Evaluating Usability of a Website

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Abstract — **Software Testing is necessary because human make mistakes while developing the software product. When testing the Software product its functionality as well as nonfunctional characteristics should also be tested. Complete functionality cannot be achieved if the system is not usable, thus usability must be elevated to the same priority as functionality.**
There are many usability testing techniques are available, but selecting the best technique which will uncover the most of the usability problems and satisfy the user is challenge today. In this paper, comparison between the Concurrent think aloud method with other usability evaluation techniques is done and how to use hybrid usability testing technique for different types of websites is proposed.

Keywords: **Testing, Usability testing, Think Aloud Method, Usability Heuristics**

I. INTRODUCTION

Usability testing is nonfunctional type of testing which should be performed at all test levels. The usability of a website defines how well and how easily a visitor without giving any training can interact with the site and completes his task happily.

It is important to perform usability assessment of different h/w and s/w products before delivering it to users so that cost of maintenance and training to him can be reduced to a great extent. ISO 9241 defines usability as the satisfied completion of work with effectiveness and efficiency by any user.

A. Usability is defined by five usability components as follows:

Learnability- If first time user is coming to the site then how easy it is for him to accomplish the basic task defines learnability.

Efficiency- If user has learned the site then how quickly he can perform the tasks.

Memorability- If user is using the site after a long time then how easy it is for him to reestablish the proficiency.

Errors- How many errors does user make, how severe those errors are and how easily he can recover from those errors?

Satisfaction- How much user is happy and satisfied after using the site?

B. Requirement for Evaluating Usability of a website

Along with the development of information and knowledge oriented society, more and more websites have been created and used. Surfing online is a kind of interactional behavior, so usability can be seemed as an important factor in the use of websites too. User's tasks should be supported efficiently on a usable website. How to judge whether a website is usable or not? The answer is applying usability evaluation methods.

Complete functionality is not achieved if the system is not usable hence usability of the website should be assessed at the same priority like functionality. Better usability will result in more satisfied interaction between the user and site and there is a probability that user will beck to the site or you can say there will be more hits for your site and your purpose is achieved.

I. LITERATURE SURVEY

Raquel Benbunan - Fich did research on systematic qualitative technique known as protocol analysis or think aloud method to examine the usability of a website. In Which Users or participant has to loudly verbalize their thoughts or problems they encounter while using the site. About 15 usability principles and 3 evaluation parameters Content, navigation, Interactivity were used as a framework to analyze the verbal protocols of a sample users interacting with the website. [2]

Lynne Cooke has done deep study on concurrent think aloud protocol. Think aloud protocol is basically divided into

1) Concurrent Think Aloud:

In concurrent Think Aloud method user has to verbalize their thoughts at the same time they are performing assigned task with the website. CTA identifies usability problems in a time-effective manner.

2) Retrospective Think Aloud:

In Retrospective Think Aloud method, participants are asked to perform the task quietly and then verbalize their experience at the end of the testing session. In Retrospective Think Aloud there is a problem of memory decay because the thoughts come from the long term memory.

Cooke found that there are following issues in Concurrent Think Aloud method:

1) CTA Accuracy- How accurate are the statements the user produce?
2) Verbalization categories- under what category does the verbalization fall?
3) Reason for silence during verbalizations-What does user's eye movements reveal about their behavior when they are silent?

Afifa Lodhi has done Heuristic Usability Testing on website, where she has used 10 heuristic defined by JAKOB NIELSEN for evaluating usability of a website. [4]

Ashok Sivaji1, Mohamed Redzuan Abdullah1, Alan G. Downe2, Wan Fatimah Wan Ahmad3 has proposed hybrid usability methodology comprising of Lab based usability testing [LBUT] and Exploratory heuristic Evaluation [EHE] [3].

II. TECHNIQUES FOR EVALUATING USABILITY OF A WEBSITE

1) Concurrent Think aloud Method with lab based testing

Initially Test activity to be performed is given to the participant, the eye movements, onscreen actions and verbalizations of participants are recorded. Two video tracks are used one that captured participants' on-screen actions and verbalizations and another that captured their eye movements.

Website is selected such that it is free of animation, pop ups and advertisements, because it might cause rapid eye movement not related to task performance. The participants are selected such that they should be regular users of Web and have not gone through the same website before [1]. Participants were not told that their Verbalizations are analyzed for content, since doing so would likely affect Participants verbalization quantity and content. Instead, participants were told that the study was a usability test of the website.

Finally the Data Analysis is done on participant Actions, verbalizations and eye movement addressing following issues

1) Verbalization Categories- under what category the statement produce by participant falls. Like it is just Reading, Procedure, Observation or explanation of the activity.
2) CTA Accuracy- How accurate the statement participants verbalize.
3) Silence and verbal filters- User laps into silence when they are doing complex activity. Hence Eye tracking is necessary to gain insight into user's onscreen activity during periods of non-verbalization.

2) Usability Heuristics Method

In Heuristic Usability testing the software product is reviewed based on set of heuristic or guidelines. Heuristic are the key attributes of software product and are good measuring parameters to assess usability [4]. Usability expert Jakob Nielsen has defined ten general principles or heuristic for evaluating software product and based on that usability testing is done, the ten principles are as follows:

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help users recognize, diagnose, and recover from Errors
- Help and documentation

Following is the procedure for performing heuristic usability testing where initially heuristic usability survey is done by users then it is done by experts and then defect list is aggregated.

1) Usability Survey by Users- Initially Usability testing is done by the users who are actually going to use the site. Questionnaire is prepared based on Usability Heuristic, Participant Selection is done and then users rate the product from poor to Excellent.
2) Heuristic Evaluation- Usability Expert does the Heuristic evaluation. More than one usability experts are hired as different people have different views of usability and they review the product based on heuristic.
3) Usability Defect Aggregation- Finally the defects found by both Users and Expert are combined into single list and based on frequency and severity, Criticality is assigned to the Defects.

3) Hybrid Usability Method

A hybrid methodology is a combination of lab Based Usability Testing [LBUT] and Heuristic Evaluation. It takes advantages of strengths of both the method and applies them accordingly [3]. One Uniqueness of Hybrid method is, it is carried out at each stage of the Software development lifecycle i.e. Early, Intermediate, Advanced.

1) Early- Hybrid Usability Testing is performed on the early developed interfaces after the Design phase is done.
2) Intermediate- Hybrid Usability Testing is performed after the Redesigning and Development is done based on the feedback of Early Stage usability testing.
3) Advanced- Hybrid Usability Testing is performed after the Redesigning and Development is done based on the feedback of Intermediate Stage usability testing.

ADVANTAGES AND DISADVANTAGES OF USABILITY EVALUATION TECHNIQUES

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Sr. No.	Technique	Advantages	Disadvantages
1	Concurrent Think aloud with lab based testing	80% Usability Defects can be covered.	It is Costly as Lab need to be set up to gather verbalizations, Eye Movement and Onscreen movement as well as Coverage is less.
2	Heuristic Evaluation Method	There is high Usability defect coverage if Exploratory testing is done and it is Cheap.	It fails for Dynamic Websites.
3	Hybrid Usability Method	Defect Count and Coverage is good.	Cost is more as it is done for all stages.

COMPARATIVE ANALYSIS

Comparison Factors:
Defect Count- No. of Defects Found with their Severity
Resource Requirement- Consist of number of evaluators, users, Moderators and observers required to perform testing.
Workload- No of Hours required to perform testing.
Cost- Resources and Lab Cost
Test Coverage- The no. of web interfaces Evaluated Vs. Developed.

II COMPARATIVE ANALYSIS OF THE USABILITY EVALUATION TECHNIQUES.

| Parameter | Method | | |
	Concurrent Think Aloud with Lab	Heuristic Evaluation	Hybrid Testing
Defect Count	80%, as verbalization produced by users were accurate 80% of time.	100%, Depends as it fails for Dynamic websites.	100%
Number of Resources	More, as Lab need to be set up with participants, Lab Assistant, facilaitators, Moderators etc.	Less, Participant, Usability Expert and Moderators are required.	More as it is equal to resources required for both the method.
Workload	Less, only sample web interfaces are evaluted.	More, as exploratory Heuristic evaluation is done, this includes all web interfaces.	More than both the method but divided in stages.
Cost	More, as cost of resources and Lab set up includes.	Less, as questionnaire is prepared and Evaluated by users and	More than both

Parameter	Method		
	Concurrent Think Aloud with Lab	**Heuristic Evaluation**	**Hybrid Testing**
		expert.	
Coverage factor	Less, as it is not feasible for subject to verbalize more than hour and it is difficult to repeat the study.	More, as all available web interfaces are evaluated.	More than both and divided in stages.

PROPOSED WORK

There are various usability Evaluation techniques available, but we can't use any technique for any type of website, we should think from both test and cost effectiveness point of view. And hence Improved Hybrid Usability testing addressing different types of websites is proposed. Websites are Broadly Divided into:

1) Information oriented Websites- from Hybrid Method only Heuristic Usability can be applied to the Information oriented Websites where scope is less and which are static in nature.
2) Business oriented Websites- Hybrid usability testing can be applied to the Business oriented websites with all interfaces to be evaluated by heuristic approach while evaluating only complex or ecommerce related part by lab based usability testing in later stages.
3) Social Networking Sites- Hybrid usability testing can be applied to the Social Networking Sites with all interfaces to be evaluated by Hybrid approach for all stages as these types of sites are playing main role now a days in E-Business perspective.

III.   CONCLUSION AND FUTURE WORK

It is appropriate to adapt a hybrid method that allows flexibility and adequateness in order to reduce the costs yet maximize output such as product efficiency and effectiveness. But one of the limitation is its cost.

The proposed work will comparatively reduce the cost and efforts while applying Hybrid Usability testing, addressing different types of websites.

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