

# A Study on Quality and Reliability of websites using Functional testing and Usability testing

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**Abstract-** Usability Testing is the extent to which a product can be used by a particular user to achieve a defined target with effectiveness, efficiency and achieve satisfaction of use in a particular context. Usability is one of the important criteria to measure website quality and reliability. In addition to visual esthetics, usability of a website is a strong determinant for user's satisfaction and pleasure. Designing user's expectations is quite challenging job for any websites designer. Users have different usability requirements based on their age group and experience level. Therefore, it is very challenging to gather and implement the diverse nature of expectations against different users. Usability Testing is the extent to which a product can be used by a particular user to achieve a defined target with effectiveness, efficiency and achieve satisfaction of use in a particular context. There are five common usability testing characteristics that may lead to the best practices in the usability testing. The five characteristics are specific goals for each test, participants representing real users, participants doing real tasks, usability researcher observes and records what participants do and say and usability researcher doing the data analysis, diagnoses the problems, and recommends changes. Websites are the key aspect for satisfying the user's demands. This papers aims to test the usability and reliability of websites.

**Keywords-** Usability Testing, Functional Testing, Websites.

## I. INTRODUCTION

In this digital world, websites are considered to be the interface between providers and stakeholders. In the academic field, websites are the source of medium to circulate information to the users to prosper and spread education throughout the world. Thus, quality is an essential attribute for websites that needs to be measured to fulfill the above purpose. The websites are meant not only to serve the purpose of the users but also should meet the user satisfaction and ease-of work. In today's advance era of computer and web, all the systems are being transferred to automated systems. This saves the time and effort cost. It increases productivity of any business. But, this can cause a great loss in case of user acceptance failure. A major factor for this kind of failure can be ignoring usability perspectives. Designers are concerned with functionality and bug free systems, but they often not consider the usability constraints. This way user is more likely to dislike the system, even if system is up to what they asked for. So, it is quite important for developers and designers to consider usability needs of the expected users. The main objective of this study is to propose the usability testing research framework that accommodates to these common characteristics. The

usability tested, problems and the recommendations have been analyzed based on its (i) features, (ii) user interface and (iii) performance and effectiveness.

The paper is organized as follows, Section I contains the introduction of functional and usability Testing, Section II contains the types of testing methods, Section III contain the quality and reliability of websites, Section IV contain benefits of usability testing, Section V contain challenges during websites usability testing section VI explain the usability methodology, Section VII concludes research work with future directions.

## II. DIFFERENT TYPES OF TESTING METHODS FOR WEB APPLICATION TESTING ARE

**A. Functional Testing:** Functional testing of web application is performed to check the working of web-links, test web forms of the page, validate various html tags, CSS tags and java script tags, test the working of cookies and database connection. Functional testing of web application is done manually as well as automatic. For manual functional testing of web application, various types of techniques used for testing i.e. boundary value analysis, equivalence class

testing, decision table and cause effect graphing technique. For automatic functional testing of websites, different types of tools are used like selenium IDE and QTP.

**B. Usability Testing:** Usability testing checks webpage navigation and user friendliness of the web pages [1]. Usability testing is performed by in-house usability or remote usability. In-house usability testing, the participants who test the web application is in the same building as where the test moderator resides. Whereas in the remote usability testing, participant who test the web application is not in the same location. Remote testing can be moderated. In moderated testing, the moderator and the participant communicate in real-time [2]. For automatic usability testing of web application, different types of tools are used like crazy egg and qualaroo.

**C. Interface Testing:** This type of testing check the bugs related with interaction between the web server, application server and database server. [2]

**D. Compatibility Testing:** This type of testing checks the compatibility of browser, operating system and mobile browsing [2].

**E. Performance Testing:** Performance testing checks the web load and stress testing. Web load testing concerns with checks with total number of users access the web page, whereas in web stress testing is done on the site to see that how will the site react and recover during the stress time.[2]

**F. Security Testing:** This checks the security of the web applications. For security purposes, access control and authentication checking of the webpage. CAPTCHA for automates scripts logins should be tested. SSL should be tested for security measures.

### III. WEBSITE QUALITY

Quality is intangible concept. It is not easy to determine it in operational way. However everyone would feel it when it is not available. The term of good quality and bad quality are used in daily life to know how good and how bad the function of a product is. Most of people can recognize quality easily but they have difficulty in describing the meaning of quality [3]. Website is seen as a product that has different feature from traditional software product. The quality of a website is similar to the concept of quality that is generally indefinable. In users perception, a website must be easy to use, easy to understand, and is provided with needed functionality and navigation help. The design and development of a website include several fields of study such as information architecture, psychology navigation, psychology, computer science, interaction between computer and graphic design [4]. The quality of websites can be evaluated using several factors such as aesthetics, logics & technology. Based on the perceptive of web designer &

administrator, the evaluation of website quality focuses on the usability. Usability covers the simplicity in learning, effectiveness & pleasure for the users. The factor of usability includes page load time, page rank, traffic and back link.

### IV. BENEFITS OF USABILITY TESTING

Usability testing is an important method for examining how system users understand and use a system to complete a specific task. Below is the list of benefits of usability testing [5]:

- Change people's attitudes about users.
- Change the design and development process.

In this usability testing method, a summative usability testing plan has been used. The testing used was performance measurement. Summative usability testing is the summative evaluation of a product with representative users and tasks designed to measure the usability (defined as effectiveness, efficiency and satisfaction) of the complete product. Usability evaluation assesses the extent to which an interactive system is easy and pleasant to use. This technique was used to obtain quantitative data about test participants' performance, when they performed the tasks during usability test. The test was conducted in a formal usability laboratory and data was collected accurately and possible unexpected interference minimized. The participants were given a pre-test training. A list of prepared tasks was provided to the users. The participants were observed while the experiment was on. The aims for the usability testing in terms of usability attribute (e.g. easy to learn, efficient to use, easy to remember, few errors, subjectively pleasing) has been defined.

The various components of the aims balanced and their relative importance were decided. Usability issues were quantified by measurements such as:

- The time users take to complete a specific task.
- The time spent recovering from errors.
- The number of user errors.

The method is based on two factors: Task and Time. The system to be evaluated is divided into sub-parts, each of which is called a Task, so that each system is a combination of many tasks. The Time is an important factor which helps us criticize the system.

### V. CHALLENGES DURING WEBSITE'S USABILITY TESTING

Testing websites is different because of many factors scenarios affecting the performance and user experience. Following are the few challenges during web testing:-

1. Browser compatibility, the end users may use different types of browsers to access the applications[6] .
2. Operating System compatibility, the end users may use different types of operating system[7] .
3. People with varying backgrounds & technical skills may use the application.
4. Intranet versus Internet based Applications, Intranet based applications generally cater to a controlled audience.
5. Network speeds, Slow Network speeds may cause the various components of a Webpage to be downloaded with a time lag.
6. In web application, client side contents and programs may be generated dynamically.
7. Navigation of states is an important challenge for web testing, here required to fetch all dynamically updating states of the specific web page
8. Transition Navigation is an important challenge for web testing, here transition navigation testing of methods triggered by user events and server message and changes the DOM.
9. Another important challenge while testing web based application is asynchronous/ nondeterministic behavior of web application due of delays, interaction between client and server and so on.
10. Stateful behavior of web application is a big challenge for web application testing.

## VI. METHODOLOGY

A study shows that the results of usability testing using different methods are not always the same. The difference in outcomes from the application of different methods is due to the testing focus of each method different from each other . Usability is a quality attribute that may be defined as the ease of using the website effectively and fulfilling users need and satisfaction. The website usability test has five assessment components: [7]:

1. Learnability, to know the size for users in understanding the reasons for accessing and identifying the sought.
2. Efficiency, explains how the size of an efficient website and can present information quickly.
3. Memorability, explains whether the website is easy to remember, whether easy to learn from how to run or operate the system.
4. Satisfaction, explaining how the user wants to be able to browse the website.
5. Errors, to explain how often a website error occurs, links that do not work.

Usability evaluation is carried out based on Questionnaire approach.

### 5.1 Questionnaire based evaluation

Questionnaire-based evaluation involved responding to a standardized questionnaire prepared by experts through pilot study to measure the perceived usability of the three websites. The pilot study is conducted in order to bring valuable insights to the evaluation process. It helps to find out the attributes and suitable questionnaires that suits best for carrying out the usability evaluation[8]. The questionnaires are prepared based on five usability attributes namely attractiveness, Controllability, Efficiency, Helpfulness and Learnability. Each attribute consists of several sub-attributes which are essential for measuring the usability aspects of the websites. 20 questionnaires are prepared for the five different usability attributes. The questionnaires are rated based on the Linguistic scale (1–5), where Very Satisfactory (VS) is rated as 5 and Very Unsatisfactory (VUS) is rated as 1.

#### 5.1.1 Identification of usability attributes and sub attributes

The attributes and sub-attributes that are considered for the usability evaluation of the websites are mentioned in order to provide better visibility and make it suitable for academic applications as well as business process environment. The parameters are considered after thorough analysis of commercial media applications and are mentioned below.

**Attractiveness:** Attractiveness is a usability attribute essential to measure the visual aspect of the website. It helps in measuring the direct interest of the users for the corresponding websites whether in term of functional or non-functional aspects. The sub-criteria which constitute attractiveness are: Aesthetic, Symmetrical, Pleasant, Organized, Clean.

**Controllability:** Controllability is one of the essential usability attribute which measures the navigational prospect of the website. The score obtained indicates how easily user can navigate through the website and complete the required task. Following are the sub-attributes which affects the controllability of a website. Navigation, Communication, Consistent response.

**Efficiency :** Efficiency measures the ease of work. It signifies how easily they can complete the task with limited resource both in terms of time and money. The following sub-attributes constitute efficiency: Number of clicks, Task completion time, Response time, Ease-of use.

**Helpfulness:** Helpfulness measures the user's expectation level from the corresponding website. Higher the level of helpfulness indicates the good content quality and its structure. The sub-attributes that constitute helpfulness are

as follows: Finding correct information, Logical structure, Cognitive effort[9].

**Learnability:** Learnability may be defined as the ability of the user to understand and learn the functionalities of the website with limited effort. Higher the score indicates more self-descriptive nature of the website whereas, low score identifies that the website provides certain terminologies that may be unfamiliar to the user. The sub-attributes that bind learnability are: Learning time, Good interface, Minimal action, Self-descriptiveness.

**TABLE I. USABILITY ATTRIBUTES AND SUB ATTRIBUTES**

Usability	
Attributes	Sub Attributes
Effectiveness	Task Accomplishment, Operability, Universality, Flexibility, Error
Efficiency	User Effort, Finance, Resource Utilization, Performance
Comprehensibility	Clarity, Learnability, Memorability, Helpfulness
Satisfaction	Likeability, Comfort, Attractiveness, Trustfulness
Safety	User Safety, Third Party Safety and Environmental Safety

## VII. CONCLUSION

This research can identify the characteristics of website quality and reliability which can be used to evaluate Functionality, Reliability and Understandability of human point of view. This paper also presents an analysis that provides better understanding of Reliability and Quality of websites using Usability testing. The usability improvement in successive iterations can be quantified by the progressively better effectiveness and efficiency. Secondly, there are three characteristics that have the potentials to improve the academic website quality i.e. functionality, reliability, and understandability. In validity and reliability test, the characteristic of efficiency has been found unreliable so that it cannot be used in evaluation and analysis. So we could not conclude what to improve in Efficiency characteristic. Thirdly, from this research we obtained several characteristics that are in priority to be developed and enhanced i.e. Reliability comes first, then Usability and Functionality.

## REFERENCES

- [1] Ruili Geng , Jeff Tian, "Improving Web Navigation Usability by Comparing Actual and Anticipated Usage", IEEE Transactions on human machine systems, VOL. 45, NO. 1, February 2015.
- [2] P. J. Meyers, "25 Point Website Usability Checklist," 2009. [Online]. Available: <http://drpete.co/blog/25-point-websiteusability-checklist>. [Accessed: 20-Apr-2015].
- [3] Y.-L. Theng and J. Sin, "Evaluating Usability and Efficaciousness of an E-learning System: A Quantitative, Model-Driven Approach," July 2012 IEEE 12th Int. Conf. Adv. Learn. Technol., pp. 303–307.
- [4] N. S. Aziz, A. Kamaludin, and N. Sulaiman. "Assessing Web Site Usability Measurement", In IJRET, vol. 2(9), pp. 386–392, 2013.
- [5] J. Rubin and D. Chisnell, "Handbook of Usability Testing: How to Plan, Design and Conduct Effective Tests", John Wiley & Sons, 2011.
- [6] M. H. TIOWfeek and M. N. A. Salam, "Students' Assessment on the Usability of E-learning Websites," in Procedia - Social and Behavioral Sciences, 2014, vol. 141, pp. 916-922.
- [7] Usability Testing on Government Agencies Web Portal: "A Study on Ministry of Education Malaysia (MOE) Web Portal", Dec 2015 9th Malaysian Software Engineering Conference, Malaysia.
- [8] Ms. Jyoti Arora "Web Testing using UML Environment Models", International Conference on Computing, Communication and Automation (ICCCA2016)
- [9] Sharmistha Roy, Prasant Kumar Pattnaik, Rajib Mall "Quality assurance of academic websites using usability testing: an experimental study with AHP", Int J Syst Assur Eng Management, 2016.
- [10] Swapnil S. Patil, Hridaynath P. Khandagale "Enhancing Web Navigation Usability using web usage mining techniques", International Research Journal of Engineering and Technology (IRJET), 2016.
- [11] Marjorie Rush Hovde Indiana University-Purdue University Indianapolis."Connecting in Online Technical Communication Courses: Addressing Usability Challenge for Students and Faculty Members", 2015 IEEE.
- [13] Dawam Dwi Jatmiko Suwawi1, Eko Darwiyanto2, Martiana Rochmani3 1, 2, 3, School of Computing Telkom University Bandung, Indonesia,"Evaluation of Academic Website Using ISO/IEC 9126", 2015 3rd International Conference on Information and Communication Technology (ICoICT).
- [14] Mohammed Naim Khan, Namita Arya and Amit Prakash Singh , "MBT for Functional Testing of Embedded Systems" IJCSE ISSN:2347-2693(E) Vol.04 , Issue.05 , pp.10-16, Jul-2016

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