

The Need For Usability Risk Assessment Model

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ABSTRACT

Usability is an important factor in ensuring development of quality and usable software product. Ignorance and unawareness about the concept of usability and failure to address usability during software development process has led to usability problems in software product. Many efforts has been suggested in literature to overcome usability problem in software products but current practices faces challenges in reducing these usability problems. Alternatively, the concept of risk management can be used to control usability problems even though these problems cannot be eliminated totally. The concept of risk management is important to deal with usability problem before it occurs. Unfortunately, there is still lack of proper definition of usability risk and a proper model to identify, analyze and prioritize potential usability risk during Software Development Lifecycle (SDLC). This paper presents comprehensive study on the need for Usability Risk Assessment Model to reduce usability problems in software products.

KEYWORDS

Usability; Usability Problem; Usability Risk; Risk Management; Software Risk Assessment.

1 MOTIVATION

Software quality has emerged as important aspects of software development process, as it might result in serious consequences such as financial loss and reputation loss [1]. Quality improvement after development of software is not recommended because it only increases the cost and is almost remaking the product [2]. Poor software quality has been identified as the key factor for success or failure of a software product [3][4][5].

Usability has been recognized as an important quality factor in various quality model [6][7][8] and has always been present even in the very first model of software quality known as *McCall Factors Criteria Metrics (FCM)* proposed by McCall in [9].

Study has shown that ignorance and unawareness on most referenced usability standard, ISO 9241-11 among industries [10] and governmental organizations [11] in Malaysia, has created various usability problems in software products [12]. Existence of usability problems are also reflected when usage level of software products is low [13]. A survey by Malaysian Administrative Modernization and Management Planning Unit (MAMPU) in 2011 had reported that the usage of online services in government is only 40% of the overall online services provided [14] and this result shows that users are exposed to higher usability problem in using online services[15] [16] [17].

To increase the rate of successful software project, it is crucial to reduce usability problems. Usability professionals have expressed that by integrating usability closely with software development process [18], usability problems can be reduced. There are many efforts to integrate a formal usability process, standard, techniques and practices into software development process to improve the interaction and quality of the systems [19][20]. However, software developers face difficulties when new usability practices are introduced [21]. Some usability approaches are only integrated in requirement and design phase [22]. In fact, their practical implementation is largely missing. Usability practices as well are not part of requirement engineering [19], so developers are often given an incomplete,

confusing, and sometimes contradictory requirement.

Besides this, various usability evaluation activities such as inspection, empirical testing, and metrics for usability standards in computing has been integrated into software development process to measure and improve usability of software [23]. However, it only evaluates a completed system and does not intervene at earlier stages of development process [24]. An International standard, ISO 13407 [25] also had proposed a framework for integration of usability in all phases of software development process. Even so, current usability engineering practices had failed to reduce usability problems in software products.

Alternatively, studies have shown that problems in software products can also be controlled using Software Risk Management methods, even though these problems cannot be eliminated totally [26][27]. Using Software Risk Management, problems in software products are dealt before it occurs, so that risk control activities can be planned and implemented as needed.

Tim Altom [28] had suggested that usability should be portrayed as risk management and not as an abstraction, to avoid later arguments, encourages discussion and allows management to see the benefit of usability in software products. Study has also shown that usability problems can be considered as a significant usability risk factor [13]. However, there are great ignorance on managing usability risk compared to managing other risks such as technology risk, market risk and money risk [32]. Furthermore, there is little effort in identifying, analyzing and prioritizing potential usability risks at earlier phases of development process. If development team continues to develop software products without identifying, analyzing and prioritizing usability risks, the chances of producing less usable software products are higher.

In relation to this, development of Usability Risk Assessment Model could guide development team on identifying, analysing and prioritizing potential usability risks that could arise during SDLC in

order to produce more usable software products with less usability problems.

This paper is structured as follows. Section 2 reviews existing studies on usability, usability problem, usability risk, software risk assessment processes and software risk assessment models. A conceptual view of proposed Usability Risk Assessment Model is illustrated in Section 3. Section 4 explains on contribution and Section 5 includes conclusion and future work.

2 RELATED WORKS

Existence of usability problems creates many quality problems in software and contributes to its failure. Risk management approach can be used to overcome usability problem in software by identifying and analysing usability risk earlier in the SDLC.

2.1 Usability

Usability is considered as one of the significant factor of software product quality. Even, five most mentioned quality models, McCall [9], Boehm [6], FURPS [30], Dromey [8] and ISO 1926/2001 [7] had defined usability as significant factor in improving product acceptability and reliability, increasing user satisfaction, and it is also financially beneficial to companies [31]. Usability is the best factor that balances between technical and human aspects of a software product which is important in defining quality [32]. Hence, it's important to ensure usability characteristics are integrated well in software products to ensure its success.

2.2 Usability Problem

Many studies had revealed that usability problems causes quality problems in software product [33][34]. Potential problems lying in interface design, operating process or product structure also contributes to usability problems which resulted in lower effectiveness, efficiency and difficulty of use for end users [35]. Websites as well faces huge usability problems which has been identified as factors for lower usage level [15][36][37][38].

Discussion above shows that it is extremely important to reduce frequency of usability problem to improve user-experience and quality of software product [39].

2.3 Usability Risk

The term usability risk was first introduced in the context of e-commerce and World Wide Web services [29]. Generally, usability risk is a chosen action or activity that leads to a loss or an adverse outcome which could impact the usability of a software product. It is related to user acceptance and meeting user's requirement. Usability risk contributes to negative user experiences which lead to software product failure [40]. However, search for the term 'usability risk' in the literature has shown that this term is not widely used and some studies related to mobile application has mentioned this term in their studies [40][41][42]. Most of the current researches are associated with usability problem and not usability risk.

Usability problem can also be perceived as a risk factor in producing usable software product since it is a threat to an optimal user experience [13]. User experience, in general includes many aspect such as human factors, design, ergonomics, Human Computer Interaction (HCI), accessibility, marketing as well as usability. Hence, usability problem is recognized as a risk factor for producing usable software product.

Since studies on usability risk is still lacking, we believe that it is important to define usability risk as a single entity, either in form of checklist, model or in other appropriate form, as a guidance for development team in developing a usable software product.

2.4 Software Risk Assessment Processes

For several decades, risk management has been a popular approach in non-software domain and it has been adopted in software domain since the last few years [43].

According to Boehm [44], two main processes in software risk management are software risk

assessment and software risk control. The first process in software risk management is software risk assessment with activities of risk identification, risk analysis and risk prioritization. The second process in software risk assessment is risk control and it involves risk management planning, risk monitoring and risk resolution.

Usability Risk Assessment Model focuses only on the software risk assessment activities namely, Identification, Analyze and Prioritization. Furthermore, since usability risk has not been identified as an entity previously, it is more appropriate to conduct the process of risk assessment before risk control can be performed.

2.5 Software Risk Assessment Models

Some popular published software risk assessment models are Software Risk Assessment Model (SRAM) [45], Software Risk Assessment and Estimation Model (SRAEM) [46], Risk Identification, Mitigation and Avoidance Model for Handling Software Risk (RIMAM) [47], and Software Risk Assessment and Evaluation Process using Model Based Approach (SRAEP) [48].

All four assessment model explains the perspective of software development and not software product itself. These models are lacks in practical guidelines. There is also a lack in standard framework or model for assessing and managing software product risk based on attributes of quality, particularly usability. This creates extensive need for Usability Risk Assessment Model.

3 CONCEPTUAL MODEL

As the needs for a Usability Risk Assessment Model is clearly described in the previous section, a proposed model of usability risk assessment is suggested in this section. Figure 1 illustrates the proposed model of usability risk assessment

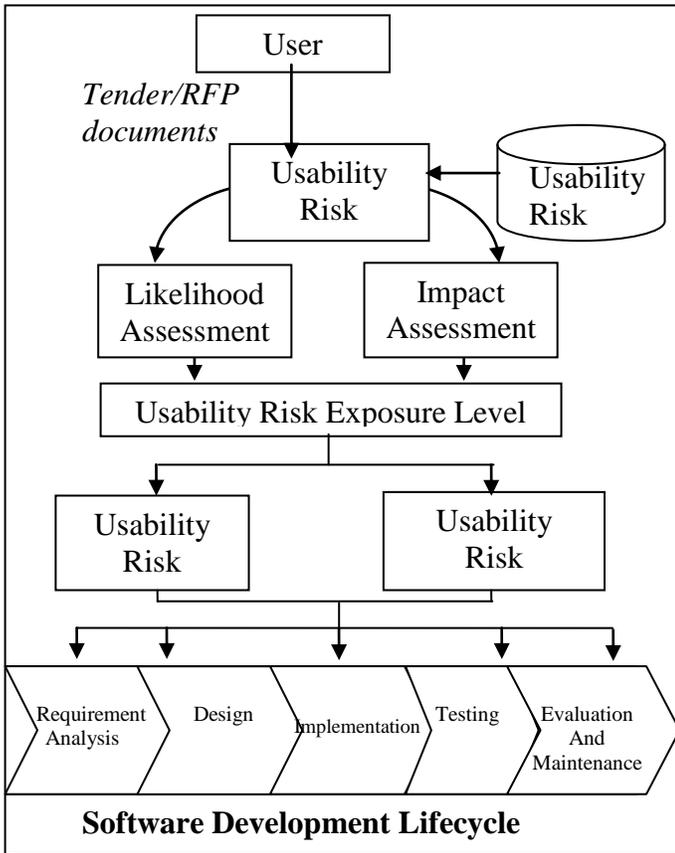


Figure 1: Conceptual view of Usability Risk Assessment Model

In Figure 1, important elements and activities in the proposed Usability Risk Assessment Model are shown and each elements are described below:

(i) Risk Identification

This model facilitates user in identifying potential usability risk in a software development projects by analysing initial tender, Request for Proposal (RFP) document or any other documents that clearly stated the initial intention of the software development projects. Potential usability risks are selected from the list of usability risks stored in *Usability Risk Repository*. List of potential usability risk are identified from Integrated usability attributes (*Effectiveness, Efficiency, Satisfaction, Comprehensibility and Safety*), Literature review and from information and experience of the industry, taking Malaysian Public Sector as the case study

(ii) Risk Analysis

Once potential usability risk has been identified, it will be analysed. For each potential usability risk, likelihood and its impact are determined using likelihood and impact assessment module. The exposure level for each potential usability risk is calculated based on likelihood and impact of usability risks.

(iii) Risk Classification

Each usability risk then will be classified according to phases in software development lifecycle and correlation analysis will be done to determine the relationship between potential usability risk and phases in SDLC.

(iv) Risk Prioritization

Each potential usability risk are prioritize by sorting respective risk exposure level in descending order to know the impact of usability risk in each phase in SDLC. Prioritization is important because it gives insight of critical and noncritical usability risk based on SDLC phases, among usability risks and in overall software product development.

5 CONTRIBUTIONS

The proposed model the proposed model could help project managers, quality managers, risk management team and software development team in identifying and describing potential usability risk that impacts and effects SDLC phases and delivery of software development objectives. By eliminating these risks, customer’s expectations on quality can be met while saving the costs and time.

Theoretically, this model contributes to the area of knowledge in Software Engineering Body of Knowledge (SWEBOK) and Project Management Body of Knowledge (PMBOK) as the concept of usability risk assessment has not been explored before and would contribute to development of more usable software products.

A list of important elements and activities in software risk assessment models is identified and used as a basis for development of Usability Risk Assessment Model. Gaps and lacking in current

software risk assessment models are identified too and will be overcome in the proposed model.

Usability Risk Assessment Model also consists of two other sub contributions:

- List of potential usability risk which influences SDLC to increase understanding and awareness on existence of potential usability risks among development team.
- Exposure level of each usability risk which describes the importance to overcome usability risks.

Usability risk is also incorporated to SDLC phases to show the impact of usability risk during software development and this incorporation serves as guidance for development team to develop more usable software product.

6 CONCLUSION AND FUTURE RESEARCH

This paper proposes a concept in ensuring high usability in software products by using the concept of risk management. The idea of this concept is that if usability risks can be identified and managed well, the overall chances of reducing risk of failure and producing usable software product could be increased. Since studies on usability risk is still lacking, this will be a good approach for development team to be responsive towards potential usability risk that need be managed during software development process.

In future, suitable methods to implement each activities suggested in the proposed Usability Risk Assessment Model will be determine in detail. Current practices in developing a risk assessment model will also be investigated for this purpose.

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