Original Research Papers

Development and Implementation of a Tool for Website Usability Measurement

ABSTRACT

Aims: Today, access to information is mostly provided by using web pages. Web pages have quite a different design. Web design should be able to provide faster and more efficient access to information. This raises issues such as web usability, usability tests, human computer interaction, and user experience. The aim of this study is to develop a web-based tool for measuring the 'usability' of a website. The System Usability Scale (SUS) was used in the developed web-based tool for this measurement.

Study design: In this study, a web based tool was developed by using System Usability Scale. The developed web-based tool has been implemented for two websites and the results have been interpreted.

Place and Duration of Study: Dokuz Eylül University Department of Computer Science between May 2018 and November 2018.

Methodology: In this study, we introduce a tool for the System Usability Scale. The websites were evaluated by the students using the System Usability Scale tool. The performance of this scale was compared for the websites.

The number of participating students in this study for Website-1 and Website-2 is 19 (10 male, 9 female). SUS score data from the students were collected and analyzed in the database quickly and accurately with web-based software.

Results: Website-1 score according to the System Usability Scale was calculated as 69.4 with our tool. It can be said that the website is a good system or a good website. The score of Website-2 is 58 and interpreted as poor website.

Conclusion: We have shown that two practical examples are provided to illustrate the effectiveness and practicality of the usability tool.

Keywords: Website Usability, System Usability Scale, Usability Test, Usability.

1. INTRODUCTION

Usability is stated as the main factor in measuring acceptability and success of system interfaces. Usability research is aimed at improving technological products and services and making them easy to use. The usability studies, in which the user's interactions with the system are used in the development of the system, provide a theoretical basis for web usability research [1]. Nasul et al. stated that the three most important reasons for not using many websites are the lack of target users, the inability of users to use the website in an easy way and the users are not satisfied with their website usage [2]. Therefore, the most important solution for obtaining a good system is stated as focusing on users. In terms of easy learnability, effective usability, rememberability, low error rate, and user satisfaction, they are identified as important factors in the design of usable systems [3].

There are many assessment methods and usability tests to investigate the use of a website such as Questionnaire For User Interaction Satisfaction - QUIS [4], Software Usability Measurement Inventory - SUMI [5], Computer System Usability Questionnaire - CSUQ [6], and System Usability Scale - SUS [7], [8]. During the usability test, which is one of these

tests, the subject is assigned to carry out the work given to them on various websites. However, the existing problems on the website are identified or the positive events in use are indicated. This problems are outdated website design, poor quality design and non-specific page titles. The usability test in this method consists of three stages: preparation, application and evaluation. In the preparation process, typical tasks which are meaningful for the user are prepared. 5 to 10 subjects are enough to reveal the problems by 80-90%. After preparation, a pilot test (trial test) is applied to find any errors that may be in the test.

During the usability test, the subjects must think vocally while performing the assigned tasks. The behaviour of the subjects is monitored by the observer. At the same time, the test is recorded to perform the analysis. Finally, during the interview, many questions are asked to get as much information as possible from the subject.

After applying the test, the strengths and weaknesses of the product (e.g. website) are found. To eliminate possible usability problems, which problems are frequently encountered are analysed. Finally, the results of the test are given [9].

In the literature, there are many studies on usability, some of which are examined in this study. Ateş and Karacan's study is one of the usability studies. Their study's aim is to explore the usability of Abant İzzet Baysal University's web site in terms of student usage. Website analysis and Measurement Inventory questionnaire, which has 20 questions, was used for data collection. The students found the site difficult to navigate, slow and disturbing [3]. Uçak and Çakmak, as a result of their usability study, positive and negative features of the Hacettepe University, Department of Information Management web page were determined by the analyses of qualitative and quantitative data. Finally, the results that were elaborated from the analyses have been used for revision that will provide an effective usage of the web page [10]. Karahoca et al. have prepared the usability measurement scenario [11]. Yıldırım et al. investigated the usability of web based assignment system, MOODLE with SUS. Perceptions of students were generally acceptable system [12]. In the other study, the Website Usability Scale, which was developed to determine the availability of websites, consists of 25 items. Validity and reliability analysis of the scale and application results are given [13]. Lewis and Sauro reviewed the factor structure of the System Usability Scale [14]. Kortum and Peres's article examines the relationship between system effectiveness and subjective usability scores using the System Usability Scale. Although the correlations are far from perfect, there are reliable and reasonably strong positive correlations. [15].

In another study (Borsci et al.), the SUS-Italian version was administered to the participants in the usability evaluation section. They have compared three alternative factor models of the SUS items. The correlation between usability and learnability was found to be positive and significant in their study [16].

In our study, SUS was used as the efficient and fastest scale. If there is a problem on the website, it is possible to determine the degree of problem with the given scores. For this purpose, we have developed tool for Turkish questionnaire and explained the used method of calculation by the software.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

After applying the usability test, the question scale is used to provide a general impression of the users. In addition to the objective data obtained through usability testing, a usability survey is applied to measure the subjective thoughts and experiences of users.

There are many usability scales available today: QUIS, SUMI, CSUQ, and SUS are a few of them. SUS (System Usability Scale) is the most reliable and free question survey with the Question Questionnaire Rating Scale. Because the processing time is so short, it is also known as “quick and dirty” method. SUS can be used for all interface evaluations and the format of the questions is designed according to EN ISO 9241 content. Questions of SUS [17] can be seen in Table 1.

The system usability scale (SUS) is a simple, ten-item attitude likert scale giving a global view of subjective assessments of usability. Originally created by John Brooke in 1986, it allows you to evaluate a wide variety of products and services, including hardware, software, mobile devices, websites and applications [7]. It provides an easy-to-understand score from 0 (negative) to 100 (positive). While a 100-point scale is intuitive in many respects and allows for relative judgments, information describing how the numeric score translates into an absolute judgment of usability is not known [18]. Benefits of using SUS are a very easy scale to administer to participants, it can be used on small sample sizes with reliable results and it can effectively differentiate between usable and unusable systems [19].

Table 1. SUS Questions

1.	I think that I would like to use this system frequently.
2.	I found the system unnecessarily complex.
3.	I thought the system was easy to use.
4.	I think that I would need the support of a technical person to be able to use this system.
5.	I found the various functions in this system were well integrated.
6.	I thought there was too much inconsistency in this system.
7.	I would imagine that most people would learn to use this system very quickly.
8.	I found the system very cumbersome to use.
9.	I felt very confident using the system.
10.	I needed to learn a lot of things before I could get going with this system.

System Usability Scale, SKS (System Usability Scale, SUS) consists of 10 short questions. There are five different scales that can be marked for each question. Values 1, 3, 5, 7 and 9 are given values between 0-4 to calculate the SUS score. Negative formulated expressions i.e. values 2, 4, 6, 8, 10 take values between 4-0. Then, the scores of all statements are added. Thus, a value between 0 and 40 is reached. This intermediate value is multiplied again by 2.5, so that a value between 0 and 100 is reached. Briefly, it is calculated as:

SUS = Total score of all statements * 2.5

System with 100 points is considered as a very good system. The system with a score of 68 is considered a good system. The system, which is less than 68 points, indicates that the system has usability problems and these problems must be removed. Table 2 illustrates the way in which the SUS responses are seen for website [20].

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Table 2. SUS Example

System Usability Scale						
Instructions: For each of the following statements, mark <u>one</u> box that best describes your reaction to the website today.						
		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this website frequently.	☐ 0	☐ 1	☒ 2	☐ 3	☐ 4
2.	I found the website unnecessarily complex.	☐ 4	☐ 3	☐ 2	☒ 1	☐ 0
3.	I thought the website was easy to use.	☐ 0	☐ 1	☒ 2	☐ 3	☐ 4
4.	I think that I would need assistance to be able to use this website.	☐ 4	☐ 3	☐ 2	☐ 1	☒ 0
5.	I found the various functions in this website were well integrated.	☒ 0	☐ 1	☐ 2	☐ 3	☐ 4
6.	I thought there was too much inconsistency in this website	☐ 4	☒ 3	☐ 2	☐ 1	☐ 0
7.	I would imagine that most people would learn to use this website very quickly.	☐ 0	☐ 1	☒ 2	☐ 3	☐ 4
8.	I found the website very cumbersome/awkward to use.	☐ 4	☒ 3	☐ 2	☐ 1	☐ 0
9.	I felt very confident using the website.	☐ 0	☒ 1	☐ 2	☐ 3	☐ 4
10.	I needed to learn a lot of things before I could get going with this website.	☒ 4	☐ 3	☐ 2	☐ 1	☐ 0

SUS calculation, the total number of questions: 2 + 1 + 2 + 0 + 0 + 3 + 2 + 3 + 1 + 4 = 18 points. 2.5 times the total, score = 18 * 2.5 = 45. The system usability score of this sample was calculated as 45. It shows that the user is having trouble using this system and these problems must be removed.

3. RESULTS AND DISCUSSION

In this section, a web-based tool for usability testing was developed and the results were evaluated. The System Usability Scale questionnaire was translated into Turkish. Turkish scale was used when developing a web-based tool. The Turkish of the questions can be seen in Table 3.

Table 3. Turkish version of the SUS Questions

1.	Bu websitesinin sıkça kullanacağımı düşünüyorum.
2.	Websitesini gereksiz ölçüde karışık buldum.
3.	Websitesinin kolayca kullanılabileceğini düşünüyorum.
4.	Bu websitesini kullanabilmek için teknik bilgiye sahip kişinin yardımına ihtiyaç duyduğumu düşünüyorum.
5.	Bu websitesin de çeşitli fonksiyonları iyi entegre edilmiş buldum.
6.	Website içerisinde çok sayıda tutarsızlık mevcut olduğunu düşünüyorum.
7.	Bir çok insanın, bu websitesinin kullanımını çok rahat bir şekilde öğreneceğine

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	inanıyorum.
8.	Bu websitesinin kullanımını çok zahmetli buldum.
9.	Websitesini kullanırken kendimi çok güvenli hissettim.
10.	Bu websitesini kullanmadan önce, konu hakkında çok şey öğrenmem gerekti.

3.1 Preparing the Webpage for System Usability Scale

It was designed as a System Usability Scale webpage to make it easier for users to access data and to transfer the data directly to the SQL database, and it was provided for the students to respond directly to the website during this scale. In this way, both the paper is saved, and the processing time is shortened. The program shown in Figure 1 is written in HTML and PHP.

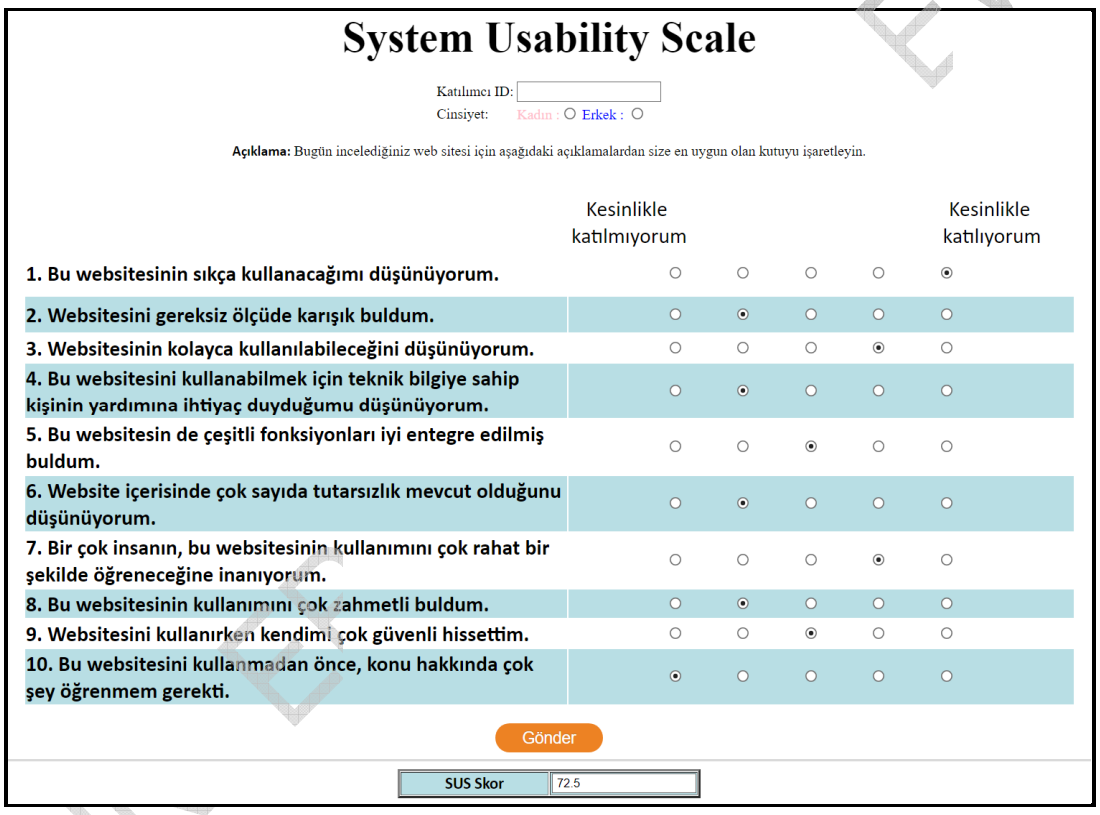

Fig. 1. Webpage for SUS tool

3.2 Implementation of System Usability Scale tool

System Usability Scale tool was applied to students. The website-1 and website-2 were evaluated by the students. They are part of the same kind of departmental websites. The students were asked to find the necessary information from these websites. Firstly, the results for website-1 were examined.

The number of people participating in the System Availability Scale application for Website-1 is 10. Website-1 score according to the System Usability Scale is 69.4 as shown in Figure 2. The average of the System Usability Scale is 68 points, and the result is above that average,

so it can be said that the website is a good system or a good website. Table 4 shows the results of the System Usability Scale and how much score the students give to the website-1.

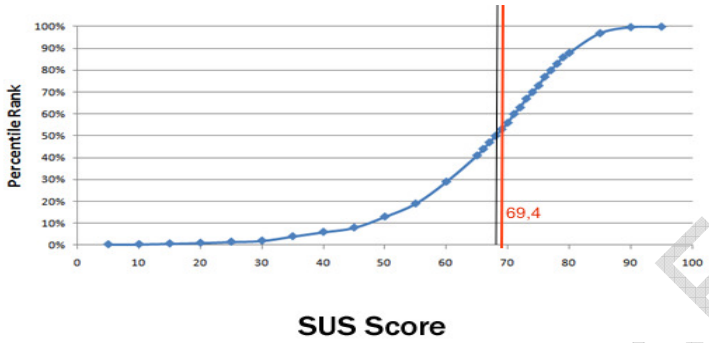

Fig. 2. SUS diagram for Website-1.

Table 4. SUS Results for Website-1.

	Question Number											
	Gender	1	2	3	4	5	6	7	8	9	10	Score
1)	Male	2	4	4	4	1	2	4	4	1	4	75
2)	Male	3	3	3	1	3	3	3	1	3	3	65
3)	Female	3	3	3	4	2	3	4	4	3	3	80
4)	Female	3	3	3	4	3	4	4	4	2	4	85
5)	Male	1	3	3	3	1	2	2	3	0	3	53
6)	Male	3	2	3	4	3	3	3	2	2	4	73
7)	Male	2	4	4	0	2	4	1	4	4	3	70
8)	Female	3	4	3	4	1	4	4	4	3	4	85
9)	Male	1	2	1	1	2	1	1	1	2	1	33
10)	Male	1	4	0	4	2	4	4	4	3	4	75
Total Average of Calculated of Score:		5.5	8	6.75	7.25	5	7.5	7.5	7.75	5.75	8.25	69.4
Male Average of Calculated of Score:		4.64	7.86	6.43	6.07	5	6.78	6.43	6.78	5.36	7.86	63.43
Female Average of Calculated of Score:		7.5	8.3	7.5	10	5	9.2	10	10	6.7	9.2	83.3

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The collected results for Website-2 were examined. In total, the number of surveyed people is nine. According to the System Usability Scale, the score of Website-2 is 58 as shown in Figure 3. As the result of the System Usability Scale is less than 68 points, the usability of the website is interpreted as poor. On the basis of this result, some suggestions are made for the issues to be resolved to related website. Table 5 shows the results of the System Usability Scale and how much the students score for the website-2.

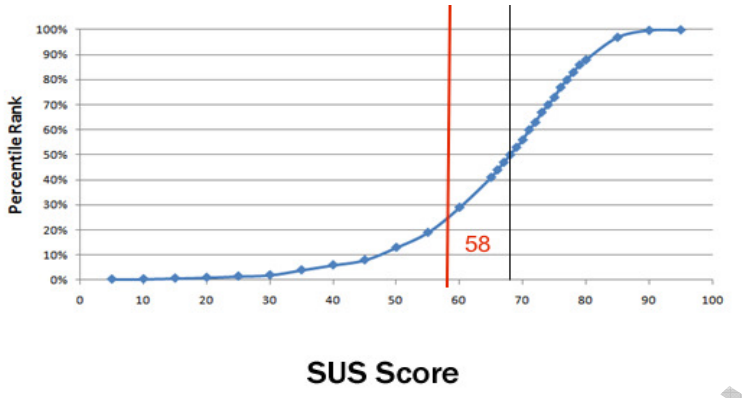

Fig. 3. SUS diagram for Website-2.

Table 5. SUS Results for Website-2.

	Questions Number											
	Gender	1	2	3	4	5	6	7	8	9	10	Score
1)	Female	3	1	1	2	1	2	1	1	1	3	40
2)	Male	0	0	0	4	0	0	0	0	0	4	20
3)	Female	3	2	3	3	3	2	3	1	2	3	63
4)	Female	3	4	4	4	3	4	4	4	2	3	88
5)	Male	1	2	3	4	1	3	4	4	2	4	70
6)	Male	2	3	3	4	1	2	3	3	2	4	68
7)	Female	1	0	2	4	4	1	2	1	4	4	58
8)	Female	3	1	2	4	2	1	3	3	3	4	65
9)	Female	2	1	3	0	2	1	3	3	2	3	50
Total Average of Calculated of Score:		5	3.89	5.83	8.06	4.72	4.44	6.39	5.56	5	8.89	58
Male Average of Calculated of Score:		6.25	3.75	6.25	7.08	6.25	4.58	6.67	5.42	5.83	8.33	60.67
Female Average of Calculated of Score:		2.5	4.17	5	10	1.67	4.17	5.83	5.83	3.33	10	52.67

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4. CONCLUSION

It is important for the user that the system is accessible, that the users can reach their goals successfully and that they are satisfied with using the system. The website-1 and website-2 which were used by the university students and the web-based tools were researched and the usability of these systems was measured. The “System Usability Scale, which is free and reliable, was used in the developed tool for measurement. The results can be quickly and reliably determined by the extent of the usability of websites with the developed tool.

In other words, this article presents the development and implementation of a tool for measuring website usability. It is important that the individual responds to the questions and

gives the score quickly by the software. Thus, it is important that the web page provides quick information about the usability status. So the tool is a decision making tool.

In the continuation of the study, a sufficient amount of information will be obtained by using the developed system usability scale tool and Turkish validity and reliability will be determined. The purpose of this study is the development of the tool only.

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