



## **Usability Methodologies and Data Selection: Assessing the Usability Techniques on Educational Websites**

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### **Abstract**

The purpose of an educational website is to efficiently provide up-to-date services and resources to students, faculty, and staff. However, the needs of university students are not always prioritized throughout the design phase of websites; technological considerations, organizational concerns, and commercial goals may drive the process. When meeting the demands of the target audience, website designers often fall short. At the same time, visitors may encounter a wide variety of usability issues while visiting the sites. Thus, the purpose of this study is to examine the efficacy of different approaches to evaluating the usability of university websites from the viewpoint of their target audiences via user-based testing and questionnaire methods involving actual users. The outcomes, based on data from tests conducted in real time, outline the difficulties and advantages associated with each strategy. Both a user-based test and a questionnaire, both trustworthy evaluation methodologies, were used in analyzing and evaluating the websites.

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## **INTRODUCTION**

Over the last decade, computer technology has advanced substantially, and the traditional means of obtaining and exchanging information have diminished. Because of technological progress and advancements in computer systems, our daily lives have become easier and safer [1], [2]. The Internet has emerged as an alternative to conventional ways of coordinating communication among geographically dispersed parties. Additionally, the website offers delivery services that might assist customers in meeting their objectives. Universities also use the web to promote themselves and provide computer resources to their students, staff, and professors [3].

The educational website serves as a channel for interaction between professors, students, faculty, alumni, and visitors. There is no better or more cost-effective method of reaching out to all of an institution's constituents than via its website. And

universities should do everything they can to maintain a good reputation with their many constituencies by making the most of the Internet's resources [4]. One of the most important aspects of evaluating a website is determining how easy it is to navigate, find the required information, and complete other activities on the site [5].

Usability indicates that various users can do different types of tasks on a specific user interface efficiently and effectively. A usability test aims to enhance the supplier's usability by finding problems or weak spots in how an item interacts with its users [6]. A dynamic website may facilitate the registration process, online payment processing, digital library access, and other similar features. In addition, these online platforms may be leveraged to gain a worldwide competitive edge, attracting students from all over the world [7]. Because of this, the quality of an educational institution's online presence is of the utmost

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importance and should be protected in the best way possible [8].

Developing a website with optimal usability systems requires more than just the viewpoint of a web designer and developer. In addition, user-based testing, evaluator-based testing, and automatic tool-based testing methodologies are all ways to assess the usability of university websites [9]. User-based techniques (also known as user-testing approaches) are a set of strategies that combine several approaches to identify usability problems.

The primary goal of these methods is to track how well and satisfied users are with various interfaces. Although user-testing approaches have been utilized to show people usability issues, they are not the most efficient testing procedures if time and resources are limited. Because of these limitations, evaluator-based approaches are a viable option; moreover, they may reveal problems that are not apparent with a small sample of users. Furthermore, a usability test represents one of the most crucial methods of determining a system's efficiency. The most commonly utilized usability qualities are reliability, effectiveness, and user satisfaction [10], [11].

The success or failure of a website may be roughly gauged by how simple or complicated its user interface is. Most universities have plans to keep offering online courses via their websites, even after the threat of coronavirus illness in 2019 (COVID-19) has passed [12]. In this way, addressing usability issues aids colleges in accomplishing their objectives in and out of the classroom.

Usability testing is used to assess a system's functionality and performance. Several usability tests of university websites are shown, utilizing different usability methodologies. Many different usability testing and analysis techniques are available for finding usability issues. There is no universal agreement on classifying these approaches since different writers have done so in various ways. For example, Ismail, N. A. et al. (2021) present automated usability testing techniques and a questionnaire approach to analyze the usability of an encyclopedia website. The questionnaire was built based on a standard form titled Website Analysis and Measurement Inventory (WAMMI), which

found twenty general usability inquiries separated into five areas [13].

Moreover, the websites of academic institutions in Jordan were reviewed using two online tools: web page analyses and HTML toolbox, together with a questionnaire addressed to the websites' users. The internal qualities of a website that cannot be experienced by users, such as HTML code errors, download times, and HTML page sizes, were measured using various tools. Based on 23 usability standards grouped into five categories, the questionnaire was conceived and built [14].

According to [15], surveys are often used to evaluate user interfaces. A pre-test survey was produced to help the researcher learn more about the particular design standards created to evaluate the usability of university websites from the perspective of students. The study's goals were to figure out the relative significance of the various categories of the advanced usability criteria, to determine the evaluations for the selected websites of Jordanian universities, and to use the weights and ratings to determine the overall usability of each website in Jordan. Some of the researchers conducted the survey and questionnaire simultaneously. For instance, in Mentis, S. Ahmet used a hybrid approach, combining two commonly used techniques. Before the online survey was made available to the whole NKU community, it was sent to a select group of students, teachers, and administrative personnel. As a second step, the NKU email system was used to disseminate the questionnaire's access URL to everyone relevant internally [16].

Weiqi and Wang used heuristic assessments to assess the Lund University website from various perspectives, with suggestions for improving the site's usability being outlined [17]. Luis et al. (2017) employed heuristic assessments using data mining methods to assess the usability of 24 university-affiliated websites using a custom-built program called Prometheus. The findings from this analysis were used to inform a comprehensive overhaul of the websites to better adhere to usability guidelines [18].

The user-based testing technique is an approach for systematically monitoring actual users using a product and gathering data on the exact ways the service is simple or

challenging for them [19]. Three of the top-ranked universities in Jordan on Eduroute in 2011 were chosen for this study of usability methodology in higher education websites. The goal of this study was accomplished by using three standard techniques for further user testing. Determine how happy users are with the trial sites. The first is associated with the act of observation itself and may include note-taking and video recording software such as Camtasia. The second strategy used a closed-ended post-test questionnaire. The third strategy was an open-ended post-test questionnaire given to participants after completing the test [20]. To assess the quality of three KRG/Iraqi university websites [3] looked at user-based testing and questionnaires from the users' viewpoint. Thirty people help carry out six user-based technique tasks and ten questionnaire-based inquiries.

Usability assessment techniques were divided into three groups by Hasan, L. et al. (2012) based on the approach used to identify usability issues. The first is user-based UEMs, which use actual users to search for usability issues. The second is evaluator-based UEMs, with testers actively looking for usability issues. The third is tool-based UEMs, which rely on software instruments and models to detect usability issues [21].

Websites that are easy to navigate and find what you're looking for have become a staple of Internet technology in the past decade, making usability assessment methodologies a must-have for judging a site's success. Several studies under "Related Work" demonstrate the widespread use of usability testing to assess educational websites' quality. The primary objective of this research is to assess how user-friendly the university's website is. Detailed descriptions of the questionnaire, research methodology, evaluation metrics, heuristic assessments, real-world user testing, and sampling strategy are provided in this chapter.

Researchers must be familiar with the strengths and limitations of the most popular complementary user testing techniques, such as observation and the use of both quantitative and qualitative records from post-test questionnaires, to make informed decisions about the best approach to take when assessing the usability of a higher education

website. This study fills a research gap by providing empirical evidence for the extent to which different types of user testing may reinforce one another when assessing the usability of academic websites. One way this was done was by comparing the results of the different user-testing methods.

The present study uses two distinct usability approaches to compare the usability of the websites of three KRG/Iraqi institutions from the user's viewpoint. It's also for figuring out which method of user interface design is the most effective. In addition, these three institutions were chosen because they are what the administration of the Kurdistan Region refers to as "new emerging universities," all of which were founded within the previous decade. In addition, they are interested in learning where they can improve and how to do so based on actual research. Accuracy, efficiency, and user pleasure are the three major usability indicators.

## METHODS

Various widely used usability assessment techniques were used to complete this study's objective. Usability methodology and data-gathering practices were compared to [3], a study that used two approaches simultaneously to examine three academic websites. The suggested study chose a strategy of systematically monitoring real users utilizing a product and gathering data on the exact methods in which the item is simple or challenging for them. It is the most important and useful way because it gives exact information about how real users interact with the interface and what problems they run into.

Although real-time user-based techniques have been used to highlight usability problems to audiences, they may not be the best testing methods if you are short on time and money. In addition, when the current restrictions are no longer an issue, one of the most important ways to assess the quality of a system's user interface is via a usability test. Researchers apply a wide variety of usability methodologies to actual access systems, but user-based techniques are among the most effective [22]. A detailed block diagram of the suggested system will be shown below based on the research methods and statistical evaluation. Figure 1 shows a block schematic of the whole system.

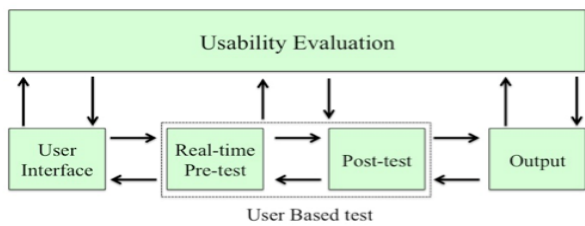


Figure 1. Proposed System's Block Diagram

**RESULTS AND DISCUSSION**

The results of a comparison of several approaches to user testing are presented in this section, along with strategies for selecting representative samples. Furthermore, an overview of the advantages and drawbacks in terms of characteristics and performance observation will be presented.

Results from both user-based and questionnaire-based research methodologies were acceptable in the intended study. The completed data is gathered from a large number of users, all of whom are familiar with computers and online surfing strategies. In

addition, user-testing data was analyzed using various criteria to enhance efficiency and achieve high accuracy. These metrics included reaction time, average task completion time, standard deviation (STD), and standard error (SE).

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

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

Where:  
 n = Data point number  
 x̄ = The average of x<sub>i</sub>  
 x<sub>i</sub> = Data value

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

Table 1 from [3] compares the standard deviation (STD), standard error (SE), and user satisfaction for each question type across three university websites, as well as the efficiency and time spent on overall tasks.

**Table 1.** Average of Accuracy and User Satisfaction of Three Universities

Usability Evaluation	Performing 6 Tasks Scenario and 10 Questionnaires 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
User-based Test (6 Tasks)	86.7 %	41.7	35.9	2.9	61.1 %	49.6	43.5	4.2	79.5 %	49.4	42.4	3.5
User Satisfaction	3.59				3.01				3.24			

Table 1 shows that completing any of the tasks in time was difficult. In contrast, the average accuracy rates at the universities of Halabja (79.5%) and Garmian (61.1%) are lower than at the University of Raparin (86.7%). Concerning the questionnaire approach, which follows the user-based method, the user satisfaction rate is consistent

with the accuracy rate of the user-based test across all three institutions.

Several strategies and user selection methods have been utilized to get quantifiable data regarding user testing after they performed the activities via usability evaluation, as indicated in table 2.

**Table 2.** The Majority of Research Measuring the Usability of Websites Fails

REF.	Usability Methods	Description	Weak points
[13]	Questionnaire and Automated testing tool	This study employs both automated methods and surveys to evaluate the usability of online encyclopedias. The survey's 20 standard usability questions were drawn from the Website Analysis and Measurement Inventory (WAMMI).	<ul style="list-style-type: none"> <li>➤ Not specific data selection</li> <li>➤ Fewer user tests on the high number of systems</li> </ul>
[14]	Questionnaire and HTML online tool	The research used an HTML toolbox, web page analysis, and a user survey on Jordanian university websites. HTML code error, download time, and page size were measured. Tests 23 usability criteria in 5 categories.	<ul style="list-style-type: none"> <li>➤ Not specific data selection</li> <li>➤ The high number of systems and huge criteria field</li> </ul>
[15]	Survey	This research assessed nine educational websites using student preferences and design criteria. Educational website usability was evaluated based on content and navigation.	<ul style="list-style-type: none"> <li>➤ Evaluating the high number of systems</li> <li>➤ Only student participated</li> </ul>
[16]	Survey and Questionnaire	The research examines Namk Kemal University's (NKU) website usability and suggests better, more accessible sites. The study hypotheses list six website usability variables.	<ul style="list-style-type: none"> <li>➤ User from the same university</li> </ul>
[20]	User-based test and Questionnaire	The study included three user-testing approaches. First, the observer captured data using Camtasia. The second strategy was a closed-ended questionnaire. Third, an open-ended questionnaire gauged user satisfaction.	<ul style="list-style-type: none"> <li>➤ All participants are students.</li> <li>➤ The test is online</li> </ul>
[23]	Questionnaire	This study rated three university websites based on Organization, Navigation, Content, Readability, Links, User Interface Design, Performance, and Effectiveness.	<ul style="list-style-type: none"> <li>➤ All Participants are students.</li> </ul>
[3]	Real-time user-based test and Questionnaire	This study evaluates three KRG/lowest-ranked Iraq university websites using real-time user-based evaluations and questionnaires. Thirty people execute six user-based activities and ten questionnaire questions.	-

Table 2 demonstrates that most research measuring website usability fails to identify the sampling technique used. This problem prevents the researcher from drawing conclusions that can be applied to the whole population. Most research done today uses non-probability sampling methods, which do not give each respondent the same chance of being chosen.

Only a few studies have graded the website's usability from "great" to "poor." As a result, designers will have a better idea of where their site's usability might be enhanced. Some studies only used participants from a single academic division; therefore, the findings should be interpreted cautiously. By asking people from other divisions to take part, findings and learning can be generalized to see if respondents' areas of expertise greatly impact how easy it is to use the websites being evaluated.


Table 2 shows how specialty affects appraisal. Questionnaires may be used to evaluate the usability of an educational website from a user's viewpoint following a real-time user-based test, but not alone or with a survey. Since the evaluations are based on questions, they include more than one typical user attempting to complete a set of objectives in the most suitable environment. User-based techniques have the potential to gather the most persuasive, dependable, and accurate data [24], [25]. Usability testing provides credible data. Usability testing records and analyzes user interface interaction, performance, activity time, and satisfaction. It evaluates usability, effectiveness, learnability, efficiency, errors, and satisfaction [26]. In addition, this approach will help website owners consider essential variables while creating higher educational websites to satisfy users' demands. The usability model helps developers and web designers construct more usable websites. Before deciding which method to use, researchers need to know how well the most common additional user testing methods find specific usability problems on a university website. This study fills a gap in the literature by showing how a user-testing approach complements evaluating university websites' usability, as it was applied in [3].

## CONCLUSIONS AND SUGGESTIONS

The suggested research is based on usability methodology and data selection and offers experimental evidence for a comparative usability study of university websites. To help enhance website usability, the results identify the challenges and benefits of each approach based on data from real-time experiments. The websites were evaluated using a user-based test and a questionnaire, two reliable assessment methods. A reasonable result may be attained with any approach, depending on the technique of evaluation chosen. In conclusion, the suggested study could show where academic websites are difficult to use by showing problems with collecting and analyzing data. In the future, using different techniques, increasing the number of tasks, adding more participants, gathering users' perspectives, and contributing to web development experts will be 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 critical techniques to improve the website's usability, referred to as the "redesign usability technique."

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