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Investigating the Usability of a University Website from the Users' Perspective: An Empirical Study of Benue State University Website

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***Abstract*—**Websites are becoming a major component of an organization's success in our ever globalizing competitive world. The website symbolizes an organization, interacting or projecting an organization's principles, culture, values, vision, and perspectives. It is an interface connecting organizations and their clients. The university, as an academic institution, makes use of a website to communicate and offer computing services to its stakeholders (students, staff, host community, university management etc). Unfortunately, website designers often give more consideration to the technology, organizational structure and business objectives of the university than to the usability of the site. Website designers end up designing university websites which do not meet the needs of the primary users. This empirical study investigated the Benue State University website from the point view of students. This research was realized by using a standardized website usability questionnaire based on the five factors of usability defined by WAMMI (Website Analysis and Measurement Inventory): attractiveness, controllability, efficiency, learnability and helpfulness. The result of the investigation showed that the university website (https://portal.bsum.edu.ng/) has neutral usability level because of the usability issues associated with the website. The research recommended feasible solutions to improve the usability of the website from the users' perspective and also provided a modified usability model that will be used for better evaluation of the Benue State University website.

***Keywords*—**Usability, usability factors, university websites, user's perspective, WAMMI, modified usability model, Benue State University.

I. Introduction

THE internet has drastically changed the conventional approach that businesses and organizations pass information across to the public. Website as a vital means of communication presents an organization to the open and facilitates functionality. There is no doubt that websites are becoming a key component of an organization's survival or success in our ever globalizing competitive world. The website is a true representation of an organization reflecting its core values, principles and objectives. The stakeholder adopts the website as a modern system of providing services that helps in achieving project goals and objectives. In fact, the website serves as an apparatus of information exchange between an organization and its stakeholders.

Academic institutions have also taken advantage of the website capabilities to provide online services to the entire university community. Mebrate [1] asserts that academic institutions use websites for different reasons. This includes the promotion of research and academic programs, e-learning facilities, information dissemination and so on [1]. Based on the assertion above, it can be unarguably concluded that a university website has three key functions: Promotion and marketing, provision of online services and providing a means of communication. Mebrate [1] clearly spelt out some of the uses of academic websites as related to the following tasks: Promotion of research and education programs (Bachelor, Masters and PhD), e-learning support to students, communication means towards the public community, and advertising vacancies for different positions in the university.

There are different groups of users of academic websites. Each user group has different requirements, skills and expectation from the website. The main users of the academic website include: Students (current and prospective students), parents, professors, researchers, journalists, schools and companies. Most academic institutions including universities, take full advantage of their websites as a key public relation and marketing tool to reach potential students. Students seeking admission probably apply for admission to the university that presents useful and explicit information patterning the courses offered and mode of operation on its website. Students may contact and interact with other students in their attempt to search for other universities.

The major aims of the university website are to provide up-to-date information and services to students, lecturers, administrators and other users in efficient ways. Through this website, university staff may access employment information from human resources, faculty may access student class lists and enter grades, and students may access course materials, grades, register semester courses, upload credentials and financial aid information. The university website is not only an effective way to communicate with various stakeholders such as students, faculty, administrative staff and visitors in terms of cost and efficiency but also a way for a university to shape its image. One of the ways to promote the image of a university is through the use of a website. Therefore, university web design must conform to specific user needs, and must also make sure that users are satisfied to successfully carry out tasks within the website without encountering any issues.

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Due to the current limited number of usability studies evaluating university websites, this empirical usability study uses WAMMI website usability measurement factors to extensively evaluate the Benue State University website. It also develops an enhanced model for conducting usability evaluation of websites. For this reason, the following research questions were raised:

1. Does the university website function smoothly enough to satisfy its end users?
1 What are the usability problems of the university website?
2 How can the university website be improved to enhance its usability?
3 How can the university website be evaluated more comprehensively?

II. Literature Review

The website of an organization is the door to its services, products and information. Therefore, it should adequately provide the needed resources for its clients. To a certain degree, usability depends upon the purpose and target audience of a particular website. However, there is an acceptable norm that a usable web interface should be simple, clear, consistent, appealing and accessible [2]-[4]. In the past, website development focused on the functional and structural requirements of the site. There is, however, a growing trend in website development where more attention is given to website usability. Researchers have different definitions for usability. Nielsen [5] defines usability as the characteristic of being easy to use. More precisely, the usefulness of a product can be assessed by two key features – its utility and its usability [5]. Utility refers to a product's capability to carry out an intended function. Shackel [6] say that usability is how users can easily perform a given task within a particular environment after undergoing a particular training. Preece [7] say that usability is the extent by which users can learn and use a system. He further said that it involves attitude, efficiency, effectiveness and safety of the users towards the system.

Usability testing methods are applied in order to evaluate the system with respect to real users' view, to develop more friendly designed systems, and to improve the satisfaction levels of users. During usability testing, different types of problems could be observed. The finding could go a long way to enhance the production of more usable and more users-friendly websites or programs. Usability.gov [8] maintains that usability evaluation helps designers and developers to identify usability problems before they are implemented. When the issues are identified early enough, it becomes less expensive in staff time and schedule to fix [8]. Therefore, usability.gov listed some of the benefits to gain during usability testing as: Make an analysis of website performance to ascertain if it meets a given usability objective, identify how long it takes to complete specified tasks, find out how satisfied participants are with your web site or other products, identify changes required to improve user performance and satisfaction, learn if participants are able to complete specified tasks successfully.

The usability of educational websites is mostly assessed using either user testing or heuristic approaches. A study on usability of university websites conducted by [9] analyzes the effects of the information age on universities in the perspective website on EUL's (European University of Lefke) website in terms of student utilization. The research employed the website analysis and measurement inventory (WAMMI) questionnaire consisting of 20 questions. The questionnaire was given to 293 students, studying at different faculties of EUL. Regression and Non–parametric techniques were used for analyzing the data collected. Their result shows a discontentment and other usability problems of the website of EUL, Northern Cyprus. Mebrate [1] designed a quality evaluation framework for the assessment of academic websites from the viewpoint of students. The framework was based on the detailed ISO 9126-1 quality model. Questionnaire technique was used to test the quality of the TU-Delft University website. The findings show that students had a better understanding on how to evaluate the website when new quality factors were added to the proposed framework. Another usability study conducted by Ekşioğlu [10] focused on evaluating the Industrial Engineering Department of Bogazici University using heuristic, remote usability testing, and post-test questionnaire methods. Users were given a task to complete and their performance was evaluated based on dwell time, task completion success rate, number of clicks, accomplishment/quittance by a remote usability testing tool, Loop11. The findings show some design issues. A related study conducted by [11] investigated the usability of the website of Uludağ University. The questionnaire given to 445 students for the experiment, comprised of 22 questions on how the university students use the website. The result shows dissimilarities in the responses between the male and female users. In the study by Mentes and Turan [12], the website usability level of Namık Kemal University (NKU) website was evaluated based on six factors of website usability. The result of their investigation depicts that five factors have an impact on the website usability. In addition, gender and web experience of users were reported as factors that equally affect the usability perception of users. The research provided possible ways for the design of websites with high usability.

The review above showed an increasing interest in studying how design factors affect the usability of websites. This study provides vital directions for how future usability testing should be conducted, which would yield improvements to current website designs.

III. Methodology

Website usability testing is evaluating the different components of web usability by watching the users accomplishing their task. Web usability provides a better approach to uncovering the roadblocks and errors users encounter while accomplishing a task. There are different approaches of how website usability can be evaluated. Some of the approaches include NIST Web Metrics, SUMI, QUIS and so on. WAMMI (Website Analysis and Measurement Inventory) is one of the most popular evaluation tools for websites. It lists factors needed to carry out a usability testing. The five factors include:

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Attractiveness: Attractive websites are visually pleasant and appeal the interest of the users, whether it is functionality or information. Many usability researchers suggest that the graphical representations such as icons, colors, images and animations, give a website a higher attractiveness.

Controllability: The report of one's degree of control over how he/she interact with a given website. It entails whether users feel they have control over a given website [13].

Efficiency: Efficiency is the resources used in completing a particular task (ISO, 1998). Website efficiency involves the resources such as time, money and energy expended in relation to achieving goals as a user interacts with a website.

Learnability: This involves attaining a certain competence level on how to use a device in order to effectively and efficiently complete some given tasks. Learnability is the ease, in effort and time in learning how to use a given device [14].

Helpfulness: This entails providing useful information to users before they view the website, as they navigate the website and after they visit the site.

The research uses these evaluation metrics to evaluate the Benue State University (BSU) website. User feedback (user testing method) approach is used for evaluation of the BSU website. The approach involves collecting mostly qualitative feedback directly from website users. The method used for this research was adopted from the website usability testing presented by Jabar, Usman and Awal [14]. Fig. 1 is the research model which indicates the dependent variable (usability) and independent variable (university website).

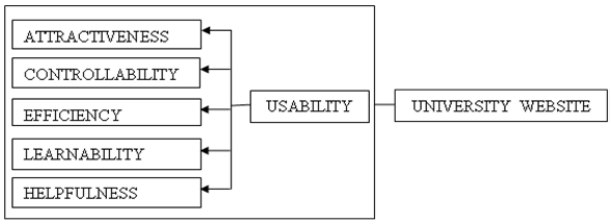


Fig. 1 Research Model

A. Participants/Sample Selection

Participants were self-volunteered students who responded to the verbal request made by the researcher. However, no incentive was provided to the participants because none of them indicated an interest in any form. The selection process was restricted to students in the faculty of sciences, specifically 400 students of the Mathematics and Computer Science department, with a conversational level of English, proficiency with a mouse, and who have also used the website for a period of time. This was done to ensure that the participants' performance would not be confounded by a poor comprehension of the web interface and task instructions, or an inability to use the standard computing hardware and software.

B. Questionnaire

1. Pre-Test Questionnaire (Demography Questionnaire)

The pre-test questionnaire started with some general questions about the respondent's personal information, such as gender, age, affiliation with the BSU website, website use experience, frequency of using website, the type of web browser and device used to visit websites and so on.

2. Post-Test Questionnaire (Survey)

This study adopted the WAMMI questionnaire [9]. The survey aims to determine the usability level of the university website and has a standardized 22-statement questionnaire. Twenty questions are categorized into five factors of usability. The remaining questions demand users' opinions concerning the usability of the website under study.

C. Pilot Test

A pilot study was conducted to test the workability of the main study. However, the data obtained from the pilot study were not added to the main study. The pilot study was conducted on two participants/students out of the 22 respondents who volunteered to participate in the usability study. The pilot survey identified some problems; the results were given due considerations and minor corrections were effected.

D. Evaluation Metrics

To evaluate the usability of university website from the users' perspective, responses were evaluated based on the merit point. The options are strongly disagree (SD), disagree (D), neutral (N), agree (A) and strongly agree (SA).

TABLE I
OPTIONS FOR UNIVERSITY WEBSITES EVALUATION QUESTIONNAIRE AND CORRESPONDING MERITS

Option	SD	D	N	A	SA
Merit	1.00	2.00	3.00	4.00	5.00

The scale used to measure the usability levels of the usability factors and the overall usability of the BSU website is shown in Table II.

TABLE II
USABILITY POINTS AND CORRESPONDING USABILITY LEVELS

Point, X	**Usability Level**
1.0<= x<=1.5	Bad
1.5<x<=2.5	Poor
2.5<x<=3.5	Neutral
3.5<x<=4.5	Good
4.5<x<=5	Excellent

E. Procedure

The data collection for all sessions followed the same procedure. Data were gathered using pre-test and post-test questionnaires. The pre-test questionnaire was printed and administered to the participants to complete. The session commenced with the researcher welcoming the participant and explaining clearly the objectives of the study; the number of tasks that would be evaluated; the number of surveys that needed to be completed; and the student's right to withdraw from the session at any time as stated in the consent form. The students were then asked to complete the pre-test questionnaire in order to collect information in respect to their

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background and experience. The post-test questionnaire was administered automatically at the completion of a session by Morae Recorder. The autopilot mode of the Morae Recorder was enabled to log the six tasks and the 22 survey questions automatically-without an observer. This means that only one laptop computer was used to carry out the usability study. Before the users completed the surveys related to the evaluation of Benue State University website, the researcher asked the students to view the home page of the website for two minutes and explore the website by clicking on at least five links for a maximum of two minutes. After the exploration, the participant was asked to click on 'start task' and 'end task' in the Morae log task window to begin a task and end a task, respectively. The Morae Recorder logged surveys automatically for completion by the student at the end of the last task. Evaluations were based on a five-point Likert-type scale.

The tasks were paced with time constraints imposed - four to five minutes were allocated to each task, and participants were given explicit instructions to complete each task before moving on to the next. During the test session, interactions between the researcher and the participant were reduced and no assistance was offered unless it was explicitly requested. The average time spent in conducting the session was 35 to 40 minutes. All the evaluations were done in five days (from 30th March to 4th April, 2018). It is worth mentioning that consideration was given to the possibility that the website being evaluated might pose some challenges over time.

A live feed from the recording device or computer was captured using Morae Recorder version 3.2.1; TechSmith Corporation, 2018, with the help of the systems Yaw webcam. The progress of each participant was also monitored/observed by the researcher who sat beside each participant, so that the researcher could annotate the session log with observations of facial expressions. However, this video stream was not recorded. Glo Wireless Access Point with 7.2Mb/s wireless MODEM was used to connect the computer to the Internet. The latest version of Mozilla Firefox was used as the browser. The speed of the internet connection was 750 kbps for upload speed and 380 kbps for download speed.

To ensure optimum connection speeds and the response of the website, the tests were conducted during the time many students had finished their exams and left the campus and the school website or portal was not open for online admission processing/registrations for newly admitted students. For consistency, the load time of the website homepage was measured before each trial, and it was below 10 seconds on every trial.

IV. Results

This section consists of the descriptive statistics of respondents, qualitative analysis (non-parametric tests), qualitative analysis (parametric tests), findings and discussion. Microsoft Office Excel 2010 and the Morae Manager (Morae data analysis tools) were used for the data analysis.

A. Descriptive Statistics Result

The responses of participants to demographic questions are displayed in Table III. According to the results presented in this table, 90% of respondents were male, while females constituted only 10%. In terms of age, 45% were aged between 18-24 years, while 55% ranged in age 21-25 years. The percentage of respondents who indicated that they have used the website for over two years was 85%, while those who used the website for only less than one month was 15%. In respect to the frequency of using the website, 60% indicated that they use website daily. Those who visit website weekly and monthly formed 20%, respectively. About 70% of the respondents visit the BSU website 2-3 times a week. Those who visit the website weekly and once a week constituted 15% in that order. The percentage of those who showed that they stay on the BSU website for less than one hour was 65%, while of those who stay on the website for 1-2 hours, 2-4 hours, and 4-6 hours that figure was 15%, 5% and 15%, respectively. In respect to the top three reasons of visiting the BSU website, 40% of respondents said they visit the site to view 'News and Latest events'. About 10% visit the site for news headlines, while 50% visit the site to log in into their account to carry out online registrations. The respondent that uses both laptop and desktop to access BSU website was 80%, while those who use a mobile phone was 20%. The web browser used by most students to browse the site is Mozilla Firefox at about 80%, with Opera Mini and Google Chrome with 5% and 10%, respectively. Based on the modem access speed to the internet, 90% of the students used the university wireless network access point, while 5% use either a wireless modem or DSL modem.

TABLE III
DESCRIPTIVE STATISTICS OF THE RESPONDENTS

S/No	Factor	Category	Percentage
1	Gender	Male	90%
		Female	10%
2	Age	18-24	45%
		21-25	55%
3	Affiliation with BSU	Current student	100%
4	Duration of using website	Less than 1 month	15%
		Over 2years	85%
5	Frequency of using website	Daily	60%
		Weekly	20%
		monthly	20%
6	Frequency of using BSU website	Weekly	15%
		Once a week	15%
		2-3 times a week	70%
7	Duration of stay on BSU website	1hour	65%
		1-2hours	15%
		2-4hours	5%
		4-6hours	15%
8	Top three reasons for visiting BSU website	Events calendar	40%
		News headlines	10%
		Login to access BSU web	50%
9	Device use to access BSU website	Desktop/Laptop	80%
		Phone	20%
10	Web browser use	Mozilla	80%
		Opera mini	5%
		Google Chrome	10%
		UC browser	5%
11	MODEM access speed to internet	University wireless AP	90%
		Wireless MDEM	10%

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B. Merit Points and Usability Points of the Usability Factors (x)

The tabled above shows the total merit point for each usability factor based on the response of each participant using the Likert scale values assigned to each option. The higher the total merit point indicates the student's satisfaction or contentment with the usability factor. The average for each value is also determined. Fig. 2 shows the pictorial representation of the information.

The *Merit point* of a usability factor (x) was deduced from:

$$\text{Merit Point} = \sum(\text{Merit points for each question of the usability factor (x)}) \quad (1)$$

While the *Usability point* of a factor (x) was obtained from the expression:

$$\text{Usability Point or index} = \frac{\sum(\text{Merit point of each Factor,x})}{\text{Number of questions of the factor}} \quad (2)$$

TABLE IV
TOTAL POINTS AND USABILITY POINTS OF USABILITY FACTORS

S/No	Usability factor (x)	Merit points of x	Usability point of x
1	ATTRACTIVENESS	11.85	2.962
2	CONTROLLABILITY	7.300	2.433
3	EFFICIENCY	8.700	2.175
4	LEARNABILITY	11.60	2.900
5	HELPFULNESS	12.85	2.570

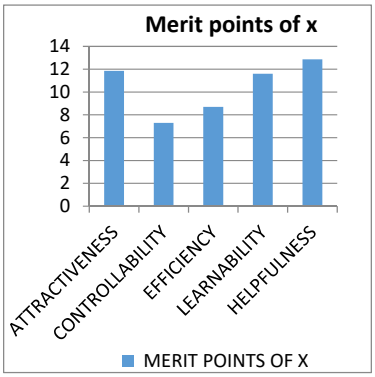


Fig. 2 Merit Point of the Factors

C. Result of BSU Website Usability Test from the Evaluation Metrics (Factors)

The overall usability of the university website shown in Table V below was calculated using formula (3):

$$\text{Overall usability} = \frac{\sum \text{Usability points of Usability factors (x)}}{5} \quad (3)$$

where 5 is the number of Usability evaluation metrics or factors.

The summary of the usability evaluation result of the BSU website is shown Table V and depicted graphically in Fig. 3.

The university website obtained poor usability level in terms of controllability, efficiency and helpfulness. While the site obtained neutral usability level in terms of attractiveness and learnability. The overall usability mean value for the university website is 2.608, which is described as "neutral" on the usability scale. The poor usability level of controllability, efficiency, helpfulness and neutral over all usability levels of the university website is not unconnected from the usability issues that are associated with the website.

TABLE V
USABILITY POINT FOR EACH FACTOR

S/No	Usability Factor (x)	Usability Point of x	Usability Level of x
1	ATTRACTIVENESS	2.962	Neutral
2	CONTROLLABILITY	2.433	Poor
3	EFFICIENCY	2.175	Poor
4	LEARNABILITY	2.900	Neutral
5	HELPFULNESS	2.570	Poor
Total	**OVER ALL USABILITY**	**2.608**	**Neutral**

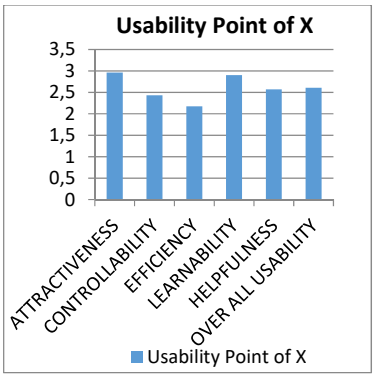


Fig. 3 Usability Point of X

TABLE VI
TASK ANALYSIS: AVERAGE TIME ON TASK BY PARTICIPANTS

	Time on Task (Seconds)					
Participant	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**
P1	104.49	68.55	103.6	128.79	67.67	50.06
P2	57.81	149.51	155.5	129.73	47.32	40.48
P3	142.58	43.35	60.23	84.33	35.38	25.34
P4	54.06	40.59	52.18	70.73	46.66	19.28
P5	119.95	36.79	31.59	92.96	48.84	44.37
P6	147.23	39.25	43.21	40.98	82.43	39.3
P7	84.54	31.11	32.33	85.44	51.92	37.9
P8	203.41	82.68	82.84	129.98	92.9	73.85
P9	170.76	81.2	52.29	142.74	142.87	174.47
P10	98.36	64.96	65.32	102.93	79.19	82.57
P11	109.95	55.38	29.22	126.38	62.74	61.23
P12	98.95	112.07	87.56	174.91	74.96	29.36
P13	65.08	121.28	69.02	160.82	53.82	132.49
P14	73.49	107.19	95.5	149.29	102.29	61.84
P15	112.06	82.1	58.2	111.49	77.3	111.38
P16	86.86	120.11	61.95	135.33	56.38	66.56
P17	175.14	64.83	104.7	303.36	106.08	77.67
P18	83.76	64.41	38.77	98.53	52.23	50.78
P19	81.26	94.43	11.76	137.19	75.1	29.31
P20	53.77	52.96	51.45	131.26	40.62	21.08
Minimum	53.77	31.11	11.76	40.98	35.38	19.28
Maximum	203.41	149.51	155.5	303.36	142.87	174.47
Mean	106.18	73.3	66.04	126.86	69.83	60.53
Standard Dev.	42.47	32.19	33.32	52.52	26.39	41.31

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Table VI depicts the time in seconds on task by each participant. The table clearly shows the maximum and minimum time spent on each task. The mean time and standard deviation for total time spent on each task by the participants. Fig. 4 is a representation of what is in Table VI.

It can be deduced from the table that task 1, task 3 and task 2 have a high mean time of 106.18 s, 126.86 s and 73.3 s, respectively. This is as a result of slow load time of the web pages evaluated under task 1, task 3 and task 2, irrespective of a high speed network connection.

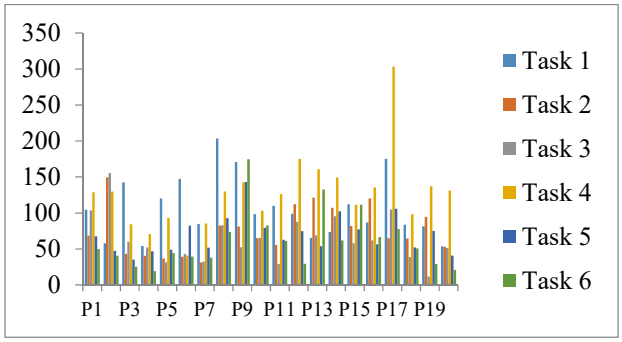


Fig. 4 Average Time on Each Task by Participants

D. Discussion

The usability results portray a clear picture as to what extent the website is usable for the students and what they want in the website. The lowest scores of usability level were 2.175, 2.433, and 2.570, for efficiency, controllability and helpfulness, respectively, and this is labeled as poor. The attractiveness and learnability have high scores of usability level as 2.962 and 2.900 accordingly. Their usability levels are termed as neutral. The overall usability level of the website according to the student's response to the survey indicates that it is also neutral with the score of 2.608.

The discussion of the issues identified on the website is based on the five web usability factors or metrics-attractiveness, controllability, efficiency, learnability and helpfulness.

1. The major usability issue lays in inconsistence in design and layout of web pages. For instance, the layout and color combination (text to background contrast or color), especially in the 'News and Latest Events' section or frame of the home page. The black background color and the red font color of the section title renders the title inconspicuous. Therefore, one has to strain his or her eyes to read what it is. In addition, the size of the font and the form of the section is small.
2. Similarly, the image in the Mathematics and Computer Science Department page does not appear and there is no ALT tag to describe the image or the motive of the image.
3. The students or participants expressed dismay with the site navigation. They said they get lost as to which page to go next to find the information they were looking for.
4. Another issue relating to controllability is the inappropriate labeling of the navigation menu. For instance, the absence of a 'Student Login' link on the 'Student' drop down menu list of the university website home page.
5. The 'Home' page is duplicated each time you click on the 'Home' link on the navigation bar in the web pages such as 'About Us', 'Mathematics/Computer Science Department', 'Department of Economics' etc.
6. The university banner having a logo is not linked to the "Home" page of the website.
7. The respondents expressed dissatisfaction with the website load time, stating that it is too slow. Also, respondents decried a browser incompatibility issue. They said the website does not efficiently solve the browser incompatibility issue.
8. Inability of the 'View Result' page to display the student's results.
9. Absence of 'Vacancies' page on the website.
10. Inadequate detailed information about departments such as staff list, courses, programs for master and PhD, and latest developments.

Despite the fair or neutral usability level of the university website, the 20 students participating in the study testify to the fact that the website is fairly attractive, has proper page headings and simple online information presentation.

V. Recommendation

The recommendations provide answers to research questions three and four.

1. The redesign of the 'News and Latest Events' section to increase the font size of the text, font color of the title text, the background color and the size of the section or frame.
2. Redesign the Mathematics and Computer Science department web page to display the image and inclusion of the ALT tag to describe the image.
3. We strongly recommend the renaming of the 'Registration' link on the 'Student' drop down menu (from the home page navigation menu) to 'Student Login' and link it to a separate 'Login' page other than the login section on the 'BSU Portal' page. Also, the 'Lecturer Evaluation' link in the 'Student' drop down menu should be removed or linked to the separate 'Login' page that the 'Student Login' will be linked to.
4. The 'Home' link on the website pages should be checked and linked correctly to the home page of the website to avoid loading of new home page in a new tab when clicked. Also, for easy navigation purpose, the university banner having the logo should be linked with the "Home' page. This can be seen in Lund university website (https://www.lunduniversity.lu.se/).
5. The web developers should optimize the load time of the web pages of the website to increase the response time of the server.
6. The researcher recommends that all necessary measures be taken to address browser incompatibility issue of the website.
7. All the department pages should be redesigned to incorporate more detail information such as staff list,

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courses, programs for master and PhD, and latest developments, etc.

8. We recommend the design and inclusion of a 'Vacancies' page on the university website, so as to provide information on job vacancies to job seekers who are also users of the website. The 'Vacancies' link can be positioned on the website home page. An instance of this can be found on the University of Lagos website, (https://unilag.edu.ng/#).
9. We also recommend that university management liaise with the web development team to see that the student 'View' result page is fully developed so that students can view and print their semester results online.

VI. Conclusion

We have figured out and discussed some common problems associated with the Benue State University website. In addition, we have given recommendations to the BSU website, and developed an automated website evaluation model. Further research can apply the model to another website, as well as develop the model.

Additional approaches such as use of experts (heuristic approach) could also be part of future studies. This would guarantee better reliability and validity of the website evaluation. The study focused on Benue State University website evaluation, which is a case study of other university website evaluations. The evaluation model built is based on the Benue State University website but it can be generalized.

VII. Further Study

In this section, the researcher suggests some methods, as well as some additional automated approaches that can be used in further study to enhance the research quality. A modified model for website evaluation is developed to improve the evaluation of university websites.

Heuristic Analysis: Heuristic method or analysis makes use of a small set of evaluators known as user experience specialists that examine the website interface and judge its compliance with known usability principles or factors. This approach basically requires that user experience specialists go through the interface of a website and carry out different tasks in order to find and fix usability issues for better user experience.

Automated Web Evaluation Approaches: Automated web evaluation techniques or approaches have emerged in recent times. Automated web evaluation approaches for usability testing allow researchers to evaluate the usability of websites by gathering information from remote users. These approaches or techniques can remotely record users' behaviour while they surf the Internet. The approaches have the capabilities of finding broken links, errors and redirects, analyze page titles and meta data, discover duplicate pages, response time, security, content, images and links analysis, etc.

The traditional web usability testing involves carrying out a test in a usability laboratory where a number of users come individually to the laboratory and execute certain tasks under the supervision of an administrator and/or be recorded by special technologies. Andres and Vitaveska [15] maintains that the main advantage of this approach is that it is possible to better control the circumstances that can occur during the test; moreover, it is less time consuming and more convenient for the researcher to have all the participants in the laboratory.

In respect to the automated web evaluation approach, the research recommends four approaches that can be used to evaluate Benue State University website, and of course, other university websites. The four approaches or techniques are: Eye tracking, Web browser, website, and proxy approaches.

Eye tracking approach: Eye tracking is the measurement of eye activity of users of a product (website). Where do users look? How long are users looking for? Where do users shift their focus to? What do users ignore? These questions are essential in evaluating the usability of a website. Eye tracking can capture data about the conscious and unconscious behaviour of web users [16]. Eye tracking devices capture where their eyes are moving and relate it to their behavioral performances. Akuma et al. [17] asserts that browsing behavior such as browsing time, mouse clicks, query change, collecting operation, printing operation, and time spent performing a task, are good indicators for predicting users' interest and intension. These indicators are helpful in redesigning a website for better user experience.

Web browser approach: The web browser approach is based on the development of a specific client-side application that the user will use to surf the web. The web browser applications usually used are often called browser extensions or plug-ins. This application is usually a customization of a specific browser such as Google Chrome, Microsoft Internet Explorer or Mozilla. Despite the fact that extensions are typically used to add features and enhance the functionality of a website, they can also be intensively used to help website owners to evaluate web pages and their entire website to identify opportunities for engaging visitors more effectively.

Website approach: The website approach is based on a web application that is inserted into the website in question and monitors user behavior. This approach usually requires full access to the website code, so it can be used only in rare cases for security reasons, also most websites owners do not allow external researchers to modify their sources [15].

Proxy approach: The proxy approach is based on an application that lies between the client and the server (a mediating application) monitoring the navigation. The approach is more appropriate in the sense that the tested users need not install anything on their computers, and that the researcher does not need to have access to the website code.

VIII. The Modified Usability Model

Fig. 5 is a representation of the new or modified model for better university website usability testing.

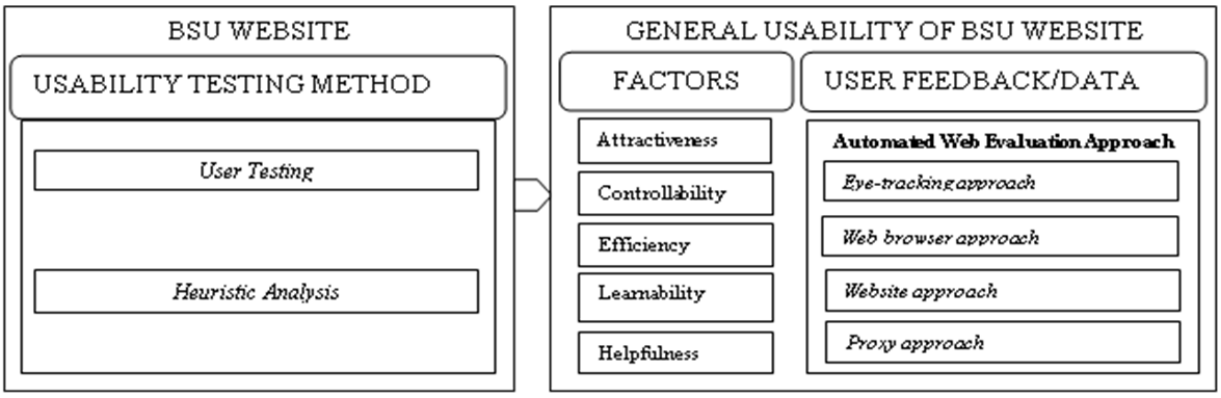


Fig. 5 Modified Website Usability Evaluation Model

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REFERENCES

[1] T. W. Mebrate, "*A Framework for Evaluating Academic Website's Quality from Students' Perspective*.", 2010.
[2] E. Matthew Carroll, "Usability Analysis in Practice: Assessment for Redesign of the School of Information & Library Science Web Site", 2004.
[3] J. Bautista *et al*, "*Students' perspectives on university website usability:* An evaluation, Pepperdine University," 2010.
[4] K. M. Handeli and S. A. Robila, "Design, development and testing an academic repository," in *2018 IEEE Long Island Systems, Applications and Technology Conference, LISAT 2018,* 2018, pp. 1-7.
[5] J. Nielsen, *Usability Engineering.* Boston: Academic Press, 1993.
[6] B. Shackel, "*Usability-context, framework, definition, design and evaluation*," *In Interacting with Computers,* vol. 21(5), pp. 339-346, 2009.
[7] J. Preece, *Human-Computer Interaction.* Harlow: Addison-Wesley Press, 1994.
[8] *Usability testing.* Available: https://www.usability.gov/how-to-and-tools/methods/usability-testing.html.
[9] E. Caglar and A. Mentes, "*The usability of University websites* – A Study on European University of Lefke," *International Journal of Business Information Systems,* vol. 9 (6), 2012.
[10] M. Ekşioğlu *et al*, "*Heuristic evaluation and usability testing*: Case Study," *Internationalization, Design and Global Development Lecture Notes in Computer Science,* vol. 6775/2011, pp. 143-151, 2011.
[11] E. Sengel and S. Öncü, "*Conducting preliminary steps to usability testing*: Investigating the Website of Uludag University," *Procedia Social and Behavioral Science,* vol. 2, pp. 890-894, 2010.
[12] S. A. Mentes and A. H. Turan, "*Assessing the usability of university websites*: An Empirical Study on Namik Kemal University," *Tojet,* vol. 11 (3), 2012.
[13] A. Seffah *et al*, "*Usability measurement and metrics:* A consolidated model," *Software Quality Journal,* vol. 14, pp. 159-178, 2006.
[14] M. Jabar, U. Usman and A. Awal, "*Assessing the usability of University websites from users' perspective*," *Australian Journal of Basic and Applied Sciences,* vol. 7(10), pp. 98-111, 2013.
[15] B. Andres and L. Vitaveska, "Behavior research methods, instruments, & computers- remote web usability testing," vol. 35 (3), pp. 364-368, 2003.
[16] S. Akuma *et al*, "Comparative analysis of relevance feedback methods based on two user studies," *Comput. Hum. Behav.,* vol. 60, pp. 138-146, 7, 2016.
[17] S. Akuma, "Investigating the Effect of Implicit Browsing Behaviour on Students' Performance in a Task Specific Context," *International Journal of Information Technology and Computer Science (IJITCS),* vol. 6, *(5),* pp. 11-17, 2014.