Usability Practices in Software Development Life Cycle: A Review

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***Abstract*— the success of any software or product depends on many factors and the usability is one of the most important factors. Usability is considered as the quality of software. The review describes what barriers occur for implementing usability, how the security of a system can be affected by the bad usability and the usability problems in much software of different fields are also explored. It is also discussed that developers have less knowledge about ergonomics, aesthetics and usability, there is need to fulfill this problem. Many studies provide guidelines to the developers for improving usability during software development and to stop the system failure at the final stage and to stop the obstacles of the usability implementation. There are many usability methods that can be used to assess the usability problems at the earlier stage of software design to overcome the severity level and to avoid the rework of design. Once the software is launched then the errors become failure hence the usability guidelines are helpful to stop the failure.**

Keywords—component; formatting; style; styling; insert (key words)

I. INTRODUCTION (*HEADING 1*)

Software engineers are struggling from a long period of time to add usability features of HCI in software codes. This process requires the implementation of usability recommendations for software design and architecture. There is a special need to focus on the usability features to design interactive software along with the application logic and it is not an easy job [1].

To avoid rework of design usability issues must be solved at early phase of software development. To develop usable and understandable software it is necessary for the developers to have knowledge about the HCI field such as ergonomics, psychology and linguistics etc [2]. According to Donahue spending each dollar to enhance usability and you will get $30.25 from it [37].

Software's success depends upon the "ease of use", if user feels easy to use the software and if the given interface is fulfilling the exact requirements then the software accepted as the qualified software. Usability is not just about user interface in fact it is about whole system with which user interact [26].

Bad usability becomes the only main reason of software failure [3]. For example, IBM registered more than hundred employees according to the principles of usability and its estimated cost is in millions. Before the process of redesign the button "help" was most famous feature and later than redesign the usage of this button was decreased with the ratio of 84 % and sales increased 400% [4].

A. Human Computer Interaction (HCI):

HCI is a study which design, evaluate and implement computer systems in an interactive way for the use of human [5]. HCI can be used for achieving latest techniques to support the user and to provide the best ways to communicate [6].

B. Usability:

"Usability consists of satisfaction, memorable, efficiency; learn ability, low rate of errors and easy recovery of errors" [7].

C. Software Engineering:

According to "IEEE" Software engineering is defined as systematic development and design of software products and the process management. The primary objective of Software engineering is to produce programs which should be accurate, timely, according to budget and also fulfill the specifications [8].

D. Usability engineering:

"Usability engineering is defined as a technique of how systems are developed and verified using experimental methods to accomplish efficiency, effectiveness and satisfaction for particular users that perform definite objective in a certain environment" [9].

II. Related Work

In this study [10] authors provide the guidelines for usability which based on heuristics and related criteria. These guidelines are useful during the design process of banking software in early stages. It will reduce the complex structure of the system. Three steps are involved in this study. First, from three development projects of banking software the usability problems are categorically managed according to their level of severity. Second, the criteria of usability rated for how fine they clarify the problems of usability encountered. Third, usability heuristic categories are made by cluster analyses and corresponding analysis in accordance the severity level. Problems of usability are collected from usability evaluation's database of three banking software and three experts are involved together with the author. The IT department conducts this and several functions of software are used by the employees. For the evaluation of banking software the cognitive walkthrough is used [11]. Total 266 usability problems are recognized in this study. According to [12] three factors persistence, impacts and frequency defines severity level of usability. To rate the severity level of every usability problems a scale is used (0-4 rating). All three experts gives severity ratings individually and these ratings are totally indecent to other experts. The final severity rating of every usability problem is decided based on the mean of ratings collected by all three experts. Because of the complicated relationship of usability problems to heuristics two techniques of statistics are used to express the every severity level. To reduce the rework of software after the completion of design/development process these usability criteria provides the guidelines at the early stage of the design process. Designers, project managers and developers pay extra attention to usability heuristics. These guidelines are helpful to overcome the major problems of usability and usability disasters.

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At the present time usability is the basic cause of the victory of any technical product. In terms of software if there is lack of understanding about the product and it is difficult to use than this product is considered to be failed [13]. The purpose of this study [14, 15] is to improve, extend and update the previous work and to identify the techniques that are mostly used to evaluate usability in software development. An examination of the consequences identifies the mostly used techniques for each type of software. The mapping review is performed on 20-june-2015. For the process of review 215 out of 1169 studies are selected after the criteria of exclusion and inclusion. It's analyzed that for the purpose of assessment the questionnaires of usability are established by most of the case studies. And the applications such as health informatics and web applications are mostly reported in this evaluation. In [14] presents the fine points concerning the quantity of studies founded at the time of search process. For the indication of mainly used assessment method of usability, it analyzed that which technique is mostly reported in related papers. This contribution is intended to serve and support the decision making facility for specialists to select the most suitable usability evaluation method for a specific situation. In [14] shows the strength of reported applications and usability evaluation methods.

In this work [16] defines the security and usability of software. The usability of an interface is the need of system's security it is the main podium of interaction between users and system. In [17] the usability and software engineering methods can affect risks and efficiency of user's tasks. According to developer beliefs the understanding of the user requirements and system's risk will challenge the necessity of security and interactive design, because of these belief developers feels that they will not get an acceptable reward by applying the usability and security techniques [18]. Security and usability both have much importance during the interface design phase. It is important to design an interface with best security and with ease of use. Usability and security both are the important factors for a satisfied, successful and secure system.

This contribution [19] is done by SME to find out the problems that occurs in the integration of usability engineering into software engineering. SME (small and medium enterprise) is belongs to the software industry of German, it provides solutions to the specific requirements of customers [20]. This paper presents the existing result of a work that have done in 2012. That study concluded the process or behavior of SME toward usability in the routine to solve the problem of customers for usability. In this work 25 interviews were conducted to figure out the process of development and for the usability approaches in ten SME. Many factors as constraints in the way of usability integration were find out. These constraints are time, cost knowledge, less interest of users toward usability and inclusion of users. Usability techniques only used infrequently not logically in projects. It's the need of today to build up comprehensive useful guidelines to overcome this problem.

This paper [21] aims to determine and present state of usability in the life cycle of software development through a technique called 'Statistical Heuristic Assessment' (SHA). SHA is an investigative and essential technique of User Experience for the evaluation of software designs and it is very effective in requisites of cost and time.. With the help of this technique the level of usability issues is highlighted and the user experience is enhanced in an appropriate way. This approach leads to the correct timing and correct selection of tools to identify the negative and positive usability behaviors in developed, existing reengineered and redesigned software. By identifying these kind of problems it is concluded that the issues of usability occurs due the lack of knowledge about User experience techniques, standards of usability and less understandability of business contexts and strategies. The purpose of SHA is to confirm the efficiency, adaptability, effectiveness and fitness of the system for the user. To overcome the later on usability issues the SHA is utilized earlier in the different phases of SDLC which are discussed in the paper. Every recognized usability issue rated and the level of severity is arranged on the bases of usability measurement scale. Scale has different levels such as low, very low, moderate, critical and very critical. The work is done by consultants who are trained in UX context. Consultants gather data that is related to both goals of users and business. The consultant's study the product in detail to understand the product's use and this study facilitate them to find out the issues of tasks done by users. After identifying the issues solutions are provided and conveyed to stakeholders through presentations. The outcome is provided in the form of report which is written in simple language. The report provides solutions related to defined issues of low, medium and high levels. The focused and intelligent consultant's are the reasons of classy reports. Reports are presented to stakeholders and open discussions are taken to improve the software and the experience of users.

In this study [22] firstly two dimension security and usability are defined. The role of these two dimensions is tested that how they influence IBUS (Internet banking use with a smart phone) as moderators. Secondly it is examine that can the usability and security have an interaction or not to influence IBUS. It is examined that the factor perceived security is crucial to the IBUS according to the customer's perspective. So, it is proposed that the security factor has a negative effect on IBUS. To examine the influence of usability dimension on IBUS two factors are identified perceived ease of use (PEU) and perceived usefulness (PU). "To make the Internet banking systems further useful, it requires to be easy for use and learn" [23]. It is concluded that PEU and PU directly affects the IBUS. This [22] paper have many hypothesis by the means of security and usability. A questionnaire containing two parts is used to gather data. One part consists of nominal scales and the second part consists a likert scale (seven point). The sample population is the residents of Columbia, Missouri and the ages are more than 20 years. 131 out of 160 questionnaires are analyzed. The response rate was 81.9%.Results of this study shows that IBUS significantly influenced by security issues, PU and PEU. It also concluded that security and usability factors PU and PEU moderate the relationship of user's perception toward the security and usability

This work [24] is committed to find out the usability problems in an EHR by using three kinds of methods including end users. Two dental schools are selected to evaluate the usability of EHR. To answer the usability problems a single method is not enough so three methods surveys, user testing and semi structured interview are involved in this study to efficiently evaluate the usability problems. This work is enhancement or an extension of a previous work [25]. Investigators conducted the usability assessment at school and the strength of end users was 32 for testing. The tasks of users related to usability were evaluated through different tools discussed in paper. The strength of end users was 36 for the user interviews taken by investigators and recorded by using different applications. The survey containing four open ended questions was conducted on 35 subjects. The usability problems were evaluated through these three methods by observing the users behavior toward usability and by also their complaints. The problems are settled according to previously defined 24 themes [25] and currently defined 4 themes in this study. Statistical software package was used to analyze data. The amount of usability problems was 187 which were finds out by the three methods. The higher rate of themes was identified by the user testing technique. These methods provide both qualitative and quantitative data. Therefore, the use of three combined methods is more beneficial for evaluating the usability problems not only for EHR but also for other health technologies.

The purpose of this study [26] is to enhance the investigation of the relationship between software design and usability. The focus is on two things, first to find out that is whether usability affects the software at the time of development. Second to analyze the impact of usability on software development. Authors have termed these HCI recommendations functional usability features (FUF). The features of usability that affects the designed defined by different authors are considered as functional usability features (FUF) in this study. FUF consists of a list of features and it applied to test the impact on designs and to detect the compatibility of real design and impacted design. To assess the relationship between design and FUFs the work has done on several actual projects. It is done by UPM and by the students of software engineering between 2004 and 2005. First the students develop the projects without using FUFs and later on the system was customized according to the proposed FUFs. Along with the recommendation of

usability the work has defined three categories on the bases of their impact on the development of software. First category defines the impact of user recommendations of usability on interface such as menus, buttons, colors etc. Second category defines the impact of user recommendations of usability on the process of development. In this category the guidelines naturally support the interactions of user system for the facility of users. Third category defines the impact of user recommendations of usability on design such as terminating a current task [27] disengage a task [28,29,30] getting response on running functions of system [28,31,32] or picking functions of software for the profile of users [29,33]. The results provide guidance to developers that when and where the FUFs have to be applied the impact of these FUFs on requirement specification and elicitation.

The work [34] presents techniques which can be applied at different methods of usability engineering which and can be used in a development lifecycle of a product in different points to design a pretty good interface for web pages, software and applications. Methods include, testing and design techniques, requirements analysis, managerial and organizational strategies. The methods are used by developers, practitioners and managers. It offers several principles for good quality design [35]. We want a system containing the multiple functionalities such as ease of learning and use, error handling power, flexibility, low cost, intelligence etc. The designers and developers of software need an appropriate process to develop software which have a good design and provide the ease of use. The purpose of this study is to provide the topics to enhance usability and also the way to pick method why and when [36].

III. Analysis

At the present time usability is the basic cause of the victory of any technical product. The usability of an interface is the need of system's security; it is the main podium of interaction between users and system. If a system provides ease of use and satisfaction n to users then this system considered as a secure, efficient and successful system. There are many constraints such as time, cost, knowledge, less interest of users toward usability and inclusion of users which becomes the reasons of usability disasters. It's the need of today to build up comprehensive useful guidelines to overcome this problem. A number of valuable studies have done a very good work on usability guidelines but there is still a lack of a proper guide and still some deficiencies in implementation of the guidelines. The less knowledge about HCI term should be improved and the usability features should be applied in an appropriate manner at the earlier stage of software design. Developers focus should also be on the usability as usability is not just about the user interface in fact it is about the interaction of full system and users.

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