

Usability Evaluation using Mapping Strategy: A Case Study of e-Appeal System

Nur Razia Mohd Suradi, Hema Subramaniam

Abstract— Web based application's become an essential element in most of the business domain nowadays. Increasing demand for web based application certainly trigger the needs for a quality assessment of it. In that case, most of the web based quality assessment method utilize usability concept since web based application widely deal with usability characteristics. As a result, there are number of usability assessment methods proposed by researcher which cover mainly on understand ability and learnability. However, the web based usability for educational domain yet to be evaluated from user perspective. For this reason, web based application known as e-appeal system, evaluated empirically in an effort to identify the usefulness of that application. Hence, ISO9126 usability metrics used as benchmark in this evaluation process by specifying the ability to understand and learned the e-appeal system. As a result, the data shows that e-appeal system is suitable for its intended use to serve the end user. Apart from that, the study outcome indicates that end user can learn on the system functionality within limited time. Thus, it shows the e-appeal system equipped with effective help system and adequate documentation. For the new web based application developer, the e-appeal system evaluation process flow provides a guideline in evaluating application using the mapping strategy.

Index Terms— Usability assessment, web based application, educational software.

I. INTRODUCTION

With the rise of internet era, web based applications become part of life in managing daily tasks. The essential of delivering qualified software has come into an important aspect now days. Quality of software not only applies for small application but also for web based application. According to ISO9126 represent as an international standard, there are six main quality characteristics, known as functionality, reliability, usability, efficiency, maintainability and portability [16]. Usability is one of the key-issue in any software application where it measures the functionality of the system as what is needed [17]. ISO9126 defines software quality characteristic is a set

of attributes of a software product by which its quality is described and evaluated" [3].

Under those circumstances, demand for web based application's quality assessment had increased from day to day. This increasing demand differ according to the business domain that the web based application had relied on. For example educational domain software concentrate more on reliability meanwhile finance oriented application depend more on security aspect of the application. Correspondingly, the web based applications quality characteristic had to be view as domain specific characteristic rather than general characteristic [1]. Even so, usability characteristic has been accepted as one of the general application quality characteristic regardless of domain[2]. Usability known as extent to which the system is attractive, understandable, learnable and adhere to usability rules and regulations[3]. Usability assessment become central focus since the usability is an essential part of an application. Although there are number of software quality model available, the effort on usability evaluation remains unclear especially in the field of higher education domain. In that case, this paper aims to suggest the usability evaluation process in the domain of higher education. Additionally the paper also practice the evaluation process into one of the higher education oriented application known as e-Appeal. E-Appeal system is an application that allows the automation of appeal system to further study in higher education institution. Usability deals with user acceptance towards the application or system functionality. Acceptance level at user can be assessed in many aspects. For that reason, it is important to match the application functionality towards to usability characteristics. The intersection between usability characteristics and system functionality is essential in estimating the system acceptance level.

The remainder of the paper is arranged as follows: The following sections identify the available software quality model and web based application quality model. This section will give an overview of usability usage in the quality models. The overview of e-appeal system covered in the following section. Meanwhile, usability evaluation process flow explained in the subsequent sections. The last section provides conclusion and future work direction.

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II. USABILITY IN SOFTWARE QUALITY MODELS

The concept of usability evaluation spreads back to more than a decade. Usability depends on a number of aspects such as how well the functionality of a system fits user needs, how easy and safe a system is to use and to which extent satisfies user requirements in a specific environment. Quality generally can be defined as conformance to requirements. Equally, software quality also has been view in accordance to user requirement. Software quality is an abstract concept whereby it always link with user requirement. Quality considered as complex and multifaceted concept. Garvin classify the product quality into five perspectives [4]. Among the five perspectives, user view is the most preferred view of quality in line with software [5]. Hence, there are extensive numbers of software quality models concentrate more on user centric characteristic. This indicates the importance of user involvement in the usability evaluation or assessment. McCall quality model aim to propose quality model based on product activity such as product revision, product operation and product transition[6]. McCall model had categorized usability under product operation category together with correctness, efficiency, reliability and etc. In fact, McCall pay attention on usability at operational level rather than user level. However in certain environment, McCall also argue on the user involvement on the usability characteristics. On the other hand, Boehm scattered the usability term into reliability, human engineering and efficiency [7]. In which all this term group together into as-is utility category whereby it refers to the characteristic of software on how easy the software to be used and utilized. Ease of use has been portrait as one of the usability characteristic that need attention during usability evaluation process. Besides that, FURPS model had stress on the usage of usability terms as one of the characteristic under their software quality models[8]. In contrast to McCall, this model stress on the usability term and user centric practices in evaluating software quality. Furthermore, later in 2000 ISO9126 aim at identifying prominent characteristic of software quality[3]. Among the six quality factors listed under ISO9126, usability viewed as the usefulness and easiness of software in the mind of end user. In fact ISO 9126 model depict the characteristic of McCall and Boehm model in determining the sub factor for each factors. For instance, usability contains understand ability, learnability, attractiveness, operability and compliance as sub factors.

There are number of usability assessment methods has been implemented by previous researchers. Among them is using interview, questionnaire or mix methods. Data collected from there has been analyzed using statistical techniques.

III. USABILITY EVALUATION FOR WEB BASED APPLICATIONS

The quality of a website can be accessed in various ways. To date, studies of websites have focused on website

functionality and on website usability [18]. The increasing needs of internet era leads to overall usage of web based applications [9]. This indicates the needs for a comprehensive web based application quality models. There are number of web based application quality model available whereby most of it based on predefined software quality model characteristics and sub characteristics[10]. Initially, web based application quality measured based on environment, behaviour and experience factors. For this reason software quality characteristic grouped into these three factors [1]. Above mention factors are solely rely on the user involvement while conducting usability assessment for a web based applications. On the other hand, navigability of a website identified as one of the main characteristic that determine the usability of a website. Hence the web application developers tend to concentrate more on the flow of the website and make sure user not lost as go through the website [11]. These particular characteristics related with the understandability of the web based applications among the users. Again, navigability interrelated with the understandability characteristic. This shows the importance of considering understandability characteristic while measuring web based applications quality. Since web application deal mostly with data, reliability become focus point while developing web based application quality model. Therefore a considerable amount of quality model had specified reliability as one of the web application quality determinant characteristic [12][13]. Reliability of an application relate back to the relation between the input and output understandability. Reliable output should be displayed with the specified type of input. So, reliability also play important role during the usability evaluation in terms of functionality understanding. Whereas, a web application quality model known as 2Q2U has been proposed to indicate the importance of usability in determining quality. Moreover this model had discussed about the interrelation between user experience and the usability [14].

IV. E-APPEAL CASE STUDY

E-Appeal system is an application created with the purposed to ease the process of appealing to continue study. Appealing process to continue study involve few peoples such as dean, committee members, record and graduation unit and secretariat (refer figure 1). Implementation and continuity is hard to ensure since appealing process involve many stages or level. In this case, atomization of appealing process is essential in enhancing the communication between the different levels of approval. For that reasons, e-appeal has been created as a platform where can initiate the communication between the different level of approval. E-appeal utilizes MySQL and PHP as web development environment. Since MySQL and PHP is an open source web development tools and freely available, it is preferred to be web development environment as compared to other web programming language. Fully normalized database

table has been an added value for this system in making sure the effectiveness of the system in meeting users' requirement.

In this study, qualitative technique is used where interview questionnaire are prepared and asked to stakeholders to investigate current process. Upon completion of the e-appeal, an evaluation process conducted in order to find out the usability of an application. In that case, a set of usability evaluation questionnaire and interview questions constructed to get the comment from the end users. Because the usability evaluation has been conducted at end user level, the questions prepared accompanied by a simple set of training provided to user. Hence the training help user in understanding the system and can give constructive input at the usability assessment level.

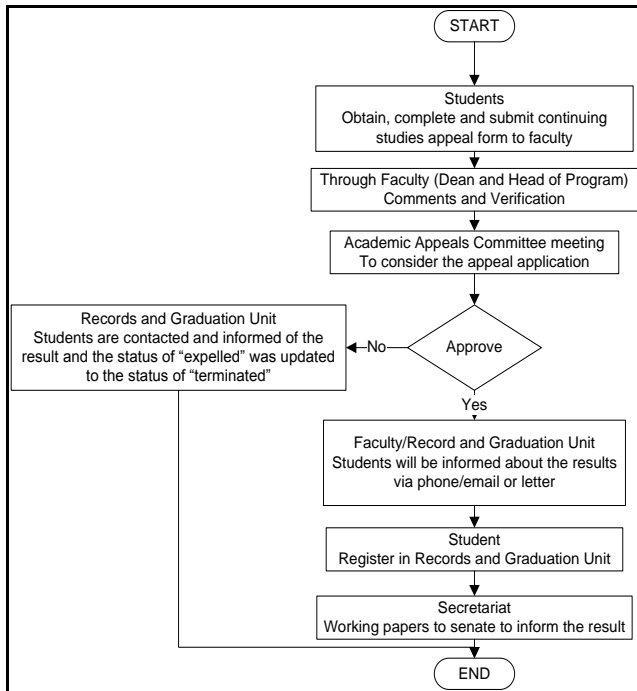


Figure 1: Appeal Process Flow

V. METHODOLOGY

E-appeal system consists of two primary users (refer figure 2). Therefore, the usability evaluation conducted in 2 different sessions. For both sessions, student and administrator were provided with the simple training module. The training module involves the way to use the e-appeal system.

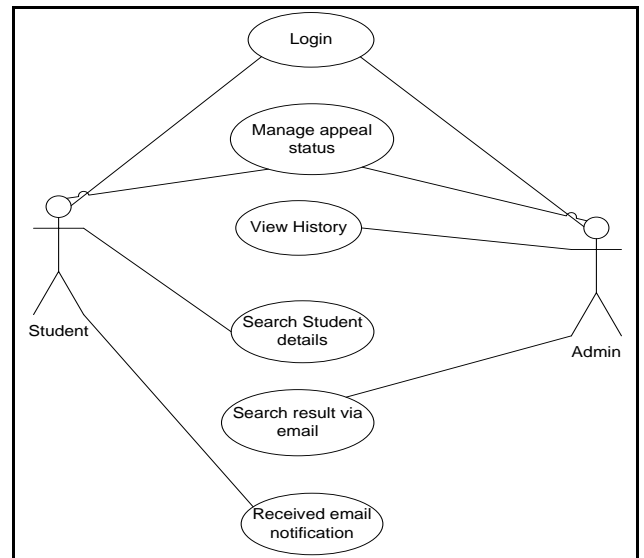


Figure 2: e-Appeal use case diagram

Upon completion of the training each participant has been distributed with interview questions. Interview questions covered mainly on the understandability and learnability element. Participants are required to evaluate the understandability in terms of function, input and output. Meanwhile, learnability evaluated based on the functionality and task performance easiness. Learnability is referring to the measurement of effectiveness of how long a user take time to learn system functionality. Meanwhile understand ability evaluates the capability of user to understand the system. Understand ability and learnability is correlated each other in making the system usable[15]. This evaluation process does not cover the effectiveness of the help system and documentation. The usability evaluation process conducted based on the user rating on each of the functionality provided. Upon successful data collection, user's response transfer into traceability matrix. Traceability matrix is a technique which can help in mapping two elements and get the result based on the intersection between the elements. Rating method used to indicate the relationship between the elements which has been mapped. For instance, learnability rated based on the scale 1-3 with indication 1 is strongly agree with the learning effectiveness and 3 for strongly disagree with the learnability. (Refer Table I).

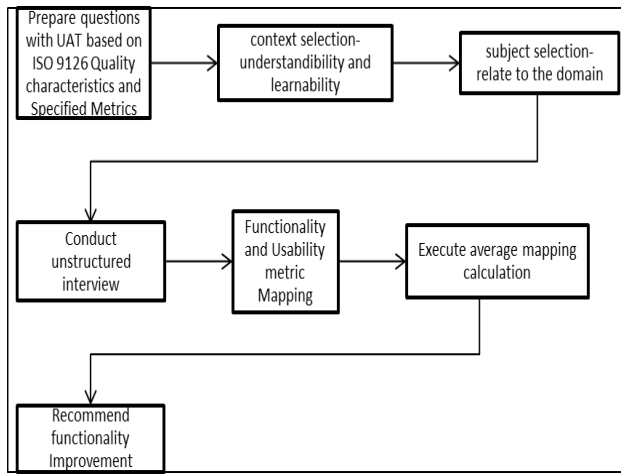


Figure 3: Usability evaluation methodology process flow

Usability assessment method for e-appeal is a mix mode method between interview and questionnaire distribution. For this reason, unstructured questionnaire integrated into the interview session in order to get the effectiveness of e-appeal in fulfilling user needs. Together with that, functionality mapping strategy used in an effort to trace the system functions learnability and understandability. Figure 3 shows the methodology flow for the usability assessment using mapping strategy.

VI. E-APPEAL USABILITY ASSESSMENT RESULT

After the successful interview session and unstructured questionnaire help the development team to derive the usability result of the system. This usability result derived by sum up all the rating numbers and then divides by 3. The formula as given below:

$$\text{Average learnability effectiveness for each function} = \frac{\sum (S_1 (C_1 SF_1) \dots S_n (C_1 SF_1))}{\sum n}$$

Where, S1-Student number 1, C1-Understandability Metric 1, SF1-Student function number 1, n-number of respondent. Further into that, the analysis aid in making decision on which function need further improvement. This improvement determination guided by simple benchmark as shown in Table II.

TABLE I
USABILITY ASSESSMENT RESULT

Features/Modules	Student Menu			
	Understandability		Learnability	
	Function Understandability (C1)	Understand Input & Output (C2)	Ease of function Learning (C3)	Ease of learning to perform a task (C4)
Registration (SF1)	2	1	3	2
Appeal Request (SF2)	2.6	1	1	2

Appeal Status (SF3)	1	1.3	1	2
Appeal Notification (SF3)	1.3	1	2	2.3
Admin Menu				
Registration (AF1)	2	2.2	2.8	2.2
Appeal List (AF2)	2.4	1.8	1	1
Appeal Report (AF3)	1.8	1	1	1
Appeal History (AF4)	2	1	1	1.8
Appeal Search (AF5)	2.5	1.8	1.8	1

Based on the calculation (refer Table II) , usability assessment that reach 2.5 or more need to be amend before the system further proceed into the real environment. For instance, appeal request function which reach the values 2.6, is evaluated as hard to be understood. In that case, this particular function need to be revised in terms of interface or process flow. For the admin page, registration features evaluated as very hard to learn and need further revision in terms of process flow. User might find the process flow for registration is ambiguous and hard to be initialized.

VII. CONCLUSION AND FUTURE WORK

Web based application mostly created in an effort to accommodate the specific needs rather than for a general purpose. Most of the web based application used to involve specific user. Under those circumstances, web based application quality assessment used to be evaluated by dedicated user. Since e-appeal is small scale application, an extensive amount of respondent is not needed. In that case, simple evaluation technique such as mapping strategy and measurement scale like average calculation is adequate enough to suit the current situation. Usability evaluation is an essential in any kind of application since it evaluate the usefulness of the application. It is important to have a simple and easy to understand evaluation process. At the same time the evaluation process also need to be clearly and accurately give the desired outcome. For this reason, usability assessment process flow which integrates the data gathering technique and mapping strategy proposed. As for the start, the data should be gathered from user in order to know their understanding towards an application. For this reason, mix methods which correlate unstructured interview and questionnaire session have been used. Interview session and mapping strategy should go in parallel so that data can be gathered collectively. Once the functionality has been map into usability metrics, mapping average calculation should take place. Consequently, it would suggest the space or functionality that needs further improvement before the application go live. In that case,

simple evaluation technique such as mapping strategy and measurement scale like average calculation is adequate enough to suit the current situation. In other word, e-appeal assessment strategy promises a simple assessment strategy that would eliminate the time consuming process and at the same time would give the desirable outcome. Even though that is the case, usability assessment for large scale application also cannot be neglected. Mapping strategy as preferable usability assessment method for large scale system would be the most challenging future enhancement.

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