Software Metrics: Practical Exercise

Dilip Somaraju
930720-3373
diso14@students.bth.se

Abstract:

Web usability determines the efficiency of a website. Web usability in general is used as a component to measure the usability of a website. This is a variable used to differentiate websites. This report deals with various factors which affect the usability of a website and how it affects the software measurement. Few journal articles related to the web usability were selected and were analyzed. The literature gave a clear idea of the usability in websites. The review of the literature was done to understand the impact of web usability on software measurement. The different types of metrics used in measuring the web usability are analyzed. The different terminology and the critical assessment are followed by it. Finally it is concluded that web usability is a crucial factor for software measurement.

1. Introduction

The internet is most widely used resource in today's world due to its variety of services and information. The information and services that are available can be accessed through the World Wide Web. It is a powerful tool for accessing all information available .To figure out the user's acceptability of a particular website, we require web usability. Web usability is one of the parameters that is useful to determine the quality and popularity of a particular website. Web usability is an effort to make a website comprehensive and usable for the user to use the website "The international standard ISO 9241-11 defines usability as follows: effectiveness, efficiency and satisfaction."[1]. The usability also helps in determining the quality of an interactive IT system. It is efficient and easy to learn.[2]

The rapid popularity and spread of the Internet has led to significant amount of dependency on it, thereby making web usability more important and valued. Web usability has become a major contributing factor. Web usability under user's perspective when considered the users look and prefer user-friendly, simple and easy to operate websites and must be interactive. Most websites today often provide many facilities which are similar to others, thus leading to the user becoming more demanding with respect to the usage of the web. Usability which is considered as a software quality factor and the success rate of the website can be measured or estimate by counting the number of times a particular website has been accessed by the users [3].Web usability describes the quality of the website how efficient the website is in the users-point of view.

The international standard ISO 9241 defines usability as "the extent to which the product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use"[1] .According to Neilsen web usability is referred as "Learnability, Efficiency, Memorability, Few errors and User's satisfaction" [1].Where learnability to the measure to know how easy the website is to learn. Efficiency states the quality of the website and how efficient the product or the website is to the user. Memorability is the need to remember the functionalities of the product or the website and it is a measure of how easy a website is to use by the user after a substantial time-lapse visits. User's Satisfaction is a measure of how the website and its service meet the user expectation and how pleasant the website is to use. [1]

The following sections of the report deal with the Critical assessment of the literature followed by Metrics in Web usability and Benchmarking- A standard method for analysing the web usability of a website.

2. Critical Assessment of the Literature.

For the critical assessment we needed to find the suitable literature. For this the INSPEC online database was searched. All the papers which fall under the domain of Web usability were analysed and among them 5 were selected. These 5 papers were thoroughly analysed and the critical assessment is given.

From the critical assessment of the articles, factors determining the web usability in each article were determined and were assessed individually.

The web usability factors are concerned with software quality of the product or the website .Based on the

literature provided by the authors in the article the usability factors are explained and considered in this section based on the literature are [4]:

- Efficiency
- Effectiveness
- Productivity
- Satisfaction
- Learnability
- Safety
- Truthfulness
- Accessibility
- Universality
- Usefulness

Efficiency: Web usability is efficient. This is justified by its ability to ensure that users use appropriate and required number of resources for a specific use or task that is to be performed on the website. Thus it makes sure that no resource is overused, leading to its depletion or underused leading to inefficiency of the resource. It makes sure that all the resources are well balanced.

Effectiveness: Accuracy, preciseness and adequacy are ensured by web usability, thus making web usability very effective. The tasks to be performed and which are being performed are always accurate and complete. They are satisfactory to the users of the website because web usability ensures that they are so.

Productivity: Productivity talks about the useful amount of output we acquire from the users. This output is related to the interaction of the users with a particular website. Web usability ensures that this productivity is achieved in terms of the resources used by the users.

Satisfaction: Satisfaction is assured by web usability. The user feedback is the major contributing factor for satisfaction, which comprises of the users opinions and feelings about the website. It also contains the users comments about the ease with which the website is accessed as well as used.

Learnability: Users need to feel that they can achieve something productive and quickly learn the functionalities used. This is another factor; learn ability which is ensured by web usability. Web usability makes the users feel productive by using the websites and it helps them achieve their goals with ease. It also helps the users expand their knowledge about different functionalities.

Safety: Safety is another feature provided by web usability. The web usability makes it a point to ensure that it does not cause any harm or risk to the users of any website. Web usability also provides operational safety and contingency safety. Operational safety means that it does not harm any resources or the environment.

Truthfulness: Web usability offers trustfulness to its users. Users of e-commerce sites are more subjected to this feature of web usability. The basic motive is to provide faithfulness to the users of the website.

Universality: Universality is one of the unique features of web usability. The users can be from diverse backgrounds with different cultures and different values. However, web usability assures that all its users of a website are accommodated **.**A local culture is considered which can be used by all the users worldwide.

Usefulness: Web usability is useful. The users can solve any type of real problems efficiently. It depends on the features of the website that is being used. Web usability also determines the skill levels and knowledge of the users for carrying out a particular task.

3. Web Usability: Metrics

For effective use of website the metrics helps in measuring the attributes of the website by which academics can analyse and understand the effectiveness of the website usability. “Measurement is a process by which numbers and symbols are assigned to an attributes of an entity in a way that helps describe the entity according to clearly defined rules”[5]. Usability testing is done to evaluate the ease with which a naive user could use a website. The user's comfort in using the application is also unveiled by considering the parameters like flow, navigation and layout, speed and content. It includes the components like learnability, memorability, efficiency, errors and satisfaction. Further the testing could be detailed to have good understanding of quantitative measures of these parameters with the help of different metrics.

Completion Rates: The completion rate is the fundamental and simple measure of usability. It typically records the success or failure in binary format. The Usability problems encountered are another metric which may bear the severity ratings as well. This measure enables knowing of the probability of the occurrence of the problems and also which users encountered with it. A probabilistic assessment is done, to improvise the website usability.

Task Time: A metric to measure the efficiency and productivity of the website is task time. It records the total time of completion of the task.

Task Level Satisfaction: Task level satisfaction facilitates the recognition of difficult tasks by prompting

the user with a simple question about how difficult the task is.

Test Level Satisfaction: Test level satisfaction metric is used to measure the overall ease of usage of the website by analyzing a set of questions posed at the end of the usage.

Errors: Errors are the unintended action or mistake made by a user while attempting a task. Different errors are recorded and the number of times of their occurrence is also noted such that changes could be made to minimize them.

Expectation: Expectation is another metric which emphasizes on the level of difficulty of the task on comparison to the expected level of difficulty.

Page Clicks: A fundamental tracking metric for measuring the success of the website is number of clicks or views. These clicks are correlated with the time of click which could be developed as an effective measure of efficiency.

All the above mentioned metrics measure the usability of the website considering a particular parameter. Single Usability Metric describes the usability of the system by combining all these metrics into a one. It is the standardized average of measures of effectiveness, efficiency and satisfaction. SUM typically comprises of completion rates, task level satisfaction and task time.

4. Benchmarking Web Usability

"Benchmarking is a measuring method widely used by companies to improve many areas of activities including human resource management ,information system, customer processes, quality management ,purchasing and supplier management"[6]. The aim is to identify the best practices of other organization and implement the practice in their own operation to improve the usability.. The usability activities are elaborated with errors finding and fixing on websites to know how usable a website is to be used .It is important to decide on benchmarks while evaluating the web usability quantitatively. It helps the evaluators in measuring and comparing data with the benchmark.

The following steps are involved in the scrutiny of the web-usability in Benchmarking:

1. **Users Identification:** The first task is to identify the target audience for measuring the web usability. The users experience plays a crucial role in deciding his ability in performing the task. More experienced user performs the task with ease and vice-versa. Also Web usability design deals with .designing the website which is user-centric. This helps in increasing the usability of the website.[2]

2. **Searching the users:** All the users who are suitable are invited via emails to test the usability of the website. Only selected target audience are invited to increase the efficiency of the web usability in the benchmarking method.

3. **Designing the tasks:** Once the users are selected, the next step is to design the tasks. The tasks are the variables based on which the usability is measured. While designing the task it is seen that the task is of equal level for both experienced and for non-experienced users. These tasks are integrated into the website to measure the web usability of the website.

4. **Comparison for standalone website:** In general we tend to determine the usability of a single website. This does not allow any benchmark for comparison. Therefore we compare the standalone website with another website to determine its efficiency in web usability.

5. **Measuring the Task:** The major component of the web usability is the task metrics. Though we cannot simply assess the web usability of a website through its task metrics. There are other key components which affect it.

6. **Test Metrics:** For measuring the usability of the whole website we prefer the Test metrics. This gives the analysed information of the website and its usability.

7. **Sample size:** We need to consider a sample size to determine the web usability of a website. We choose the sample size based on various factors such as the tasks in the website and other variables. Using this sample size we measure the usability for a particular confidence level.

5. Conclusion

From the analysis of the articles it is seen that the web usability has a direct impact on the success of a website. Benchmarking website plays a crucial role in evaluating website. The usability of a website can be decided based on creating a benchmark. However, It was noticed that the importance of factors impacting web usability also depends on the kind of website. Hence, it is important to

note the fact that measuring web usability is important in designing a website or implementing a web application.

6. References

[1] E. Mendes, N. Mosley, and S. Counsell, "The Need for Web Engineering: An Introduction," in *Web Engineering*, E. Mendes and N. Mosley, Eds. Springer Berlin Heidelberg, 2006, pp. 1–27.

[2] P. Yan and J. Guo, "The research of Web usability design," in *2010 The 2nd International Conference on Computer and Automation Engineering (ICCAE)*, 2010, vol. 4, pp. 480–483.

[3] H. Banati, P. Bedi, and P. S. Grover, "Evaluating Web Usability from the User's Perspective.," *J. Comput. Sci.*, vol. 2, no. 4, 2006.

[4] A. Seffah, M. Donyaee, R. B. Kline, and H. K. Padda, "Usability measurement and metrics: A consolidated model," *Softw. Qual. J.*, vol. 14, no. 2, pp. 159–178, Jun. 2006.

[5] J. W. Palmer, "Web Site Usability, Design, and Performance Metrics," *Inf. Syst. Res.*, vol. 13, no. 2, pp. 151–167, Jun. 2002.

[6] S. Hassan and F. Li, "Evaluating the Usability and Content Usefulness of Web Sites: A Benchmarking Approach," *J. Electron. Commer. Organ.*, vol. 3, no. 2, pp. 46–67, 32 2005.