PROPOSAL OF AN EMPIRICAL STUDY TO IMPROVE MAINTAINABILITY OF WEBSITES

Assignment 2- Part III
Software Metrics (PA 1407)

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I. ABSTRACT

The maintenance activities of any software product can be handled efficiently when issues related to the usability are considered. This provides with a possibility to learn users' choice in advance in order to reflect them in the subsequent revisions. With an aim to improve maintenance activities by decreasing frequent design revisions, in this paper, we present a proposal to carry out a survey and utilise a questionnaire for gathering the required data. We try to evaluate the usability of a children's website by suggesting a suitable empirical method. Our work is intended to serve the web designer's community as a set of guidelines that help in taking informed decisions during a website's design revision. The expected results are estimated to further substantiate our stance.

Keywords: web design, maintenance cost, empirical studies and survey.

II. BACKGROUND

As a part of the previous assignments, we identified the possible entities and attributes required to accomplish our measurement goal. Adhering to the guidelines of the Goal-Question-Metric (GQM) template, we formulated the measurement goal. Recapitulating the purpose of our study, we present it as follows:

Purpose: *"To evaluate the impact of website revisions on its maintenance activities, in order to reduce maintenance cost and effort".*

By revisions, we mean design changes that take place in a website which are often done with an intention to draw users' attention. From the similar studies as suggested in [2, 4 and 6], it is found that there is a significant impact when the aspects such as, user acceptance and user expectation are considered prior to release of a software product. Since the website under evaluation in our study has been developed and deployed, we decide to focus more on the maintenance phase of the website rather than the development, design or testing phases. To contribute in enhancing the maintenance activities, we evaluate the usability. This evaluation is based on a questionnaire designed by using the GQM framework.

In this paper we propose an empirical research method to be carried out in a small web company, called http://pbskids.org that is currently at CMM (capability maturity model) level 4. The maturity level of the company also has significance to our work, in a way that the empirical process can be handled without deviating from the quality standards of the company. With this motivation, we presented a set of metrics in the previous assignment along with suitable scales by

referring to related works such as [1] and [5]. This is done with an intention to measure specific aspects of usability that give us an insight about the maintenance activities.

In the following section, we present the questionnaire used to collect data pertaining to the previously mentioned measures and metrics.

III. QUESTIONNAIRE

In order to measure the usability of a website we have framed a set of questions. The questionnaire was formulated by using a certain standard guidelines as stated in [1]. We framed the questionnaire such that it also forms a part of our survey we plan to conduct. In our survey questionnaire, initially we shall have the general questions like name, age and since when have they been using the website. Apart from these queries, we present a set of questions relating to measuring the usability of a website with a special focus on maintainability. In the table below, we present the questions to be addressed and the purpose of having that question.

S. No	Question	Purpose
1.	On an average how many mouse clicks from the homepage does it take for you to play your favourite game or video?	We framed this question to correlate the responses to the metric i.e., three clicks count and measure the navigability of our website.
2.	On a scale of 1 to 5 how easy is it for you to understand the messages displayed?(5-very easy, 4-easy, 3-sufficient, 2-satisfactory, 1-difficult)	This question is aimed at measuring the readability of our website with the help of a likert scale.
3.	How long would you wait for a response from the feedback team upon posing a query?	The time taken by the maintenance team to respond to user submitted queries plays a pivotal role in evaluating the maintenance of the website. The question is also targeted primarily at parents who will be using the website.
4.	Are you notified of the changes made to the website?	This question is also for parents because it is important for the users to be notified of the changes made in a website and bring it to their attention.
5.	On a scale of 1 to 5, rate the design changes made during a revision. (5-excellent, 4-very good, 3-good, 2-satisfactory, 1-poor)	To understand how well the changes made in a website are acknowledged by the users.
6.	Do you think an internal search option would be helpful?	Certain users are acquainted with the use of traditional ‘search’ or ‘find’ option in a website. Due to the absence of such a feature in the website being inspected, we intend to seek the users’ take on it.
7.	Can you find the website easily over the internet when searched using a search engine?	The usability of a website defines the success of a website to a major extent

		[3 and 4]. The number of indexed pages on a search engine would actually imply to the website's success. Answer to this question will thus help in measuring usability.
8.	On a scale of 1 to 5 how easy is it for you to understand the purpose of the buttons? (5-very easy, 4-easy, 3-sufficient, 2-satisfactory, 1-difficult)	The intuition of buttons plays a key role [3]. Thus, better the intuition better the usability of a website.

Table 1 Motivation for the selected questionnaire

IV. Challenges and Problem Focus

To carry out our study, there exist certain constraints such as lack of control over the changes made during our study and limited access to the earlier version of the website prior to web design changes etc. All such limitations are stated as a part of previous assignment along with possible mitigation measures to be used to handle them. Given these setbacks, the problem focus remains unaltered which is about gathering user response to website revisions pertaining to website design and try to map these findings to improve website's maintenance.

V. Method or Approach

In this section, we explain our research approach and the motivation for selection of research method.

Objectives

Our main objective in carrying out this project is to measure the usability of a children's website namely www.pbskids.org with a main focus on its maintainability. Being part of a CMM level 4 organization, we have a set of defined metrics upon which we plan to measure the usability of the website. We desire to measure the usability from the users' perspective. In achieving our objective we have chosen survey as our method for empirically evaluating the usability of the application.

Data Collection

For the survey we intend to conduct, we plan to adopt two data collection methods. One is an online survey questionnaire, where we would post the questionnaire on the website under inspection followed by notifying the users to take the survey and finally, we would collect their opinions. By posting the questionnaire only on this website, it will restrict the people taking the survey to only the users who have been using it. Hence, this will reduce the total number of obsolete responses that generally tamper the quality of the results obtained. The second data collection method is by direct observation, where in we present the same questionnaire to some of the users who are acquainted with the website and practically observe how their responses are. This would result in more concrete and reliable answers.

SELECTION OF SUBJECTS

It is essential that the participants required for extracting the data are selected appropriately so that they reflect the entirety of a user group [1][6]. Children and parents form the two classes of users of this website. Therefore, it must also be noted that during analysis, two distinct set of data must be considered, one based on parents feedback and the other based on input gathered from children. However, the combined results are considered while drawing conclusions and analysing maintenance effects. Therefore, the responses gathered are differentiated by the age as submitted in the questionnaire.

RESEARCH METHOD

As our work involves investigating the impact of web design changes on the overall usability of a website, the nature of study involves a retrospective approach. Further, the opinion of a general user base must be considered to evaluate the usability aspects. These two aspects of our study are contrary to the principles of a *case study* where, research is conducted in a typical environment. Also, an experiment would not stand as a possible approach either, because it involves taking control over variables related to the study. In the present work, no such control exists as the website under evaluation is subjected to design revisions that cannot be influenced. Additionally, as per the nature of a survey, it helps in gathering a greater scale of input from larger audience which helps in a more effective way of cumulating the data.

RESEARCH APPROACH

The suggested questionnaire is utilised in conducting the survey by following the given steps that form the research approach:

i. Publish the questionnaire in the website being inspected. Also, notify users to participate by providing incentives such as waivers on purchases made in the website etc. This process is time bound and the responses of users must be collected between a stipulated period of time.
ii. Simultaneously with the online method, we circulate the questionnaire to a group of selected participants who reflect the general user group and identify key aspects of web usability by direct participant observation.
iii. We then collect the data submitted by the users and discard any obsolete entries by following fundamental principles of survey as stated in [1].
iv. Using the selected metrics and scales, we quantify the gathered data into measurable data sets that help to find an inference.
v. Finally, we map our findings to the maintenance activities and provide a set of guidelines that foster web designers in making better choices.

VI. SUMMARY

This section summarises all our contributions in measuring the usability of a kids' website called www.pbskids.org. We have initially started off by postulating our goal as measuring web usability with an emphasis on maintainability by following the Goal-Question-Metric (GQM) framework. We have formulated questions and for each question we have defined metrics that we will measure. Subsequently, we have mapped the chosen metrics to the attributes and entities and further identified the measurements and scale types. Finally in this paper we prepared a

questionnaire targeted at measuring the usability of the website. Using this questionnaire we propose to conduct a survey as a suitable empirical evaluation method to address the goal.

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