

# Usability Evaluation of Some Selected Nigerian Universities' Websites

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## ABSTRACT

This study carried out a usability evaluation of some selected Nigerian universities websites. A total number of ten randomly selected universities though; mostly first and second generations universities were taken into account. This was done by making use of automated tools such as web page analyzer and HTML toolbox for data collection. The internal attributes that were taken into consideration embodied Total number of html files, Total html page size, Total size of images, Total number of images, Total number of external files, Total size of external files, as well as Load time, HTML check and repair, Browsers compatibility, Pages with bad links respectively and the various values were collected and analysed and presented in the graphical form using bar charts. The results showed that some of universities' websites adhered to the laid down threshold values of these attributes while some are still very much lacking. These include University of Calabar, Nnamdi Azikiwe University and University of Ibadan. Generally there it was also observed that no single university adhered to the threshold values as stipulated by the two automated tools used. A conclusion was made and some necessary suggestions were also proffered so as to enhance the usability of the stated universities' websites.

## General Terms

Web Usability

## Keywords

Website, Usability Evaluation, University Websites

## 1. INTRODUCTION

Web sites have become one of the most convenient and comfortable means of information communication. It use spans to all ramifications of the human endeavours ranging from business, education, industries, entertainment and advertisement. Notwithstanding, Web-based applications have influenced several domains, providing access to information and services by a variety of users showing different levels and characteristics. Users visit Web sites, time and again if they are able to easily access and get the so needed information they require this comes as a result of a well-structured layout, well presented and organisation of information in a way that facilitates access and navigation of such a web site by the users not forgetting bandwidth economy and efficiency as well as colour conflict to the user. This therefore, has called for more concern on the design and development of web pages where the various design rudiments and guidelines must be followed in order to ensure that the website can achieve its intended purposes and goals. Usability among others is one of the most important metrics used to test and evaluate the functionality and validity of a website. This is in conformity with the suggestion made by [3], that a "truly usable system must be compatible not only with the characteristics of human perception and action, but, most critically, with users' cognitive skills in communication, understanding, memory,

and problem solving." A usability evaluation consequently assesses the ease of use of a website functions and how well they enable users to perform their tasks efficiently [8]. Being such a powerful tool it needs to be well developed such that it really gives the totality of information content of the organisation it is meant for. Due to its importance and power in website evaluation it has become a point of concern overtime by many researchers. As a result, many definitions of usability have been given by many scholars and authors. According to [5], usability is "A set of attributes that bear on the effort needed for use and on the individual assessment of such use, by a stated or implied set of users" while "The ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component". As defined by [5], it is "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" [6]. In line with the [5] definition, one can conclude that the usability of the system will comprise learnability, effectiveness, efficiency and satisfaction [4] with which specified users can achieve specified goals in a particular environment, where:

- Learnability measures the time taken to get accustomed to the system and its operation and how easy it is to remember operational details;
- Effectiveness measures the accuracy and completeness of the goals achieved;
- Efficiency measures the accuracy and completeness of goals achieved relative to the resources, for example, human time and effort used to achieve the specified goals; and
- Satisfaction measures the comfort and acceptability of the system to its users and other people affected by its use.

In this regards, usability is an embodiment of many different attributes such as Load time, link check, number of images and their sizes, total number of external script files and Html files and their various sizes, browser compatibility problems, Html Check Errors among others as highlighted in [11]. Usability attributes can either be internal or external, any of which in the like manner can be measured and/or tested using many different methods that have been put in place by many researches and possibility of technological advancement.

This paper delves into the usability evaluation of some selected ten Nigerian universities, most of which are first and second generations universities. These include: Ahmadu Bello University, University of Ibadan, Obafemi Awolowo University, University of Nigeria, Bayero University, University of Benin, University of Port-Harcourt, University of Calabar, University of Lagos, Nnamdi Azikiwe University.

## 2. RELATED WORKS

Usability evaluation of websites is a means by which website designers and developers can use to know how well or how bad their sites are. This is the reason why many researchers have gone into serious work in order to develop ways of tackling the issue. According to [7] five distinct approaches that embody testing, inspection, inquiry, analytical modelling, and simulation can be identified. Among these approaches, one common characteristic of usability evaluation methods is their dependence on subjective assessments in the form of user judgments. Thus, usability is not intrinsically objective in nature, but rather is closely interwoven with an evaluator's personal interpretation of the artefact and his or her interaction with it [1]

[2] Undertook a research of on the Usability Study of Some Selected Functional Websites in Nigeria. Their findings showed that usability index of the selected websites ranges between 65% and 84%, which is below the standard 90% recommended level. Due to inadequate usability index of the tested websites, it can therefore be deduced that none of the websites attained good web usability. The result suggests that web development organizations have to follow user centred design process. Also, [12] went into further research and reviewed usability standards and models while highlighting the limitations and complementarities of the various standards. It then explains how these various models can be united into a single consolidated, hierarchical model of usability measurement. This consolidated model is called Quality in Use Integrated Measurement (QUIM). Included in the QUIM model are ten factors each of which corresponds to a specific facet of usability that is identified in an existing standard or model. In the like manner [11] were able to show that the overall usability level of the studied Websites is acceptable despite the fact that there are some weaknesses in some aspects of the design, interface, and performances.

Nigerian universities' websites can be generally categorized as having meagre content and defective architecture as the findings of [13], exposed salient weaknesses like wrong domain name adoption, errors in syntax, poor style, spelling mistakes and non-availability of meta tags in the websites. In addition, the websites did not contain most of the official and everyday information expected to be in a university website. [10] showed that there exists a general low-level of utilization of the Web for sharing and disseminating of information produced by Nigerian universities.

## 3. METHODOLOGY

In order to carry out this task, data for the evaluation was collected from the websites of the ten different universities under study using automated evaluation tools such as [9] and [14] all of which were gotten online.

HTML Toolbox is available from NetMechanic Inc. It is an award winning product that identifies site problems and automatically repairs HTML code for the websites. This tool can assist in the evaluation process by measuring and identifying some of the internal attributes of a website. The internal attributes that were measured using this tool include:

- Load time
- HTML check and repair
- Browsers compatibility
- Pages with bad links

Web Page Analyzer is a free web-based tool provided by Website Optimization. It can calculate page size (Html page size, total image size, and total image number), composition, and download time for website. In this study, the following attributes were measured using this tool:

- Total number of html files
- Total html page size
- Total size of images
- Total number of objects per page
- Total number of external script files
- Total size of external script files

The values of the various attributes derived from the automated evaluation tools were found, recorded and presented in tables 1 and 2 as well as in figure 1 and 2 below.

### 3.1 Html Toolbox Report for the Ten Nigerian Universities under study

#### 3.1.1 Html Check Errors:

These errors are places where the web page does not follow the rules for proper HTML coding. These problems may cause the page to display incorrectly under different browsers. As Figure 1 indicates, Obafemi Awolowo University (OAU) tops the list with zero HTML code errors then University of Benin (UniBen), Ahmadu Bello University (ABU) and University of Lagos (Unilag) with less than ten HTML code errors. In the same way, University of Ibadan and University of Calabar contained 66 and 32 errors respectively while Bayero University, University of Lagos and Nnamdi Azikiwe Universities registered fewer errors ranging between 6 and 24 errors. University of Port Harcourt (Uniport) registered the highest number of errors counting 132. Some of these problems represent places where HTML tags or attributes are used that do not follow the latest HTML standard and may not be supported by all browsers.

#### 3.1.2 Browsers compatibility Problems:

The measure, as assessed by the tool, shows how well the web page is displayed by different browsers. Figure 1 shows that OAU, Unilag, UNN, registered less than 10 compatibility problems each while ABU and Uniport registered 11 problems. All the remaining Universities got just between 24 and 34 browser problems. Apart from these a high number of 74 browser problems were found with University of Calabar (Unical) website.

#### 3.1.3 Load Time:

Page load time depends on several factors such as: the size of the HTML file and any frames it references, the number and size of the images, the use of HEIGHT and WIDTH attributes with image and table tags, the number of servers that must be contacted to download files and images, and the speed of the user's modem. For the websites covered in this study, OAU took 11.63 seconds then followed by Unilag and Uniport with 15.22 and 15.99 respectively then ABU with 37.27 seconds download time while Unizik, and Uniben registered more than 150 but less than 156 seconds each. Unical got the longest down load of 343.51 seconds on a 56k modem; which exceeds 15 seconds, the recommended acceptable level. This might be attributed to the large number and size of images some of these websites contain.

### 3.1.4 Pages with Bad Links:

Also known as link death or link breaking, is an informal term for the process by which hyperlinks in general point to web pages, servers or other resources that have become permanently unavailable. The phrase also describes the effects of failing to update out-of-date web pages that clutter search engine results.

Unilag, Uniben, Uniport and OAU had no pages with bad or broken links but UNN had only 1 bad link while Unical and Bayero University (BUK) got 3 and lastly 16 pages with bad or broken links was gotten from Nnamdi Azikiwe University. Some causes of this might be traced back to the fact that the websites linked to do not exist anymore. The most common result of a dead link is a 404 error, which indicates that the web server responded, but the specific page could not be found which is what was observed here.

## 3.2 Web Page Analyzer Report for the Ten Nigerian Universities under study

### 3.2.1 Number of HTML Files

The number of HTML files for each of the ten web pages (Including the main HTML file) is 1 file which most browsers can multithread. Minimizing HTTP requests is a key for web site optimization. The tool used indicated that such a value is appropriate. So, all the websites of the universities under studies satisfied.

### 3.2.2 Size of HTML Page:

The web page sizes, which will load in various time seconds on a 56Kbps modem as shown in Table 2, indicate that ABU contains, University of Ibadan, Nnamdi Azikiwe University, University of Benin, Obafemi Awolowo University Bayero University and university of Calabar respectively contains websites with HTML sizes that fall below the size value of 50K as recommended by the tool while others such as University of Port Harcourt, University of Lagos and University of Nigeria respectively scored a higher HTML size value than the recommended.

### 3.2.3 Size of Images:

The total image sizes of the ten universities fall within the recommended 8K and 100K. Apart from University of Calabar with a zero Kilobyte, a ranking of University of Benin, University of Lagos, University of Ibadan, Nnamdi

Azikiwe University, Obafemi Awolowo University, Ahmadu Bello University, University of Nigeria and University of Port Harcourt respectively is gotten.

### 3.2.4 Number of Images:

The number of images per page as recommended by the tool is just 20 images. In this case all the universities considered in this study did not follow this rudiment apart from Ahmadu Bello University alone with just 19 images per page. This gave an ordering of Ahmadu Bello University, university of Calabar, Nnamdi Azikiwe University, University of Lagos, Obafemi Awolowo University, University of Port Harcourt, Bayero University, University of Ibadan, University of Benin and University of Nigeria respectively. These high values help to increase the total latency time.

### 3.2.5 Number of external script Files:

The external CSS files must be in the HEAD of an HTML document, they must load first before any BODY content displays. Although they are cached, CSS files slow down the initial display of the web page. The tool indicated that such a number of one or two is good. In this respect University of Nigeria had a tie with University of Ibadan, and the list was followed by University of Lagos, Ahmadu Bello University, University of Calabar, Nnamdi Azikiwe University and University of Port Harcourt, Obafemi Awolowo University, Bayero University and University of Benin respectively. Only University of Ibadan and University of Nigeria are able to satisfy this condition of just one or two external script files as required and revealed by the Web page Analyzer.

### 3.2.6 Size of external script files:

The threshold value of 20K is stated by the tool. This will fit into three higher-speed TCP-IP packets. As such the ordering stands at University of Benin whose external script files size is less than 10K followed in that order by University of Lagos, Nnamdi Azikiwe University as the only one with 20.23K. The remaining universities scored above the threshold value that is University of Port Harcourt, University of Nigeria, Bayero University, University of Ibadan and lastly Ahmadu Bello University.

**Table 1: Html Toolbox Report for the Ten Nigerian Universities under study**

UNIVERSITY	HTML CHECK ERRORS	BROWSER COMPACTIBILTY PROBLEMS	LOAD TIME (56Kbps)	PAGES WITH BAD LINKS
Ahmadu Bello University	2	11	37.27	6
University of Ibadan	66	13	112.95	8
Obafemi Awolowo University	0	6	11.63	0
University of Nigeria	13	7	52.06	1
Bayero University	24	34	75.85	3
University of Benin	1	17	155.27	0
University of Port-Harcourt	132	11	15.99	0
University of Calabar	32	74	343.51	3
University of Lagos	6	6	15.28	0
Nnamdi Azikiwe University	22	23	150.92	16

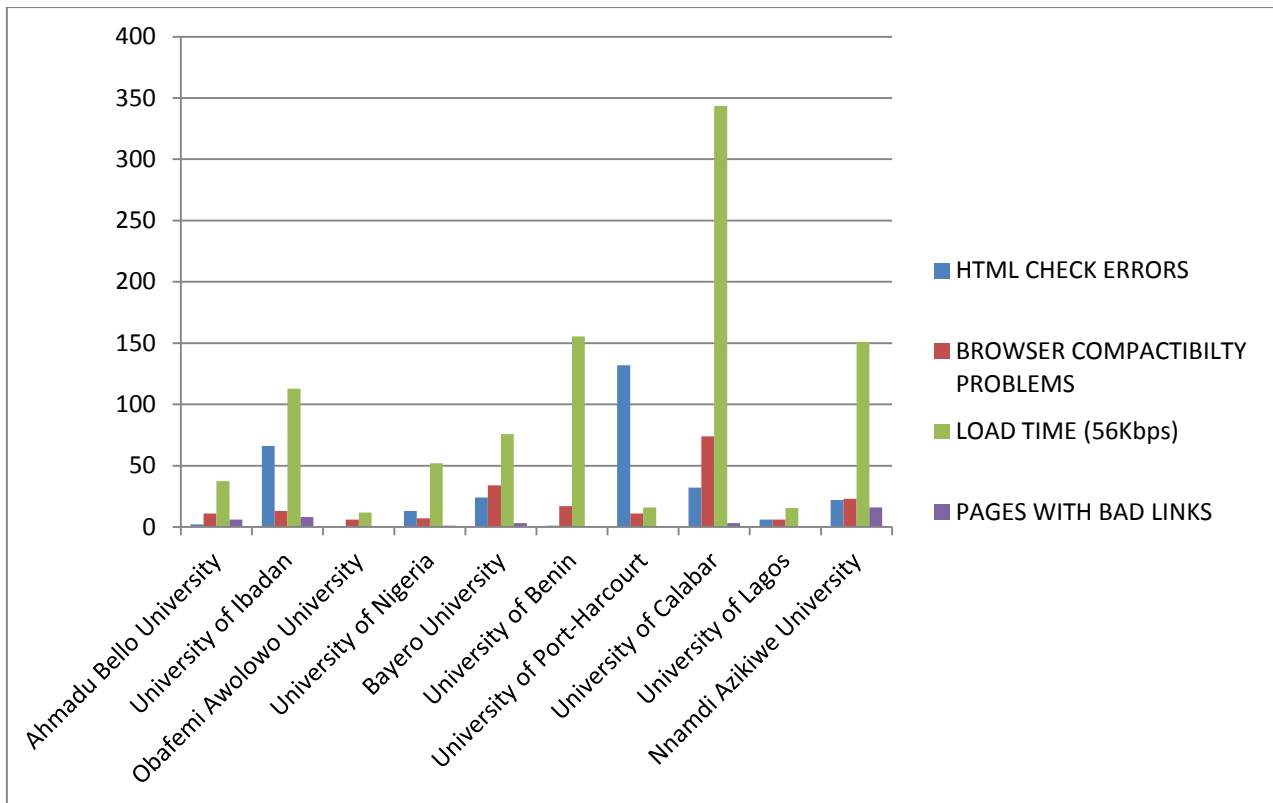


Fig 1: Graph showing Html Toolbox Report for the Ten Nigerian Universities under study

Table 2: Web Page Analyzer Report for the Ten Nigerian Universities under study

UNIVERSITY	THF	THS	TIS	TNO	TNS	TCSSS
Ahmadu Bello University	1	5.654	79.495	19	5	83.888
University of Ibadan	1	12.044	35.2342	77	1	52.204
Obafemi Awolowo University	1	35.867	62.7953	64	11	57.835
University of Nigeria	1	79.6426	79.6426	107	1	29.417
Bayero University	1	36.481	42.8416	73	12	37.777
University of Benin	1	29.439	15.5529	96	22	0
University of Port-Harcourt	1	53.759	79.8001	69	8	21.512
University of Calabar	1	41.374	0	38	7	28.363
University of Lagos	1	61.879	23.55745	50	4	12.365
Nnamdi Azikiwe University	1	27.722	37.1948	44	8	20.238

**THF:** Total number of HTML Files, **THS:** Total HTML Page Size (K), **TIS:** Total Size of Images (K), **TNO:** Total number of Objects per page, **TNS:** Total number of external Script Files, **TCSSS:** Total Size of external Script files (K)

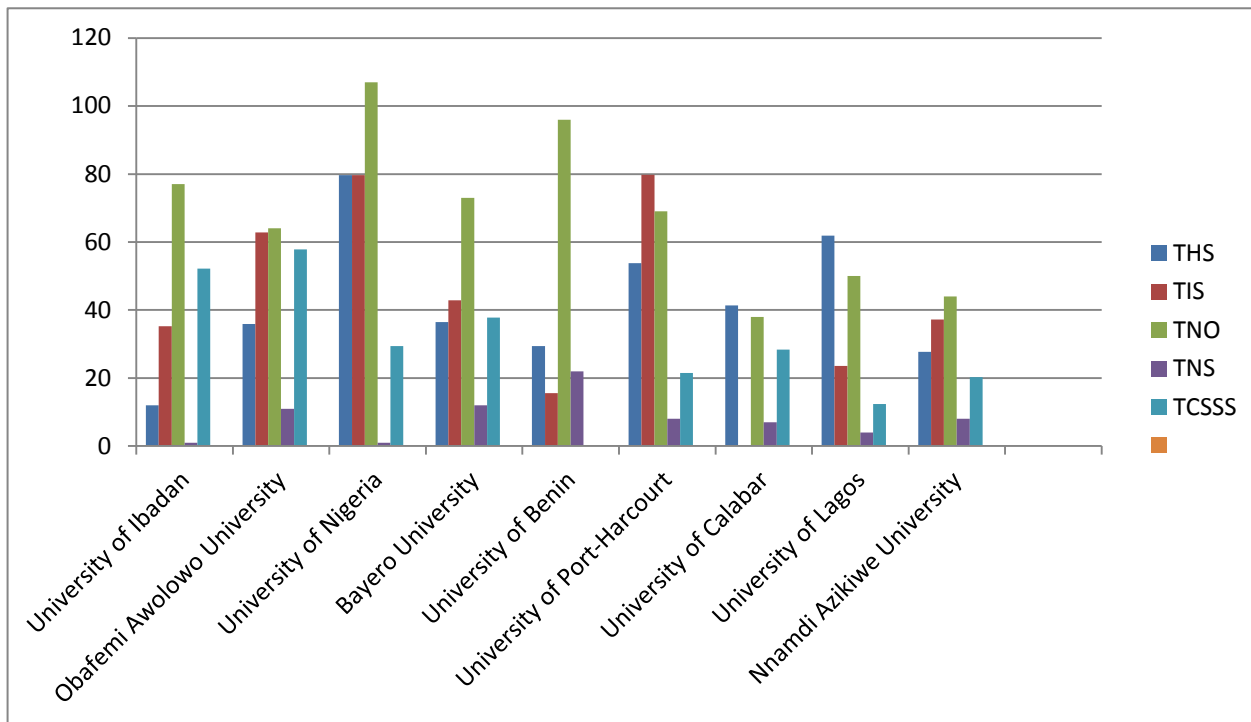


Figure 2: Graph Web Page Analyzer Report for the Ten Nigerian Universities under study

#### 4. CONCLUSION

Nigerian universities are growing tremendously in age, size and population. They therefore need to take advantage of the fast developing technology in computer age to disseminate the necessary information to its students, staff and other stakeholders as fast, efficiency and promptly as possible. Websites are one of those facilities that they are fast encroaching into its use for these stated purposes. Thus, it is worth noted that this endeavour should be prompt and efficient and satisfactory. The evaluation of this nature will go a better way to enforce the usability of the websites as it will show those that do not follow the basic guide lines of the design and development of these websites. This paper has taken into consideration some of the internal attributes which were measure through automated means as focal points for the evaluation. The study covered various aspects of usability, some of which have been found not at the acceptable level of performance. These aspects include HTML check errors, browser compatibility, load time and pages with bad or broken links. University of Ibadan, Nnamdi Azikiwe University and University of Calabar fall in this category. It has been pointed out that some parameters of evaluation such as the value of number of external script files, size of external script files, number of images, size of images, HTML pages and size of HTML pages, have satisfied the necessary conditions when compared with the acceptable threshold values. This is clearly seen with the case of Nnamdi Azikiwe University, Ahmadu Bello University and University of Lagos in the order. It should be noted, however, that the results of this study should be viewed with the fact that the design of some websites undergo changes and updates continually. The results obtained from this approach shows that the usability of Nigerian's university websites are to some extent reasonably acceptable, based on the measures of evaluation used.

#### 4.1 SUGGESTIONS

Consideration all these, some suggestions are hereby made to all the universities websites designers and developers as below:

- The websites should be updated from time to time so as to ensure efficiency and effectiveness in functionality. This will also help to curb down the errors that comes up from bad or broken links as has been released by the results of the evaluation exercise.
- The images and other graphics should be created with some care as pertaining to their heights and sizes so as to reduce the loading time.
- It was also discovered that HTML spell checking revealed some problems. Because of the diverse nature of browsers, it is therefore necessary to always spell check our pages so as to ensure browsers compatibility.
- The external script files number and their sizes should also be written with care following the stated rudiments so as not to exceed the number and the size stated.

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