

NEW FRAMEWORK FOR USABILITY EVALUATION WEB ENGINEERING METHODS

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[ABSTRACT]

Usability is an important attribute for measuring a quality of web engineering methods. Also, many usability evaluation methods proposed. The problem is web engineering methods can not complete web development lifecycle especially evaluation phase and the developers sometimes do not meet users' expectations regarding usability. For expressing the actual feedback from developers directly, we have defined a new framework for usability evaluation of web engineering methods. The new framework consists of six phases, in these phases we defined web engineering process development, web application features, usability attributes, usability evaluation methods, and usability testing. In the usability testing, we use several ways for returning user's feedback such as usability testing by expert and group developers, open-ended and close-ended questionnaires, and interviews. This framework is too strong for measuring usability of web engineering methods because it has reach feedback from developers

[KEYWORDS] *Usability Evaluation, Web Engineering, Evaluation Method, Framework.*

1. INTRODUCTION

The rising interest in the internet in current years has brought about the production of a high amount of Model Driven Web Engineering (MDWE) methods that provide a framework of orientation for the Web systems [1]. Conversely, there are high figures of methods with no standard agreement, [24] showed a lack in the employ of principles, and the shortage of both realistic experience and device support. Within the face of this state, a significant need to evaluate the excellence of accessible methodologies comes up.

Usability is considered to be one of the larger crucial quality aspects for Web applications [5]. The complex of developing more functional Web applications has supported the materialization of a huge figure of usability evaluation approaches. Nevertheless, the majority of these methods simply consider usability evaluations in the final phases of the Web development process. Efforts like that of Matera et al. and [6] and Juristo et al. [7] present that usability evaluations should as well be conducted throughout the early phases of the development procedure to enhance the consumer experience and reduce maintenance expenses [8].

To address usability evaluation issues, a process for this aim proposed that named Web Usability Evaluation Process (WUEP), which can be instantiated and integrated into different model driven Web development processes. In this type of processes, intermediate artifacts, which represent different views of a Web application, are used in all the steps of the development process, and the final source code is automatically created from these models. In this context, inspections of these models can provide early usability evaluation reports to identify usability problems that can be corrected before the generation of the source code [9].

The primary problem is that most usability evaluation methods for the Web domain have several limitations such as the concept of usability is only partially supported; usability evaluations are mainly performed when the Web application has been completed [8] on the one hand; whereas ,on the other hand, in the process development of web application by Web engineering methods, the web engineer sometimes does not meet user's expectations

regarding usability. The challenge is current methods for usability evaluation return the feedback from end users and only for the user interface, this is a big challenge for measuring usability by expert people and for context, moreover, the current methods have limitations because it used for usability web applications and return the feedback from web application features.

This paper is organized as follows: Section 2 explains the existing works relating to usability evaluation software and web engineering. Section 3 describes the concept of usability in MDWE methods. In Section 4 we define a framework for measuring usability. In Section 5 we applied our framework for a case study. In Section 6 discusses validity and limitation of the new framework. The last section consists of the conclusion and suggestions for future work.

For expressing the actual feedback from web engineers or developers or expert people directly, we have defined a new framework for usability evaluation of MDWE methods. Significant of our framework is consists of six phases, in these phases we defined web engineering process development, web application features, usability attributes, usability evaluation methods, and usability testing. In the usability testing we use several ways for returning user's feedback such as usability testing by expert and group developers, open-ended and close-ended questionnaires, and interviews. By using this framework, we can get a real image for evaluation usability of web engineering methods.

2. USABILITY EVALUATION

In this section, we explain the concept of usability and usability evaluation. Also, we analyze the existing frameworks and their role in measuring usability evaluation of MDWE methods.

Usability Engineering (UE) is a field that is interested with the inquiry of how to devise software that is user-friendly (usable). UE is a method to the enlargement of software and systems that entails user involvement from the onset and warrants the effectiveness of the brand through the employ of a usability requirement and metrics [22]. UE offers a broad range of approaches and systematic methods for the support of improvement.

These methods are known as UE models or Usability Lifecycles. Cases comprise GoalDirected-Design [23], the UE Lifecycle [24]. Each of them has much in familiar because they portray an idealized method that guarantees the growth of utilizable software, although they vary in their specifics, within the applied approaches and the universal definition of the process, for example stages, dependencies, objectives, responsibilities, and so on [25].

Latest studies point out that the implementation of Model-Driven Development (MDD) has augmented. Presently, there are numerous Web development methods that follow this approach, for instance OO-H, UWE, or WebML. These methods support the creation of a Web application by describing models, together with at slightest one structural prototype, a navigational archetype, and a theoretical presentation model. Several methods as well offer model alterations and automatic code creation. The Web application usability got because of this alteration procedure can be evaluated at numerous phases of a MDD procedure. Fernandez, et al. suggest the employ of a Web Usability Model (WUM) that can be used within the following stages of a MDD procedure: i) Within the PIM, to evaluate diverse models that stipulate the Web.

The ISO/IEC 25000 usability is precisely a quality aspect delineated as “the ability of any software to be comprehended, understood, and employed, while being striking to the user upon being utilized under certain conditions”. This delineation could be adjusted to highly fit within MDWE domain as “the capacity of an approach aspect to be comprehended, studied, utilized and it is user-compelling when used under certain provisions, or generally as “a collection of aspects that allows impact on the effort required for use, plus the personal examination of such utility, by implied or stated collection of users”.

Some quality sub-qualities are established for every quality characteristics. Excellent sub-qualities linked to each quality trait of usability are correspondingly delineated by adjusting additional delineations from ISO/IEC, IEEE, additional standards plus the already published studies. As described by Nielson, Usability entails a quality aspect that examines the accessibility of user interfaces. The phrase “usability” equally entails the

techniques of enhancing accessibility during design procedure.

3. PROPOSED METHOD

In previous sections, we have explained the concept of usability evaluation in software engineering and web engineering. Most evaluations have focused on the end user, while others concentrated on developers. We define a new framework for usability evaluation of MDWE methods, with the results geared towards web engineers. The term “Web engineers” refers to web developers who are working on the web engineering methods and who are generally expert designers.

Phase 1: MDWE method, In this phase, we select a method by which we can obtain a usability evaluation from the developers. There are many web engineering methods in existence, such as: UWE, OOH, IFML, and so on. Also, some methods have been extended after combination or improvement from researchers for different aspects, such as UWE4RIA, which is a UWE method which has been improved for support of RIA. NewUWE [28] is a UWE method which has been enhanced to develop homepages, and so on. The researcher can measure usability of the standard methods or extend methods by this framework.

This phase consists of two parts: the first selects the method that we want to evaluate; the second decides on the method we should use to highlight a particular aspect when we need to show usability. For example, should we wish to show usability metamodels, or usability object-oriented models, or new improvements, etc., the selection of aspect is very important for questionnaires and finding attributes. Phase 2: In this phase, it must be remembered that the evaluator needs to assess which step in the web engineering lifecycle can provide the best usability to cover all phases of the web engineering lifecycle. The lifecycle, as defined by MDA or Agile methods and general Web engineering Lifecycle in particular, consists of: planning, analyzing; design, implementation and testing. Phase 3: Web application Features: web application features based on web engineering methods in [29] explain the attributes that are supported by MDWE methods. These include, for example: Rich User Interface; Adaptivity; design ontology; web mining; etc. Phase

4:Usability Attributes: Usability is defined by five (5) quality components as follows [26]: 1. Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design? 2. Efficiency: Once users have learned the design, how quickly can they perform tasks? 3. Memorability: When users return to the design after a period of not using it, how easily can they re-establish proficiency? 4. Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors? 5. Satisfaction: How pleasant is it to use the design? Phase 5: Usability evaluation methods, There are many usability evaluation methods used in the evaluation of usability of software products. Among these, the more frequently-used methods are : (1) Questionnaire; (2) User Testing; and (3) Heuristic Evaluation[30]. Evaluators can use one of more methods as well as mixed method when combining two or more methods. Phase 6: Process of usability evaluation: This important phase determines show to perform the usability evaluation. We adopted the process usability evaluation from [31] after the enhancement we carried out for our framework, as shown in Figure5. This phase consists of five steps, explained as follows:

Step 1: Usability Testing: this step consists of four parts, as described below: A: Task definition: in this part, we determine the requirements of the task and ask the developers to design the task by the web engineering method selected in phase 1. B: Pre-test: this stage involves implementation of the task by developers. The task can be implemented by way of two methods: Individual task: the task should be implemented by two (2) developers and two (2) expert developers respectively. Group task: the task should be implemented by three (3) groups each of which has three (3) members. These members should be developers or students in the software engineering department. C: Post-test: in this stage, the above developers should redesign the task after improvements to the method have been carried out. D: In this part, we will determine the extent of the usability problem by use of the following equation: $\text{Problems-found (i)} = N(1 - (1 - l)^i)$
 i = number of test users N = number of existing problems
 l = probability of finding a single problem with a single user
Step 2: this step also consists of four parts, described as follows: A: Questionnaire Guideline: although a number of guidelines have been proposed for a list of

usability evaluation criteria for questionnaires, the implementation from developers in step 1 is the best guideline for proposing a list of questionnaires. B: The design process of the questionnaire starts after the analysis of usability test which gives authors a better understanding about the system and how users interact with it. Here we prepare a list of questions with 5 options ranging from: 1- very poor; 2-poor; 3- moderate; 4-good; 5-Excellent. We need the input of a number of developers, experts, researchers and students in software engineering departments. C: Open-ended questions: this is a type of question where respondents are free to respond in their own way. These questions are also known as subjective questions. Here we need to propose some opened questions based on our attributes and our task.

4. CONCLUSION

In this paper, we have defined a new framework for usability evaluation of MDWE methods. Our framework consists of six phases, in the phases we explained all requirements by detail. In this framework we combined the phases of several of frameworks. This framework is too strong for measuring the usability of web engineering methods from web engineers or developers, because when the feedback returned from expert people and questioners form we should make an interview for verifying our framework. Furthermore we applied to a case study successfully. However we have some limitation especially no more expert people in any place for returning feed back or interview, that is the reason not easy to use the new framework. In the future, we plan to adopt a process by which to implement usability evaluation. We recommend that developers use this framework and improve upon it after real implementation.

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