EVALUATING THE USABILITY OF THREE OF THE LOWERMOST KRG/IRAQ UNIVERSITY WEBSITES IN WEBOMETRICS BASED ON USER PERSPECTIVE

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ABSTRACT:

In the higher education sector, web based facilities perform a vital aspect to offer success of an academic institution, due to the users depend on the universities websites to achieve different academic instructions. Simultaneously, users may face many usability difficulties while having access to the websites. For that reason, this research investigates user based testing and questionnaires methods from user perspective to evaluate three of lowermost university websites in KRG/Iraq according to Ranking Web of Universities (webometrics); university of Raparin, university of Garmian, and university of Halabja. Thirty participants contribute to implementing six tasks of user-based methods and ten questions of questionnaire approach. Based on the analysing process, the accuracy of universities websites are; 86.7%, 79.5%, and 61.1% for each University of Raparin, University of Halabja, and University of Garmian respectively. Moreover, user satisfaction for the University of Raparin is 3.59, while 3.24 and 3.01 are the rates of satisfaction for University of Halabja and University of Garmian.

KEYWORDS: Usability, Websites Usability, User Satisfaction, User Testing, Questionnaire, Usability criteria, and Website Evaluation.

1. INTRODUCTION

The Internet technology has been significantly enhanced in the past decade, the classical method to achieve information and sharing data has been decreased. The web technology became an alternative to traditional methods to organise communication from different areas. The website also provides delivery services that can help users to achieve requirements (Mentes et al, 2012)[1].

Enhancing web technology promotes developing communication facilities in variant society environments such as business sector, broadcast media, and academic sector. University website is the common type of Academic website to communicate among university staff and students (Jabar et al, 2014.)[2]. The crucial point to assessment websites is having proper usability measurement for obtaining information and executing several tasks on the website (Yusof et al, 2010)[3].

Usability was described by variant terminology; in a simple form, different users can be able to practice variant tasks in particular user interface easily and effectively (Shackel, 2009)[4]. In the web technology aspect; user could interact with the website to achieve wide-ranging information by using different types of web browser tools safely and efficiently (Zaphiris, and Ellis, 2001)[5].

Perspective of a web designer and developer is not sufficient to construct a website with perfect usability technology. Moreover, user-testing methods, evaluator-based methods, and tool-based methods are three techniques to evaluate educational websites based on usability criteria (Chiew & Salim, 2003)[6]. Generally, User-based methods (user-testing methods) are described as techniques, which consist of using several methods in a process of determining usability issues. The main purpose of these techniques is recording user performance and user satisfactions with specific user interfaces. Though user-testing methods have been used to present usability problems to users, they are not being able to use as the most efficient testing techniques if there are money and time restrictions. For that reason, using evaluator-based

methods is a suitable solution for both of these constraints, also it may discover those issues that are not illustrated with few users testing. A simple example of using evaluator-based methods is "heuristic" evaluation, it involves a number of evaluators measuring user interface and assessor acceptance to a number of usability concepts (Nielsen J, 1994)[7]. In the other term, Software tools is used to determine usability problems in tool-based methods, then it evaluates the capability of the website to confirm these usability guidelines (Caglar, & Mentes, 2012)[8].

Usability is considered as an evaluation feature that decides how users successfully use a website. As clarified by ISO 9241-11, it is "the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO, 1998)[9]. Using user interface easily or difficulty is the basic measurement to count as the success or failures website. Currently, after the challenge of coronavirus disease in 2019 (COVID-19), most of the higher educational institutes have planned to continue online education via their university websites (Muhammad, et al, 2021)[10]. So, decreasing the usability difficulties assists universities to achieve their goals perfectly even outside of the university campus.

1.1 Project Aim and Objective:

The aim of the proposed study is to measure the usability of three of lower KRG/Iraq universities on international webometrics websites from the user perspective through the six tasks and three web categories that consist of ten practical questions. Moreover, the purpose of selecting these three websites is, these universities are called the new developing universities which they established in the last decade in Kurdistan Region government. Moreover, they would like to know the weak points and what are the procedure to progress their level based on the real studies. The main utilise usability factors are indicated through the accuracy, time consuming, and user satisfaction. The outcome of this study is a significant result to afford direction for enhancing a better and more practical platform not only for these three universities even for the public and private universities in Iraq.

1.2 Related Work

Usability testing technique is the crucial method to evaluate user based system to determine performance and functionalities of the systems. From that point of view, several studies in the area of usability of educational institutes websites are demonstrated through using variant kinds of usability methods. Weiqi and Wang evaluated Lund University website depending on the point of experts' view through using heuristic evaluations, recommendations illustrated to enhance the website's usability (Weiqi and Wang, 2009)[11]. Similarly, heuristic evaluations were used to evaluate the Hellenic Open University website and Saudi Arabia universities' website (Kostaras and Xenos, 2007)[12] (Alotaibi, 2013)[13]. Other scholars have applied heuristic evaluations such as Luis et al; using data mining techniques to evaluate 24 University websites through a special tool known as Prometheus to present usability evaluation. The outcome of this study was used to restructure and redesign the websites base on usability standards (Luis, C.E., 2017)[14]. SortSite tool is used to assess the usability and accessibility of ten public Nigerian university websites randomly, and the output of evaluation presented that usability and accessibility guidelines were not available properly. So, redesigning such types of websites was recommended to reduce usability difficulties inside the content of the university websites (Fortune, 2018)[15].

Muhammad, A. et al (2021)[10] classified several factors based on priority to evaluate five university websites, authors also used validate framework with the fuzzy analytic hierarchy process (FAHP) methodology to identify real usability problems, which are in higher educational institutes (HEIs) websites. Moreover, analytic hierarchy process (AHP) is used to make a decision on usability issues; also both of qualitative, quantitative comparison parallel with other unsure reasons participated in this process (Erkan, 2014)[16]. Other researchers used web based tools depending on three measurements; Content of information, loading time and overall performance, to evaluate the context of universities of Bangladesh website. Beside this, authors provide comparative analysis amongst university platforms to create a ranking list based on the survey result (Rashida, M., 2021)[17].

Most of the researchers use questionnaire techniques to evaluate usability of the websites; Chiew and Salim organise a usability questionnaire including 24 evaluation questions that are implemented as a Web-based tool. The outcome of the research illustrated positive and negative aspects of the website usability (Chiew, T. K., & Salim, S. S., 2003)[6].

Three common university platforms went through two evaluation techniques; performance based and questionnaire method, the statistical rate result of accessibility and usability of these websites were acceptable (Sharmistha Roy et al, 2014)[18]. University of Putra Malaysia (UPM) website was evaluated by five usability factors under the name of; efficiency, learnability, attractiveness, controllability, and helpfulness, in a form of questionnaire technique. The result shows controllability, helpfulness, and efficiency was suitable, while attractiveness and learnability of the website was poor (Marzanah, A.J., 2013)[19]. In another study, 293 students participated in 20 questions of evaluation questionnaires to assess the website of the European University of Lefke depending on WAMMI (Caglar, E., & S.A. Mentes, 2012)[8]. However, previous research focused on human judgement through the questionnaires; in fact, the usability problems cannot be solved entirely via a simple guideline based on questionnaires. Because usability is recognized as multi-criteria decision-making (MCDM) issue, and to achieve the content of these problems, researchers should scrutinise criteria and factors. The common MCDM methods are analytical network process (ANP), analytic hierarchy process (AHP), preference ranking organisation method for enrichment evaluation (PROMETHEE), technique for order performance by similarity to ideal solution (TOPSIS), data envelopment analysis (DEA), and grey relation analysis (GRA) (Li and Sun, 2020)[20] (Agarwal, P. et al, 2011)[21]. Moreover, Wahyuningrum, et al (2017) emphasised that the quality performance of websites can be determined by MCDM criteria's. Two algorithms; linear weightage model (LWM) and simple additive weighting (SAW) are suggested. Load time, traffic, stickiness, page rank, and backlink are the usability tasks used in the evaluating university websites ranking (Wahyuningrum, T. et al, 2017)[22].

1.3 Research Contributions

In the last decade, Internet technology has developed dramatically in the form of browsing for information through efficient websites, and usability evaluation methods are the crucial criteria to assess website performance. As it is mentioned in "Related Work", there are many researchers who use usability techniques to evaluate educational websites. However, one of the ranking measurements in National University Ranking (NUR) for universities of KRG/Iraq is the evaluation of webometrics website for higher educational institutes (HEIs) platforms. There is no research that identifies the low position of university websites in "Ranking Web of Universities (webometrics)". In addition, there are lots of usability methods that are used to detect weak points of user interface of university websites; user based method and questionnaire techniques are used to evaluate the three of the lowermost university websites in webometrics in KRG/Iraq.

The outstanding section of the research is organised as follows. Section 2 contains methodology which includes user based methods and questionnaire techniques in detail. Section 3 consists of "Results and Discussion", and finally, conclusions and future work are described in Section 4.

2. METHODOLOGY AND MATERIAL

The proposed research selected user-based methods and questionnaires techniques through several steps to achieve the main aim and objective of the paper, which is the assessment and illustration measurement of three university websites in KRG/Iraq. The selected websites based on the position on webometrics international website, have low ranking in among public universities' websites in KRG/Iraq. The universities are; University of Raparin, University of Garmian, and University of Halabja.

Regarding to usability assessment, the technique has been used to achieve the measurable data about user experimentation when they completed the tasks through usability assessment. Initially, several of arranged tasks was performed to the users. Generally, usability testing was measured by the time that users require to implement a particular task.

The proposed metrics which are determined to achieved the results during the evaluation are successful task completion (in second), leave task, and average time for tasks as clarify below:

- The time (X): $X_n <= 180$ seconds that user complete task.
- The time (Y): $Y_n > 180$ seconds that user leave task.
- The average time = $X_{n1}+X_{n2}+X_{n3}…./Count(X_n)$
- The error (not completed) task= assume $Y_n=1$, then $Y_{n1}+Y_{n2}+Y_{n3}…..$

In addition, Camtasia and Snagit software were used to record users' screen during user based test for those users were tested online. Also SPSS and MS-Excel were used to analysis the data for both user based methods and questioner technique.

In this section, block diagram of the proposed system will be illustrated in detail based on the methodologies and statistical analysis. A block diagram of the system is shown in Figure 1.
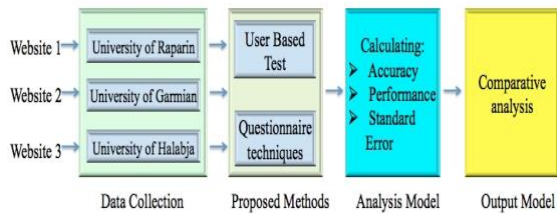
Figure 1: Block diagram of Proposed System.

2.1 User based method

User testing methods were used to evaluate all three websites based on six usability tasks. Tasks related to variant sectors of the universities' websites, which they are associated with each other, and visiting these parts of the websites have a significant impact on location of the websites on webometrics. To achieve the reasonable result in this method, direct interview is applied and online implementation were used as observations technique, and also recording time and taking notes were applied to capture performance data. The all action tasks were optimised for each of the three universities' websites, as presented in Table 1.

Table 1: Task scenarios for the three Universities' websites

Task No.	Tasks Scenario
Task 1	As a user you want to have access to the Portal of the university website or Classroom, to download and upload materials, you have to find the index which is correlated to that functionalities. In a short form (Having access to the Portal index or Classroom).
Task 2	As a user you have to attend and check the student feedback process through the university websites, you have to find the index which is correlated to that process. In a short form (Having access to student feedback process)
Task 3	As a user you want to find/read information about specific member of Academic Staff of college of science. In a short form (Finding Academic Staff of college of science)
Task 4	As a user you want to find/read information about Computer Science Department in the university websites. In a short form (Finding information about Computer Science Department)
Task 5	You are interested in publishing a paper in the journal of the university for that purpose you have to find the journal template and author guideline of the journal. In a short form (Finding Journal template PDF or MS Word or author guideline)
Task 6	As the visitor of the website you are looking for finding information about director of Career Development Center in the university websites. In a short form (Who is the director of Career Development Center (CDC))

Thirty users participated to execute tasks for each university website that indicates performance of the websites. During executing the tasks, all participants were encouraged to express their opinions about the process and the validation of the decision. Moreover, authorising time to complete each task is three minutes; otherwise, participant users have to move to the next task.

2.2 Questionnaire technique

After completing user-based testing, a post-test questionnaire technique was provided to measure satisfaction of the uses. Furthermore, satisfaction is indicated by selecting five points from poor satisfaction (1) to strong satisfaction (5) that are known as Likert scale. The questionnaire outline consists of ten questions in three different categories of web technology objects as shown in table 2.

Table 2: Common usability issues on websites from user's perspective.

Category No.	Category issue	Question No.	Questions
CAT 1	Navigation bar	Q1	Using a different dropdown button on the navigation bar without getting lost.
		Q2	Redirecting to the home page index from any author pages of the website easily.
		Q3	Having tough Search engine optimization (SEO)
		Q4	The anchor tags of the website are working perfectly.
CAT 2	Client side architecture and design	Q5	Using simple structure for reorganising objects layout.
		Q6	Having access for the required information directly
		Q7	The user interface of the website is attractive for the user
		Q8	The font formatting of the text quite well and make the website readable
CAT 3	Content of the website	Q9	The presented information is up-to-date and relevant to user requirement accurately
		Q10	Acceptable and strong-shared information about the university colleges and departments was demonstrated

The questionnaire evaluation methods were used to identify and analyse the above usability problems, which derived from users' point of view, to achieve user satisfaction criteria. The same user based methods participated were involved in the questionnaires evaluation methods for evaluating the three universities websites and indicating their usability issues based on navigation bar, organisation and design, and Content of the websites.

achieved data is collected from different users, which they have enough experience in computer background and web browsing techniques. Participants who answered questionnaires; they were gathering experience from the user based methods, which is the first step of evaluating process. Moreover, user-based data analysed through different criteria to reach performance and quite accuracy based on response, average of performing time (in seconds), standard deviation (STD), and standard error (SE) for each task across the three universities as presented Table 3.

3. RESULT AND DISCUSSION

The proposed research obtained a reasonable result from both user based methods and questionnaire techniques. The

$$\text{Accuracy (Effectiveness)} = \frac{No.\ users\ completed\ tasks\ successfully}{Total\ numbers\ of\ Users} * 100 \quad \text{.......(1)}$$

$$\text{Standard Deviation (STD)} = \sqrt{\frac{\sum_{n-1}^{n}(x-\bar{x})^2}{n-1}} \quad \text{.......................(2)}$$

Where:
n = The number of data points
$\underline{x}$ = The average of x_i
x_i = Each of the value of the data

$$\text{Standard Error (SE)} = \frac{STD}{\sqrt{n}} \quad \text{...............................(3)}$$

Table 3 shows the accuracy and spending time for each task across the three universities websites paralleled with standard deviation (STD), and standard error (SE)

Tasks No.	Task scenario for each University											
	University of Raparin				University of Garmian				University of Halabja			
	Accuracy	Avg. Time	STD	SE	Accuracy	Avg. Time	STD	SE	Accuracy	Avg. Time	STD	SE
Task 1	83.3%	40.1	45.36	9.07	46.7%	47.4	43.01	11.49	86.7%	34.2	56.24	11.03
Task 2	90%	14	19.45	3.74	6.7%	57	16.97	12	60%	83.8	40.85	9.63
Task 3	96.7%	25.9	17.76	3.3	70%	61	48.36	10.55	83.3%	50.2	33.56	6.71
Task 4	70%	60.4	42.41	9.25	90%	34	32.73	6.3	86.7%	23.7	16.3	3.2
Task 5	93.3%	42.3	21.11	3.99	53.3%	66.2	49.7	12.43	86.7%	56	45.44	8.91
Task 6	86.7%	67.4	53.21	6.91	100%	31.8	29.94	5.47	73.3%	48.5	28.3	6.03
AVG.	86.7%	41.7			61.1%	49.6			79.5%	49.4		

According to the data in Table 3; all tasks were challenging to perform successfully within time limit that was three minutes (180 seconds). However, accuracy rate for each six tasks in University of Raparin are between 70% and 96.7%; the rate of accuracy in University of Halabja are between 60% and 86.7%. The highest and lowest accuracy are recorded in University of Garmian in task 6 with 100% and 6.7% for task 2.

Regarding time consumption, the lower time average to perform the tasks is 41.7 seconds on the website of the University of Raparin, while, university of Garmian requires 49.6 second. Whereas, users suffer difficulties in completing task 2 in the website of University of Garmian. Task 2 required 14 seconds on the website of the University of Raparin and 83.8 seconds on the website of the University of Halabja that is the lowest and highest time to perform tasks.

Additionally, the second step that has been done after user-based methods is questionnaire techniques to present user satisfaction for each category of questions across the three universities as presented in Table 4.

Table 4 shows the user satisfaction across each question for the three universities websites

Questions	User satisfaction for each category questions across universities					
	University of Raparin		University of Garmian		University of Halabja	
	Avg. Sat	STD	Avg. Sat	STD	Avg. Sat	STD
Q1	4.03	0.89	3.07	1.05	3.47	0.94
Q2	3.20	1.16	3.13	1.17	3.33	1.24
Q3	3.13	1.04	2.77	1.10	2.83	1.05
Q4	3.83	1.09	3.17	1.21	3.57	1.07
Q5	3.70	1.18	2.73	0.94	3.40	1.07
Q6	3.67	0.88	2.83	1.05	2.93	1.01
Q7	3.77	0.63	2.90	0.99	2.93	1.05
Q8	3.93	0.83	2.90	0.96	3.63	0.96
Q9	3.27	1.05	3.33	0.92	3.33	1.27
Q10	3.37	1.16	3.27	1.08	2.97	1.19
Average	3.59		3.01		3.24	

The collected data from the questionnaires in table 4, were gathered from the users' perspective. The participants respond to each question after understanding and navigating through the three websites practically. The data is the result of analysing processes by calculating the average of the thirty users' answers.

According to table 4, users determined the website of the University of Raparin has the most user satisfaction compared to two other websites. In comparison, the satisfaction of the University of Halabja website is 3.24 that is 0.23 more than the satisfaction of the website of University of Garmian. Additionally, users expressed that Q1 (Using dropdown menu without getting lost) has the most satisfying usability on the website of University of Raparin, which is 4.03, while 2.73 is usability satisfaction for Q5 (Simple structure and reorganising objects) on University of Garmin website. Simultaneously, the rate of satisfaction for Q9 (Information is up-to-date) is almost the same, that is approximately 3.30.

On the report of standard deviation (STD) and standard error (SE), there is a huge variety among STDs and SEs of every task and question as it is identified in table 3 and table 4. Obviously, the lower rate of the STD means more closely values together. Contrariwise, the higher value of STD indicates more spread out of data in the dataset.

The results of table 4 indicate that the client side architecture and design category of the University of Raparin website has agreement results, for that reason, it has respectable usability testing. Whilst, the factor of poor usability of university of Garmian website comes from deficiency of client side architecture and design category. In addition, the results obtained from the three categories of questionnaires in the University of Halabja website are nearly equivalent. Consequently, its result of usability testing is placed between the other two websites. Generally, the results indicate that the majority of the users have the same satisfaction with the usability of the content of the three websites.

According to "Ranking Web of Universities (webometrics)" (Webometrics, 2022)[23]; the Iraq university ranking of university of (Raparin, Garmian, and Halabja) websites are 47, 48, and 68. While, 10668, 11311, and 16682 are the order of world ranking of the tree websites respectively. The Webometrics Rank of a university show that "there are strongly linked to the volume and quality of the contents it publishes on the Web" and 50% of weight of ranking calculation indicators belong to visibility of Web Contents Impact. (Webometrics, 2022)[23]. The result of the proposed study show that poor content of the website has impact on the usability score. While, both methods' results show that the website of University of Raparin is reasonably easy to use. However, there are still numerous usability issues that require to be fixed, particularly in case of sharing and updating information in content of the website. In the light of analysing data all the three websites require completely redesign usability to improve content and rising up ranking in Webometrics.

4. CONCLUSION AND FUTURE WORK

The proposed study provides experimental evidence for usability evaluation of three academic websites. The outcome determines the difficulties and strengths of each website based on a special aspect of usability tasks and criteria in user perspective, which is a useful guideline for web developers to improve usability of the websites. Using two accurate evaluation approaches assessed the websites; user based test and questionnaire techniques. Based on the procedure of assessment used, the reasonable outcome achieved from both methods. From the user perspective, the University of Raparin website has a higher position in having respectable usability. While, University of Garmian contains a lot of factors to

determine poor usability. Finally, the proposed research can help to identify weak points of three academic websites in KRG/Iraq with respect to usability; web developers can enhance the website design to provide significant usability.

In the future, using different techniques, increasing the number of tasks, adding more participants, gathering users' perspectives and contributing web developer experts are the main ways to improve the usability capacity of the user interface. Even implementing research with the above feature becomes an interesting study. However, the research still requires complement with crucial techniques to improve the website usability, which is known as redesign usability technique.

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