

Redesigning Academic Website for Better Visibility and Footprint: A Case of the Federal University of Petroleum Resources Effurun Website

A.A. Ojugo¹ & D.O. Otakore¹

¹ Department of Mathematics/Computer Science, Federal University of Petroleum Resources Effurun, Delta State, Nigeria

Correspondence: A.A. Ojugo, Department of Mathematics, Computer Science, Federal University of Petroleum Resources Effurun, Delta State, Nigeria. E-mail: ojugo.arnold@fupre.edu.ng; kekeje.debby@fupre.edu.ng

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Abstract

Usability is the focal point on which webometric is studied as it seeks to ascertain the experience and convenience level of users who interact with a web-based systems. It scores vital aspects of the website based on certain criteria. Thus, the website's design, architecture and deployment must be poised to change, reshape and refocus a user's image while satisfying the user's search quest about the institution. Our study is an investigation of website usability based on some criteria that describes usability of academic websites with a focus on the Federal University of Petroleum Resources Effurun, Nigeria. Result shows the strengths and weaknesses (problems cum prospects) of the websites in relation to redesigning and improving the university website. Its major strength is in its content and architecture; While, the site struggled to ensure effective search, navigation, design and others. Findings suggest that the FUPRE websites is lacking in various usability areas.

Keywords: webometrics, footprint, user experience, architecture, FUPRE, visibility, academic website, usability review

1. Introduction

THE Internet continues to advance the field of informatics by housing web-based contents as researchers continue to seek effective means to acquire knowledge and desired data. As users sought to satisfy their ever-growing data appetite as a product delivered across platforms, knowledge czars and engineers continues to proffer better techniques, medium and processes to deliver these to their clients (Ojugo, 2015). Thus, it has become imperative for web designers to build products aimed at satisfying users' quest, experience and interaction. Institutions today, employ rich web-based contents as means for high visibility, which will ultimately aid them to capitalize on profits and benefit by promoting their products in a competitive market. A good website can change, recreate and refocus a user's image of an organization (Kuzic et al., 2010). Designing such website is quite a daunting task that is rippled with many challenging feats such as navigation, contents, openness etc – all of which guides the users as they peruse a site's pages, to keep users' interest engaged and lead to satisfied users' experience, and knowledge as outcome its byproduct cum outcome (Weiderman & Mgidana, 2004).

The study about the navigation structure has been carried out in various dimensions. A study area termed web usage mining. The navigation pattern of a website as users visit the site is easily recorded in the web log file (Chevalier, Bothorel, & Curruble, 2003; Xing & Shen, 2004). Data housed within the web log file is only available to the site owners. Thus, such information is often difficult and costly to obtain for research purposes. However, if such evaluation is performed by third party intent of publishing comparative data between sites, full cooperation may not be given. These data may be unavailable also, for reasons of user privacy or confidentiality (Petricek, Escher, Cox, & Msthyryd, 2006; Escher, Margetts, Petricek, & Cox, 2006).

2. Classification of Website Evaluation Methods

2.1 Web Usability

Website usability aims to investigate the quality measure or degree of a user's experience and corresponding convenience while interacting with the site. Improving a website's usability dramatically help users gain great

knowledge. Critical analysis into the usability of a site can help designers and site owners also cut down the number of errors in their system delivery, improve precision, and support uplifting attitude in users etc (Agarwal & Venkatesh, 2002; Nielsen, 2000). Its adaptation in educational sites, help keep students engage to increase their learning experience, confidence and encourage them to use the site more (Lencastre & Chaves, 2008). Thus, it is best to define usability of a website from a user's standpoint.

Leavitt and Shneiderman (2014) defines 'usability' as the study of how productive, consistent, easy to use, efficient, organized, intuitive, and straightforward it is to accomplish tasks within a web-page via eased user navigation. Users often have expectations based on prior knowledge and past experience within same or similar website. Thus, has become imperative for designers to develop a synergic understanding of their users' expectations through task analyses and research. Studies have also shown that very often, users act on their own expectations even with onscreen indications to counter such expectations. Kaur and Dani (2011) notes it is thus, imperative to use familiar formatting and navigation schemes and themes, which makes it easier for users to remember and learn the layout of a site. It is best to assume that a certain percentage of users will not use a website frequently enough to learn to use it efficiently. So, it is best the designer uses familiar conventions that a user is accustomed to. This works best.

Web-designers create links to their sites and/or pages based on the relevance of its data-content and certain interests of their own. Very often, websites and pages are classified based on hyperlink relations and the site's structure. For example, if link www.xyz.com is a collection of pages under the journals section. They, all fall under a single unique class. It is often assumed that a user will preferably visit the next page, which belongs to the same class as that of the current page. Thus, developers must create a fine structured dominant links that point to pages that define a particular category. All the pages followed by that particular link remain in the same class. The pages are then further categorized into levels based on page ranks in the initial period and later, on frequency of users' access (Kleinberg, 1998). Also, many of the prediction models perform this based on history data or logs. Mukhopadhyay et al., (2011) provides prediction model that is not based on history data or logs; But, rather are built up using ranking of pages and dynamically updated as HTTP requests from the users arrive at the server.

The development of a system is a continuous process with an iterative life cycle of analysis, design, implementation, and testing. In analyzing websites, Stolz et al. (2005) distinguished between 3-basic measurements on: (a) structure (organization and navigation links), (b) usage (visit frequency, page view, sessions, unique users, and duration), and (c) contents. Toit and Bothma (2010) grouped the assessments pattern into user, evaluator, and tool-based user evaluation methods (UEMs). They further note a different view and focus on the evaluation methods with new categorization system based on the purpose and platforms of evaluation. They proposed the distinction as a measure limited to the number of websites based on assigned criteria to achieve high-quality website. Its manual evaluation includes experts user testing; while, the automatic assessments employ different software-testing tools. The output of such an evaluation is a list of usability problems and recommendations to improve the tested website. These classifications are further grouped into these methods below:

2.2 User-based UEM

The process of designing for usability, user testing, and redesign is a User-centered Design (Nielsen, 2003). Usability evaluation describes the entire test process from planning to conducting the evaluation and its result presenting. Its goal is to measure usability of a system and identify the associated problems that lead to user confusion, errors, or dissatisfaction (Papadopoulos & Xenox, 2008). User evaluation approach includes method where users execute some tasks on a selected system. Users' performance and satisfaction with the interface is recorded. The most common, valuable and useful method here is user-testing. Other suggested methods include field observation, think-aloud, questionnaires, and interviews further explained as below:

a) **User Testing:** As users navigate a system, they aim to accomplish specific goals. A goal is an abstract end-result or standpoint of what is to be achieved, and it is attained in numerous ways. Each goal breaks into tasks specifying what a person has to do, and each task decomposes into individual achievable step to be undertaken (Contel et al., 2010). User testing must be a sampling process, and users should be able to do basic tasks correctly and quickly (Zahran et al., 2014). Examiner selects tasks to be tested by exploring all tasks on the site, and highlights those that are most important to users. A good task discovers a usability problem, or reveals an error that is difficult to recover from as users navigate the site. The examiner then sought how to present selected tasks to participants. A way to do this is to use a "scenario" in which the task is embedded in a realistic story. A good scenario is short, in the users' words, and directly linked to the user's everyday tasks and concerns.

It does not give the steps for doing the task, since the point of the test is to see if a user can figure out the required steps alone. It is important to test users individually and let them solve problems on their own. Actually, the purpose of a usability study is to test the system and not the users, and this aspect must be explicitly explained to tested users (Nielsen, 2003; Contel et al., 2010). The following metrics can be collected from user testing: time for users to learn a specific function, speed of task performance, type and rate of users' errors, user retention of commands, and user satisfaction (Astani & Elhindi, 2008; Bjomeborn & Ingwersen, 2004). Moreover, how many participants to include in a user testing is a major issue in the usability field. Usually, three to five participants are needed to see all the potential usability problems. Nielsen confirmed that the best results come from the first five users and that roughly 85% of the usability problems in a product are detected with five participants.

b) Think-aloud Method: Nielsen (2012) posits that thinking aloud is single most valuable usability evaluation method – which involves an end user using the system while thinking out loud. By verbalizing their thoughts, the test users enable us to understand how they view or interpret the system and what parts of the dialogue cause problems. Its strength lies in the wealth of collected qualitative data that can be obtained from small number of users. The users' comments can be included in the test report to make it more informative. However, to some extent, thinking aloud seems an unnatural setting for users, and sometimes it may give a false impression of the actual cause of usability problems if too much weight is given to the users' justifications (Nielsen, 2000).

2.3 Evaluator-based Usability Evaluation Methods

Evaluators or experts inspect the interface and assess system usability using interface guidelines, design standards, users' tasks, or their own knowledge, depending on the method, to find possible user problems (Kanter & Rosenbaum, 1997). The inspectors can be usability specialists or designers and engineers with special expertise (Gonzalez et al., 2008). In this category, there are many inspection methods, such as cognitive walkthrough, guideline reviews, standard inspection, and heuristic evaluation (Thelwall, 2009).

2.4 Heuristic Evaluation

Heuristic evaluation is a very efficient usability engineering method, and it is especially valuable when time and resources are scarce. A number of evaluators assess the application and judge whether it conforms to a list of usability principles or heuristics (Hasan, 2009). Nielsen's heuristics are part of the so-called "discount usability methods" which are easy, fast, and inexpensive. During heuristic evaluation, each evaluator goes individually through the system interface at least twice, and the output of such evaluation is a list of usability problems with reference to the violated heuristics (Matera et al., 2006). In principle, heuristic evaluation can be conducted by only one evaluator, who can find 35% of usability problems (Nielsen, 2003), but another view by Matera et al. (2006) believes that better results are obtained by having five evaluators and certainly not fewer than three for reasonable results.

2.5 Automatic Website Evaluation Tools

Automatic evaluation tools are software to automate collection of interface usage data and identify potential web problems. The first study of automatic tools was by Ivory and Chevalier (2002). They conclude that more research is needed to validate the embedded guidelines and to make the tools usable. Thus, professionals cannot rely on these alone to improve websites. Brajnik (2004b) notes that several kinds of Web-testing tools include: accessibility tools (e.g. Bobby), usability tools (e.g. LIFT), performance tools (TOPAZ), security tools (e.g. WebCPO) and classifying website tools such as WebTango. He stated that adoption of tools is limited, due to the absence of established methods for their comparison. Thus, he suggests that the effectiveness of automatic tools must be evaluated too (2004a). Many automated tools are available either as web-based services or applications. A popular free Web-based accessibility tool is Cynthia Says (www.cynthiasays.com) – a product of HiSoftware that allows you to enter the URL to be analyzed in to the sight and get a report on how it complies with Section 508 standards and/or the Web Content Accessibility Guidelines (WCAG).

3. Materials and Methods

3.1 Research Instruments/Design Criteria

From the Usability guidelines that are based on the criteria of Expert Review guidelines for evaluating educational sites available in userfocus.co.uk/resources/guidelines.html, we choose to scores the website in focus based on these selected criteria namely:

a) Design Process Evaluation – relates to visual display and attractiveness of a site. The use of appropriate design of a website's pages, and the appropriate use of images, fonts and colors in the design of a site. It also

includes the aesthetic design, appropriate use of images, choice of fonts, choice of colors, page design and its consistency.

- b) Architecture relates to the structure of the website's data and how it is divided into logical, clear groups – such that each group is associated with its related information. The logical structure of a website is such that there is no deep architecture; But, simple navigation menus to aid users through the pages and documents in the website.
- c) Hardware/Software (HW/SW) needs describes the design of the website considering the browsers on which it is to be run as well as considering the device platform in terms of portability, mobility, speed, operating system etc.
- d) Navigation relates and assesses if a site include tools such as navigational menus, internal search facility; And, if these links help facilitate a user's effective navigation around the pages of a website. It thus provides navigation support, effective internal search, working links, no broken links, no orphaned pages.
- e) Homepage relates to the nature of the page tagged homes, its aesthetic design, colour choice and the user's ability to navigate through the pages of the website. Also, users should be able to easily differentiate the homepage from other pages of the website. Other necessary characteristics includes its being easily perceived as homepage via the use of effective menus and action buttons, search option such that users experience satisfaction with just 1-click of the homepage from their desired information.
- f) Credibility relates to data contents housed in the pages of the website being authenticated by renowned personnel.
- g) Help, Search and Error tolerance – relates to the user being able to place requests for data, not really navigating the entire pages and documents on the website in order to safely acquire the desired information. It usually includes the introduction of a search option (on the homepage) that can return the desired values (information) appropriately to the user.
- h) Content quality relates to authenticated research, teaching, employability (from the student's perspective) and an international outlook. These also refers to the various citations, references to scholarly journals, staff profile outlook amongst others.

There are about 123-rules in the checklist that is scored to evaluate a website's usability. These were used in developing and deploying a 5-likert format questionnaire for the study. It will guide both experts and non-experts in observance of the website along with filling out the questionnaire. A total of 40 participants were involved in the data collection chosen from ten (10) departments in FUPRE.

3.2 Selected Websites

Academic institutions were amongst the early developers of websites to present themselves on the Internet (Astani & Elhindi, 2008; Sandvig & Bajwa, 2004; Peterson, 2006). However, the aim of their websites differed over time due to technological advances, and the increasing number of Internet users. The site in focus is the Federal University of Petroleum Resources Effurun website with the uniform resource locator (URL) at www.fupre.edu.ng.

3.3 Study Objectives

- a) Employ usability expert review guidelines to evaluate the FUPRE website.
- b) Display individual result for the website's criteria.

4. Result Findings and Discussion

4.1 Overall Performance

At the start of this study, the case study in focus (i.e. Federal University of Petroleum Resources Effurun) was ranked via www.webometrics.info at 12009 in (December 2016) and 58 on the Nigerian front; While, at the completion of this study (May 2017) – it is ranked 12015 (on RWU) and 62 on the Nigerian front. Table 3 shows overall score of some websites.

Table 1. Overall relative score of some selected universities

RWU (World University Ranking)	Nigeria Ranking	University	University Name (Abbreviated)	Relative Score (0 -1)
1335	1	UI		0.87615
1788	2	Covenant		0.86322
1986	3	OAU		0.82891
2613	4	UniLag		0.80720
2652	5	UNN		0.79818
2840	6	UniPort		0.77332
2914	7	UNAAB		0.76201
12015	62	FUPRE		0.284901

Data obtained both from the webmaster and the web server log data file are expressed in Figures 1, 2 and 3.

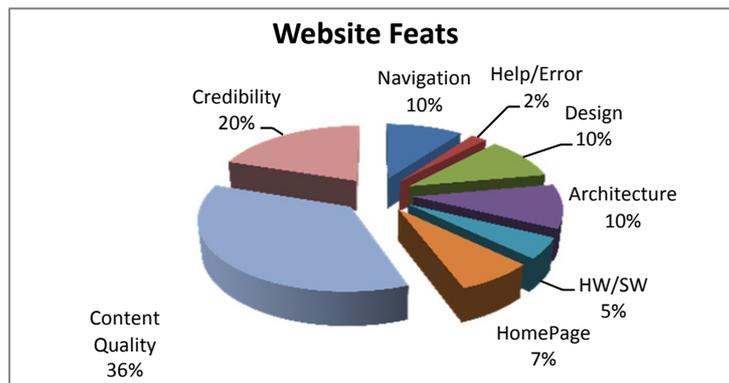


Figure 1. Overall website usability for fupre

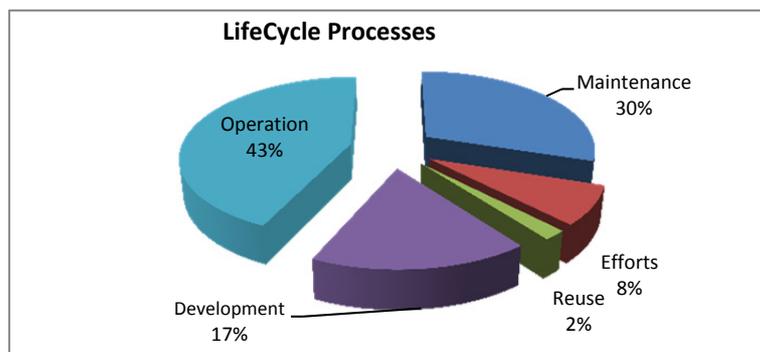


Figure 2. The fupre website lifecycle development process

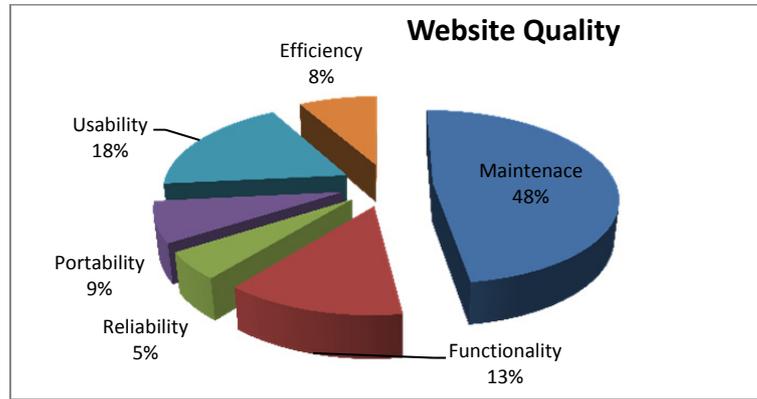


Figure 3. Quality feats for the FUPRE website

Table 2. List design process usability attributes

Design Process Evaluation	SD	D	U	A	SA
a. Does web-page meet concise set goals and also includes the success rate and time it takes users to find specific information on the page?	21	15	2	2	0
b. Does web-page provide useful contents that are engaging, relevant and appropriate for the target audience?	21	18	0	1	0
c. Does the page improve your performance as a user?	15	22	1	2	0
d. Do you think all necessary resources that can improve user experience were consulted in the deliverables of this web-page?	0	26	0	13	1
e. Does page format meet your expectation as regards navigation, content and organization?	0	26	2	8	4
f. Does the page employ a User-centered design by involving users to improve completeness and accuracy?	10	10	3	7	10
g. Is this site easily found amongst the top 30 references presented from a major search engine?	0	9	3	12	16

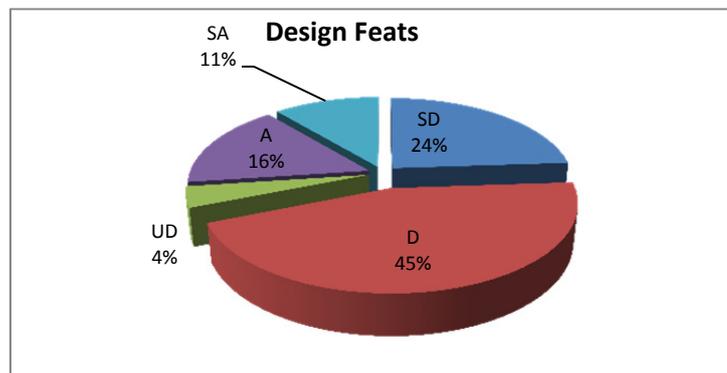


Figure 4. Design usability feats

Figure 4 shows 45% of participants disagree that the design feats meet the required website usability criteria level that will aid user experience satisfaction and convenience as the user navigates the website.

Table 3. Trust and credibility section usability attributes

Trust and Credibility	SD	D	U	A	SA
a. Is data up-to-date to increase site's credibility and rich content?	0	6	0	22	2
b. Are tasks standardized, performed by users in the same sequence and manner across similar conditions?	0	5	7	23	5
c. Does site reduce users' workload via functions to perform tasks?	2	16	1	19	2
d. Does flow-screen request users to remember data from page to page?	1	10	19	4	6
e. Page is easily readable and in printable format.	0	7	0	23	10
f. Does page have feedbacks as the user waits for task to complete?	2	6	10	19	3
g. Does page require users to multitask while reading the page?	0	15	0	22	3
h. Does page have useful assistance to users as they navigate the page?	0	7	0	23	10

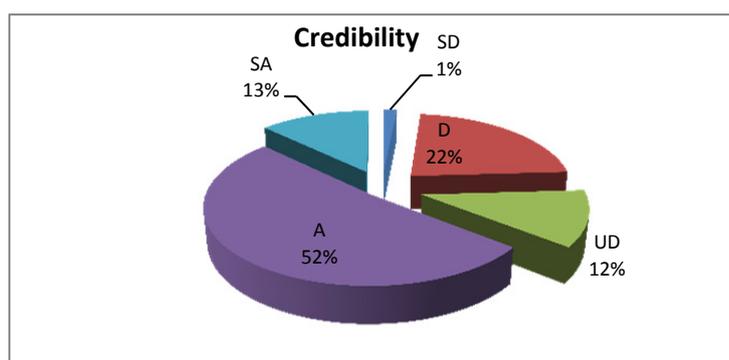


Figure 5. Trust and credibility usability section

Figure 5 shows that 52% of participants agree that the website meets the credibility usability criteria as information retrieved from the website is up-to-date and can be trusted.

Table 4. Navigation section usability attributes

Navigation	SA	A	U	D	SD
a. Page has needed navigation option	0	3	1	23	13
b. Does site have enough feedbacks to indicate user's location on the site via the use of site maps?	0	2	0	27	11
c. Site has primary navigation menus placed on the left – making it quite similar to other related sites.	0	0	0	32	8
d. Menu tabs are well represented via descriptive labels?	0	0	1	31	8
e. Are the menus appropriate for the site cum pages therein?	0	5	5	30	0
f. Users cannot navigate effectively with breadcrumbs. Thus, site uses glosses to provide data as users place mouse over menu	1	9	0	28	2

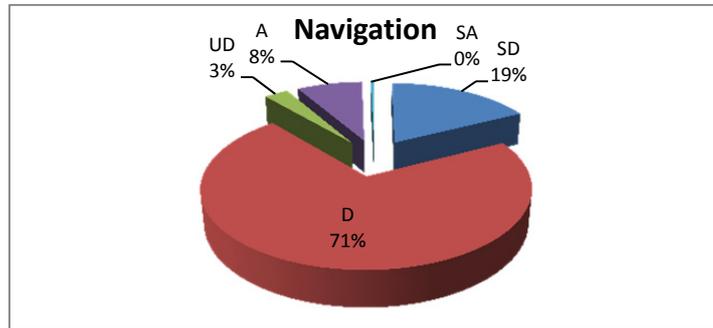


Figure 6. Navigation criteria

Figure 6 shows 71% of participants disagrees that the site meets the navigation criteria to guarantee an increased level of user satisfaction as the user goes through the pages of the website.

Table 5. HW/SW section usability attributes

Hardware and Software Needs	SA	A	U	D	SD
a. Page designed for common browsers?	9	20	0	10	0
b. Does page account for differences in the browser architecture?	9	20	0	10	0
c. Is page adaptable to most popular OS and portable devices	12	9	0	19	0
d. Does page account for commonly used resolutions?	12	7	0	20	1
e. Does each page or document account for typical (user) connection speed?	10	1	2	26	1
f. Site accounts for portability, ease of use, mobility & migration in porting site between various browser platforms	10	8	1	20	1

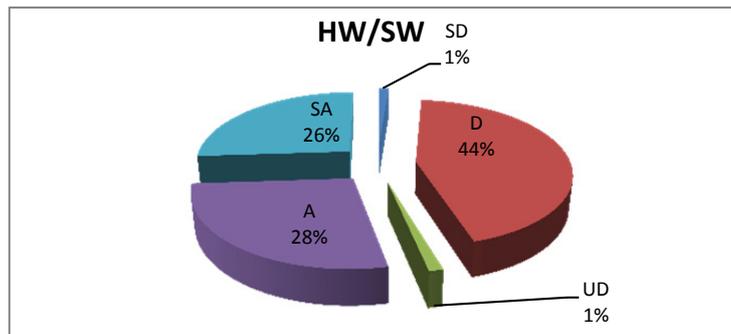


Figure 7. Hardware and software needs section

Figure 7 shows that 44% of participants disagrees that site meets the Hardware and Software (HW/SW) needs section criteria.

Table 6. Architecture and Organization

Architecture and Organization	SA	A	U	D	SD
a. Tasks form has of assistive technologies?	0	4	2	30	4
b. Page allows users to skip repetitive some or all navigation links	2	7	0	25	6
c. Page provides equivalent text for graphic elements?	2	9	1	24	4
d. Plug-Ins and applets for access to links function properly	13	9	0	18	0

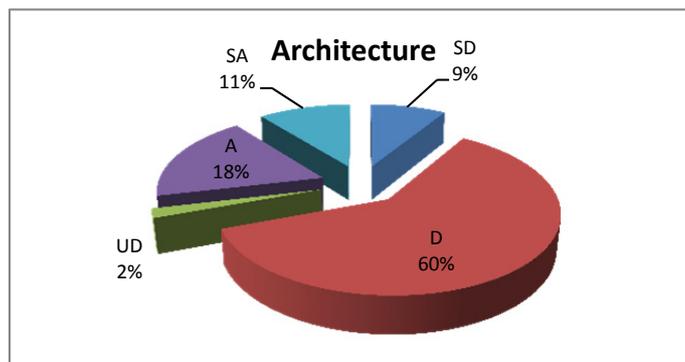


Figure 8. Architecture

Figure 8 shows 60% of participants disagrees that the site meets the architecture and organization criteria that guarantees for an increased level of user satisfaction as the user goes through the pages of the website.

5. Recommendations / Conclusion

5.1 Summary

The place and importance of FUPRE as a frontier trainer and developer of manpower in the Oil and Gas Sector of Nigeria, Africa and the World cannot be overestimated. It is imperative thus, to first make known usability criteria to all FUPRE staff and students as a means to promote the university's position among other universities as well as to enhance FUPRE's web site quality and usability. To achieve this goal, it is necessary to motivate staff and authorities to have a web presence that reflect accurately their activities so as to promote the position of the university both in university ranking and webometrics ranking also.

5.2 Recommendations

a) To ensure high credibility, a website's pages: (a) provide useful FAQ with answers, (b) logical arrangement of the website, (c) pages not more than 1-click from homepage, (d) articles with citations and references, (e) display its author's credentials, (f) up-to-date pages, (g) archive and repositories of past content, (h) looks professionally designed, (i) have links to outside sources and materials useful to users, and (j) ensure site is frequently linked to by other credible sites.

b) Pages should focus on user performance more; Rather, than preference. This implies that if user performance is of utmost importance, then the designers and developers should make content (data contained therein), its format, user interaction and navigation is far more important than deciding which color themes and decorative graphic to employ.

c) Use of meta-content and page titles, the number of links to the website and updated registration with major search engine. Example of a meta-content for can includes:

```
<meta name="description" content="The Official Website of the Federal University of Petroleum Resources Effurun, Delta State in Nigeria">
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<meta name="title" content="Federal University of Petroleum Resources Effurun">
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<meta name="subject" content="Federal University of Petroleum Resources Effurun, FUPRE, F.U.P.R.E., Petroleum Varsity, Petroleum University, Intelligence, Computer Science, Mathematics, Electrical and Electronics Engineering, Marine Engineering, jobs in Nigeria/Africa, great careers etc">
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d) Most users spend a considerable amount of time scanning through the page rather than reading. Thus,

well-designed headings can help facilitate both scanning and reading written materials. Designers should also use descriptive headings as necessary to enable users find what they are looking for. Thus, we can have more headings as possible rather than scanty through: (a) effective categorization of labels, (b) unique and descriptive page titles, (c) highlight critical information, and (d) provide users a great way to reduce options as they peruse through your pages. Also provide meaningful links and links to related contents on the site. Also avoid misleading cues to click (i.e. ensuring that items that are not clickable do not suggest the ability to be clicked to users). Ensure to use pointing/clicking. Indicate and differentiate internal from external links.

e) Text coloration and casing should be adhered to ensure visual consistency. Use bold text only when important to draw user's attention to specific information. Use familiar fonts and use color coding to help users accomplish tasks faster. Use formatted lists to order the elements for easy scanning.

f) Pages should use screen-based controls (or widgets) that users are familiar with. Also, minimize user-data entry. Anticipate typical user errors.

5.3 Conclusion

Websites now play prominent roles in education and training as millions of users visit them, searching for relevant data to meet their various research needs. The FUPRE website also plays key role in the interaction between students, instructors, other staff and administration. The emergence and challenges in university ranking has made usability an imperative study in the qualitative assessment – since, the quality of university's website influences its whole ranking. Its primary aim is to help students make informed comparative choice about their local and/or international studies. The ranking compares universities across 4-broad areas of interest to a prospective student: teaching, research, employability and international outlook.

These 4-areas are assessed using 4-indicators, each of which has a different percentage weight. Some indicators are based on 'hard' data; while, others are based on major global survey. These include: (a) Academic reputation (40%), (b) Employer reputation (10%), (c) Student-faculty ratio (20%), (d) Citations per faculty (20%), (e) International faculty ratio (5%), and (f) International student ratio (5%).

Web presence is a trustworthy mirror, which avails us of its positive and direct relevance to a university ranking. The university that wishes to improve its position must enrich her website. This importance is seen both in university ranking criteria and website ranking, because there are both direct and indirect relevance between these two items.

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