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Increasing usability for web engineering methods

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ABSTRACT

Usability is considered to be one of the most important quality factors for products, and accordingly, there are a number of MDWE methods existing which can develop web applications. With the rapid evolution of web applications, existing MDWE methods has a number of weaknesses was appeared in the process development web applications; one of the issues is usability problem. There are many factors to increase usability of MDWE methods such as adaptability, lifecycle, user interface and so on. In this paper, we define a new framework to increase usability for MDWE methods through two important factors that are adaptability and lifecycle. Increased usability will ultimately lead to increased quality of the methods. Furthermore, increased quality of web engineering solutions would subsequently lead to improved usability for websites and web applications.

Keywords: Usability, MDWE, Adaptability, Lifecycle, Web.

1. INTRODUCTION

Usability is a significant pointer of excellence of the interactive IT product or system. Nielsen has indicated that the usability is efficient, easy to learn, effective, easy to recall the fewer errors and satisfaction for brand consumers [1]. The international standard ISO 9241-11 describes usability in the following manner: efficiency, effectiveness, and satisfaction what are qualities of products in a particular environment for a specific user for specific purposes [2].

The usability engineering concept materialized since people have a stress on the product quality right from the 80s of last century, and after that has equally created a popular area in academic world and business. Usability engineering is a method of engineering for the IT product and user interface development growth right through the stages of the product life cycle [3]. The temperament of web evolution compels designers to concentrate principally on time-to-market matters to attain the necessary short cycle periods [4].

Improved reliability and efficiency of the system will have fiscal consequences by declining user support expenses, and prolonged preparation savings. Usability engineering will reduce technology improvement time and expenses: delayed discovery of grave defects to a system will make the essential re-engineering cost- and time-intensive [5]. Enhancing the computer systems usability is possibly the mainly significant objective of human-computer interaction exploration. Modern approaches to usability engineering appear to concentrate on simply enhancing the interface. A substitute is to develop intelligence into the mechanism. Nevertheless, so as to do this, a further comprehensive study is needed and systems should be planned in order that they can be rendered adaptive [6]. Web engineering methods like OO-H and UWE attempt to present a whole solution to create web pages (or help in their creation), characteristically offering models for the appliance logic, navigation configuration, and the final web pages presentation [7].

The objective of this paper is to clarify the role of usability for web engineering methods. There are many complexities which appear in these methods; one of the problems is that of usability methods from web developers. In this paper, we focus on the usability of the web engineering lifecycle and adaptability; these are two factors to increasing usability methods by web engineers in the process development of web applications. Furthermore, we define a framework that shows how to achieve improved usability through the lifecycle and adaptability.

This paper is organized as follows: Section 2 shows related works for this topic. In Section 3 the concept of usability in MDWE models and methods is explained. Section 4 outlines the factors which can increase usability for MDWE, in addition to defining a framework for increasing usability. The last section consists of the conclusion and suggestions for future research.

2. RELATED WORK

In this section, we review previous research relating to usability effectiveness for software and web development;

usability MDWE methods; usability engineering; usability lifecycle and usability for adaptive systems respectively.

The web usability model [8] is an adaptation and extension of the usability form for model-driven development process suggested by [9]. The model was modified to be acquiescent with the ISO/IEC 25010 (2011) standard, as well called SQuaRE (software product quality requirements and evaluation). This standard was formed for the function of offering a rationally ordered, supplemented, and unified sequence of standards covering two major processes: software quality requirements specification and software quality evaluation. Both of these processes are sustained through a software quality measurement process. SQuaRE substitutes the earlier ISO/IEC 9126 (2001) and ISO/IEC 14598 (1999) standards so as to describe the web usability.

Fernandez et al., (2013) presented the operationalization and empirical validation of a usability inspection method (WUEP) for its use in the WebML development process. From a practical viewpoint, their usability inspection strategy facilitates the development of additional usable web applications through construction [1]. Usability through construction implies that every model built at different phases of a model-driven web development process (PIM, PSM, Code) suits a certain usability level of the matching web use, thus decreasing the attempt of fixing usability troubles when the web appliance is created [10].

Silvia Abrahão et al. (2014) launched a usability examination approach that can be incorporated into definite model-driven Web development methods to generate extremely usable web applications. This approach depends on a usability model that has been built particularly for the web domain and which is adjusted to the SQuaRE standard to permit the iterative evaluation and improvement of the usability of web-based uses at the design point [4]. Martínez, 2012 in his PhD hypothesis deals with the earlier restrictions detected by offering a usability inspection technique that can be incorporated into diverse Model-Driven Web development processes [11].

There are many established Human Computer Interaction (HCI) methods are of value for the design and evaluation of interactive intelligent systems, although there are a number of typical issues that need to be borne in mind and extensions and variants of the methods that ought to be considered. There is also room for new methods. Design research for example [12], can yield new procedures that are relevant and extensible to practitioners who strive to design usable intelligent interactive systems. Behavioral and cognitive scientists can develop new theories and models of users' interactions with intelligent systems. Such models may reduce the extent to which empirical data need to be collected, and they may lead to improved ways of conducting empirical evaluations [13].

Alshammari et al., 2015 presented an adaptive e-learning system. That was designed and built based on knowledge and learning style to support learner-system interaction goals, after did an evaluation between the adaptive-learning system based on learner knowledge and learning style has a higher level of perceived usability than a non-adaptive e-learning system [14, 15].

Panach et al., defined all the primitives that can be used to represent functional usability features. Moreover, they have defined a process to include the Usability Model in any MDD method without affecting its existing conceptual model. The proposal is based on model-to-model and model-to-code transformations. As proof of concept, they had applied their proposal to an existing MDD method called the OO-method and they have measured its efficiency [16]. In another work, STATUS patterns have been chosen because the authors solve usability issues at conceptual level. The main purpose of this work is to improve the usability of web applications automatically generated by OOWS (a model-based web engineering method) applying the STATUS patterns [17].

The previous works showed that usability in MDWE is one of the effective factors influencing the efficiency of systems. It also approved the concept that adaptive systems are more usable than non-adaptive systems. Moreover, it was agreed that usability should be improved during entire whole lifecycle phases. Finally, there was a suggestion that increased usability through extension models and defining new models would be desirable.

3. ANALYZING USABILITY IN MDWE

In this section, we analyze usability in MDWE and the factors relating to improved usability, especially concerning adaptability and lifecycle.

3.1 Effective usability

Interaction design largely deals with activities related to improving usability. Usability is generally regarded as ensuring that products are easy to learn, efficient to utilize and pleasant form the user' perspective [18]. Nielsen [1] as shown in Figure 1, describes usability as a sub-attribute of convenience and separates it into five different properties that are relevant to a system:

- Learnability (simple to learn).
- Efficiency (effective to use).
- Memorability (simple to recall how to utilize
- Errors (users make little mistakes, good mistake managing so users can recover from any
- (error).
- Satisfaction (enjoyable to employ).

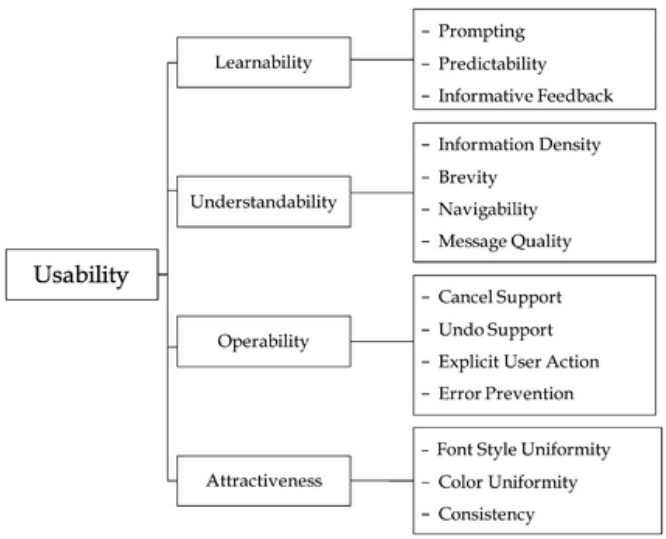

Figure 1. The proposed usability model extended from ISO/IEC: ISO/IEC 9126 [19]

Within interaction design, usability is not a detached aspect or something that can be attached to a product finally. The usability of a brand is an outcome of systematic effort that

begins at the starting of the scheme.

3.2 Usability and agility

Agile methodologies follow a life cycle which is iterative and incremental in nature, agile methodologies assisted designers to finish the projects within few minutes using high quality. Awad (2005) defined the features of some conventional and agile methodologies that are extensively applied in software improvement. Moreover, he talked about the strengths and flaws between the two contrasting methodologies and offered the challenges linked with executing agile procedures within the software business. This anecdotal proof is growing concerning the efficiency of agile methodologies in definite settings [20]. Furthermore, Kirstinsdottiir (2012) executed his scheme with an IT consultant firm in Stockholm, Sweden. The firm wanted to incorporate usability actions into their agile software enlargement procedure. The hypothesis provides an introduction to the way User-Centered Design, and Agile interconnect in reality, and the way usability work can be traded to consumers [21]. Moreover, Nielsen (2011) discovered a means for agile software creators and consumers to incorporate usability within agile software development procedures by initiating practices and methods from communication design and employing them to create and check software necessities [22].

Methods of agile software development are presently becoming the business standard for web application development. Conversely, MDWE methodologies are acknowledged to advance productivity when constructing this type of applications. Nevertheless, modern MDWE methodologies seem to disregard significant features of web applications creation endorsed by agile procedures such as continuous consumer criticism or early plan of consumer interfaces. Rivero et al. (2014) studied the challenges of supporting agile aspects within MDWE methodologies. Subsequently, they offer a method that eases the integration of recognized agile practices to MDWE, also they projected employing User Interface models (generally identified as mockups) as a means to begin the modeling procedure in the milieu of a different agile-MDWE procedure. To help this procedure, they described an inconsequential metamodel that permits modeling aspects over mockups, communicating with end-users and creating MDWE prototypes. Then, they carried out a statistical assessment of both methods (customary vs. mockup-based sampling) [23].

3.3 Usability and adaptability

Adaptability has been confirmed to be an influential and helpful concept in diverse domains [24-27], nevertheless, designing efficient adaptive approaches from a usability viewpoint is viewed as a demanding mission. Learners' favorites, behavior, and knowledge all change eventually, and any system employing the concept of adaptation requirements to adapt to these changes. Additionally, the intricacy of learner-system communication can be improved and simplified through adaptability that might conquer or at least alleviate the problem of data overload [28].

Adaptive models and frameworks symbolize a significant research region [29]. The adaptive framework is described as a theoretical model that has major elements so as to produce adaptation. This part emphasizes several of the adaptive frameworks to comprehend their main elements and how they are offered and applied to give adaptation. Adaptive primitives are initiated into an already described navigational prototype since adaptive methods influence the appearance of the hyperlinks and contents of a page that are defined within the navigational diagram of the appliance. Conceiving this schema as a sight of the structural diagram of the appliance domain, characterization of the planned users of the application is integrated into this structural description. Moreover, to endorse the modeling choices that can be made from the latest theoretical structures, a necessities model for adaptive web applications has been initiated that consists of the specification of the needs of adaptability and the knowledge of the planned consumers on which the adaptability is founded. Targeted at endorsing the traceability of these necessities, a set of alteration regulations has been described that permits systematically attaining the correspondent conceptual definition of every adaptability need in stipulations of the initiated adaptive primitives [30].

3.4 Usability and MDWE

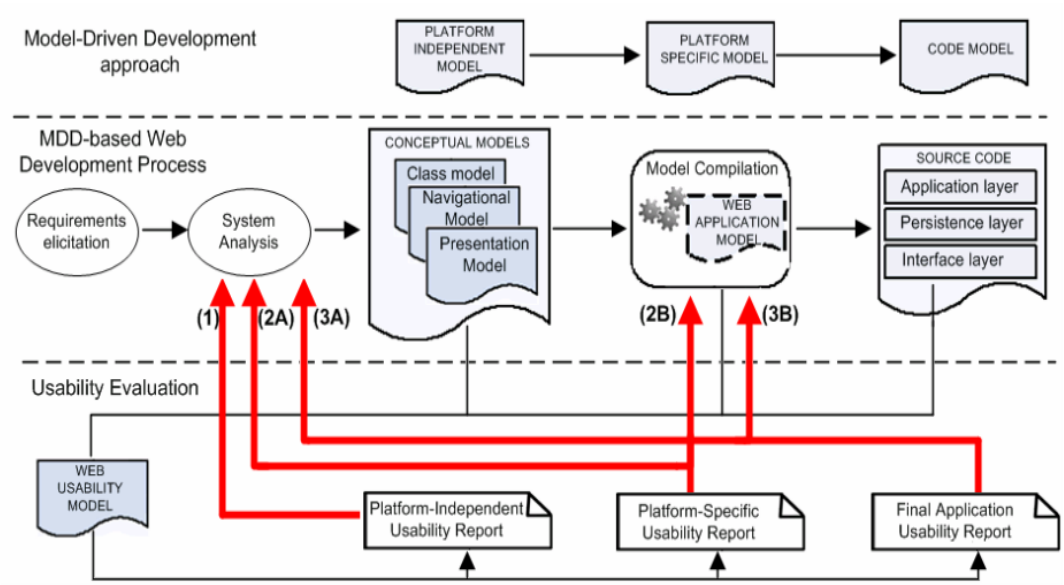

Figure 2. Integrating a web usability model into the MDD process [31]

Latest studies point out that the implementation of Model-Driven Development (MDD) has augmented. Presently, numerous web development methods follow this approach, for instance, OO-H, UWE, or WebML. These methods support the creation of a web application by describing diverse models, together with at slightest one structural prototype, a navigational model, 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 process can be evaluated at numerous phases of an MDD procedure. Within this essay, Fernandez et al. (2009) suggested the employ of a Web Usability Model (WUM) that can be used within the following phases of an MDD process: i) Within the PIM, to evaluate diverse models that stipulate the web application separately of platform particulars (such as navigational models, models that symbolize the conceptual UI); ii) within the PSM, to evaluate the real interface models linked to a particular platform; and iii) in the CM, to evaluate the last UI (see Figure 2) [31].

3.5 Conclusion usability in MDWE

There are many factors to increase usability web engineering methods, some projects done to increase usability web engineering methods, each work by different peoples tried to increase usability in different aspects. The exits working could not increase usability with high efficient. Also they use only one factor. For increasing usability, we need to use more than one factor to web engineering methods such as adaptability and life cycle.

4. DEFINE A NEW FRAMEWORK TO INCREASE USABILITY

The field of MDWE is relatively new in software engineering, with evolving web applications of MDWE methods needing to improve based on requirements in different domains. Accordingly, we have proposed a systematic mapping study for MDWE. In the result, we explained how the research focus, adaptability, agility, and process development are the focus of research in MDWE [32]. In addition, there are many factors which can increase usability methods such as agility and adaptability as explained in previous sections. moreover we extended the UWE metamodels to increase usability of the method [33, 34]. In the recent work for increasing usability and adaptability the method we extend IFML method [35], and we analyzed IFML for cover lifecycle in two works for presenting usability IFML method [36-37]. In this section, we define a new framework by which to increase the usability of MDWE methods. As has been previously explained and approved, MDWE usability increases by improving Lifecycle, especially with the Agile model. In addition, another factor which can increase usability MDWE methods is adaptability, since adaptive models in the methods become more efficient following the use of the methods. Finally, we combine this to factor in the methods in MDWE. As shown in Figure 3, MDWE has normal usability but achieves increased usability after adding lifecycle factors. Further, it is also more usable after adding adaptability influences.

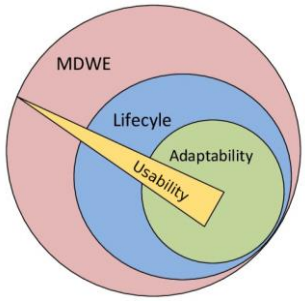

Figure 3. A new framework for usability MDWE methods

Above figure (Figure 3) shows usability framework for web engineering methods. In the first circle (MDWE) usability starting normally, one of the aspects in MDWE is cover lifecycle, after solving whole lifecycle phases for the MDWE methods in second circle (Lifecycle) the usability increased, then we can solve adaptability aspect in the whole lifecycle as shown in third circle (Adaptability) usability more increased. Finally, we can conclude after solving lifecycle issue and adaptive models usability increased as shown by yellow triangle (Usability).

5. CONCLUSION AND FUTURE WORK

In this paper, we have analyzed the problem of usability for web engineering methods by solving the lifecycle issue, and adding adaptive models for the methods. We have defined a new framework for MDWE methods. In this framework, we have been able to increase usability after applying whole lifecycle phases and adaptability for the methods together. The methods will be more efficient and dynamic in order to develop web applications. We recommend implementing this framework during web engineering projects, and improving it through different models and mechanisms for improving lifecycle and adaptability. Further, we suggest the combination of other factors to this framework to increase usability.

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