Bytes)	CSS Load Time		CSS Size (Bytes)
	56k(s)	T1(s)		56k(s)	T1 (s)		56k(s)	T1(s)	
University of Ibadan	11.77	0.51	58078	218.6	30.54	969434	48.88	6.17	220184
Bowen University	8.97	0.53	43990	44.4	11.49	169560	7.71	0.98	34686
LAUTECH	2.16	0.25	108218	39.39	3.19	186570	0.88	0.22	3388
LASU	7.18	0.58	34004	116.71	6.22	569639	1.77	0.83	2895
Covenant University	8.11	0.66	38700	118.15	13.85	537631	0.71	0.60	534
OAU	2.36	0.26	10833	65.51	2.52	324695	1.02	0.42	3122
Average	6.8	0.5	48970.5	100.5	11.3	459588.2	10.2	1.5	44134.8

IV. CONCLUSION

An image optimization tool was developed to reduce the size of the image which will improve the response time on the user side. This solves the problem of website loading time as discovered from our research. Users want a good quality in website so it is necessary to evaluate a website to usability and accessibility problems. With this result it is therefore recommended that the number of HTML objects and images used should be reduced so as to reduce the load time of these websites, also the website developers should ensure that the websites are compliant with the W3C guidelines slated for developing website in order to achieve the usability goals. Accessibility relate to whether the website can be accessed by anybody and since university website is meant for all category of users including people with disability hence we recommend that future work should consider students with disability. They should ensure that the website work well with assistive technology such as Screen Reader, Screen Magnifier and voice Recognition software.

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