

USABILITY TESTING OF INDUSTRIAL TRAINING SYSTEM (ITS-UTM)
PHASE I FOR MODULES USED BY THE STUDENTS

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“To my beloved family and friends, thanks for being there, throughout this journey”

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ABSTRACT

Usability testing is the core of usability engineering practice to identify areas where users struggle with the site and make recommendations for improvement. Industrial Training Systems (ITS-UTM) is a web based application system which is developed to manage the industrial training process in Universiti Teknologi Malaysia (UTM). Since ITS-UTM is new system, no usability assessment has been done on it before. Therefore, a usability evaluation is needed to evaluate if ITS-UTM is easy to use for average students. However, the literature on usability testing offers surprisingly little help in how to measure usability, in particular how to select measures of usability. Therefore, it is needed to identify the suitable usability aspects and evaluation methods for usability testing on ITS-UTM. In this study, a usability evaluation model has been developed to evaluate the usability of ITMS in aspects of effectiveness, efficiency and satisfaction. The usability evaluation methods applied in this study is performance measurement, observation, and questionnaire. From the results, the overall effectiveness for Student Pre-registration and ITS-UTM are above the success criterion (70%). However, the efficiency and satisfaction of Student Pre-registration rated by subjects from questionnaires are low. For usability testing of ITS-UTM, the overall satisfaction rated by subjects after completing each task is high. Besides, the main usability problems met by the students have been identified in this study. Furthermore, this research found that correlations among effectiveness, efficiency, and satisfaction were medium correlated.

ABSTRAK

Ujian kebolehgunaan adalah teras kepada amalan kejuruteraan kebolehgunaan untuk mengenal pasti bahagian yang menyebabkan pengguna berasa susah dan membuat cadangan untuk pembaikan. Sistem Latihan Perindustrian (ITS-UTM) adalah sebuah sistem aplikasi yang berasaskan web. Ia dibangunkan untuk mengurus proses latihan perindustrian dalam Universiti Teknologi Malaysia (UTM). Oleh sebab ITS-UTM adalah sistem yang baru, tiada ujian kebolehgunaan yang pernah dilaksanakan terhadap sistem ini. Oleh itu, ujian kebolehgunaan diperlukan untuk menilai ITS-UTM supaya mengetahui bahawa ia adalah mudah diguna oleh para pelajar. Walau bagaimanapun, literatur pada kebolehgunaan jarang memberi bantuan dalam pengukuran kebolehgunaan, khususnya cara untuk memilih pengukuran kebolehgunaan. Oleh itu, ia adalah penting bagi mengenal pasti kesesuaian aspek-aspek kebolehgunaan dan cara penilaian untuk ujian kebolehgunaan pada ITS-UTM. Dalam kajian ini, satu model ujian kebolehgunaan telah dibangunkan untuk menilai kebolehgunaan ITS-UTM dari segi keberkesanan, kecekapan dan kepuasan. Cara-cara untuk melaksanakan ujian kebolehgunaan dalam kajian ini adalah ukuran prestasi, pemerhatian, dan soal selidik. Daripada keputusan, keberkesanan keseluruhan untuk “Student Pre-registration” dan ITS-UTM adalah lebih daripada kriteria kejayaan (70%). Bagaimanapun, kecekapan dan kepuasan “Student Pre-registration” yang dinilai oleh peserta daripada soal selidik adalah rendah. Bagi ujian kebolehgunaan ITS-UTM, kepuasan keseluruhan yang dinilai oleh para peserta selepas menyempurnakan setiap tugas adalah tinggi. Selain itu, masalah-masalah umum kebolehgunaan yang dihadapi oleh para pelajar telah dikenalpasti dalam kajian ini. Tambahan pula, kajian ini mendapati hubung kait antara keberkesanan, kecekapan, dan kepuasan adalah berkorelasi dengan sederhana.

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LIST OF ABBREVIATIONS

ANOVA	-	Analysis of Variance
CSUQ	-	Computer System Usability Questionnaire
ITS	-	Industrial Training System
ISO	-	International Standard Organization
QUIS	-	Questionnaire for User Interface Satisfaction
SUMI	-	Software Usability Measurement Inventory

CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

Most developers of interactive software and information system always want people to find their products easy to use. Generally, people also want software or information system to be usable with acceptable mental effort. By following a usability engineering process, users' abilities to find information and satisfaction with information system should improve significantly. In general, usability refers to how well users can learn and use a product to achieve their goals and how satisfied they are with that process.

According to Seffah, Guliksen and Desmarais (2005), usability is a multidimensional construct that can be evaluated from various perspectives and it means different things to different people. Nielsen (1993) points out that usability have five aspects: learnability, efficiency, memorability, error recovery, and satisfaction. Miles Macleod (1994) stated that usability can be thought of as quality of use, a quality of the interaction between user and system. Quality of use can be

used to measure usability as the extent to which specified goals can be achieved with effectiveness, efficiency and satisfaction by specified user carrying out specified tasks in specified environments (Bevan, 1995). However, most common usability testing applied the definition of usability defined by International Standards Organization (1994). ISO (1994) defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”. Effectiveness is the user ability to successfully use a system to find information and accomplish tasks. Efficiency is the user ability to quickly accomplish tasks with ease and without frustration and satisfaction is how much a user enjoys using the system.

Usability testing fits in as one part of the user-centered design process. It is the core of usability engineering practice. Usability testing is a software evaluation technique that involves measuring the performance of typical end-users as they undertake a defined set of tasks on the system being investigated. It commenced in the early 1980s, as human factors professionals studied subjects using interfaces under real-world or controlled conditions and collected data on problems that arose (‘human factors’ is an early term for the human-computer interaction discipline). It has been shown to be an effective method that rapidly identifies problems and weaknesses, and is particularly used to improve the usability of products (Dumas and Redish, 1993).

Rubin and Chisnell (2008) defined usability testing is refer to, “a process that employs people as testing participants who are representative of the target audience to evaluate the degree to which a product meets specific usability criteria.” Usability evaluation methods can be divided into usability inspection and user participation. Usability inspection is evaluation methods based on expert’s analyses such as heuristic evaluation and cognitive walk-through. Evaluation methods involving user participation are laboratory studies, thinking aloud protocols, observation, focus group, interviews, questionnaires, and card sort.

Typical usability metrics include the time taken to complete a task, degree of completion, number of errors, time lost by errors, time to recover from an error, number of subjects who successfully completed a task, and so on (Nielsen 1993; Rubin and Chisnell 2008). The primary targets of usability testing are the user interface and other interactive aspects. Such testing is used by academics for research and development, and also by usability practitioners in the corporate environment for rapid refinement of interfaces and analysis of system usability.

1.2 Problem Background

Usability is the lifeblood of the web and it is important in software engineering. Usability study can evaluate a website's ease of use and the impact it has on end users. The purpose of a usability test is to identify areas where users struggle with the site and make recommendations for improvement.

Some studies have shown that 80% of total maintenance costs are related to user's problem with the system but not technical bugs. Among them, 64% are usability problems (Seffah, Gulliksen and Desmarais, 2005). According to Dhillon (2004), nowadays billions of dollars are being spent annually in US to produce new products using modern technologies. The usability of these products has become important than ever before because of their increasing complexity, sophistication, and non-specialist users. Besides, over 30% of all software development projects are cancelled before their completion primarily due to inadequate user design input which resulting into a loss of over \$100 billion annually to the U.S. economy alone.

At the most fundamental level, if a web based system is not ease to use then the user would not use it regardless of how much the website inspires. As a result, it

can be said that usability has become one of the most vital issues in website design. Therefore, a usability test should be developed in an effort to design a more user-centered web page.

Since usability is a multidimensional construct that can be evaluated from various perspectives and it means different things to different people. Therefore, it is important to identify and define the aspects of usability and its measurement in order to carry out a usability testing. Besides, there are a number of methods to evaluate usability. Different usability evaluation tools can be designed based on the different perspectives emphasized. Besides, methods for usability evaluation may have various purposes. Therefore, it is also important to select the correct usability evaluating methods in order to fit in the purpose of the study.

1.3 Problem Statement

Industrial Training Systems (ITS-UTM) is a web based application system which is developed to manage the industrial training process in Universiti Teknologi Malaysia (UTM). Since ITS-UTM is new system, no usability assessment has been done on it before. Therefore, a usability evaluation is needed to evaluate if ITS-UTM is easy to use for average students who undergo industrial training. It is hoped that the data collected within usability tests will make ITS-UTM easier to use and less frustrating.

The literature on usability testing, however, offers surprisingly little help in how to measure usability, in particular how to select measures of usability. The papers (Frøkjær, Hertzum, and Hornbæk 2000; Hornbæk and Lai 2007; Jeng 2005;

Nielsen and Levy 1994; Sauro, and Kindlund 2005) investigating this issue have mostly looked at correlations between usability measures, but show mixed results.

Nielsen and Levy (1994) found that performance and preference were correlated in 75% of a selection of 57 studies, meaning that users in general preferred the application with which they performed best. In contrast, Frøkjær et al. (2000) argued that the usability aspects of effectiveness, efficiency, and satisfaction should be measured independently and not in general be expected to correlate.

In addition to addressing these differences in results, it has been suggested that analysis of correlations among usability measures would help understand better how usability can be measured. Therefore, the problem statements in this research are:

1. What are the usability aspects suitable for usability testing of ITS-UTM?
2. Which evaluation methods are suitable to apply in usability testing of ITS-UTM?
3. What are the relationships among the usability aspects (Effectiveness, Efficiency and Satisfaction)?

1.4 Project Aim

The aim of this research is to propose a suitable usability testing model for usability testing of Industrial Training System (ITS-UTM) Phase 1 for the modules used by the students.

1.5 Objectives

The objectives of this research are shown as follow:

1. To identify the suitable usability aspects for usability testing of ITS-UTM.
2. To apply the suitable evaluation methods for evaluating ITS-UTM.
3. To analyze the relationships among the usability aspects (Effectiveness, Efficiency and Satisfaction).

1.6 Scopes of Project

The scopes of the research are defined as below:

1. The usability of ITS-UTM is only assessing in aspects of effectiveness, efficiency and satisfaction. Satisfaction will look into the areas of ease of use, labeling, navigation, error, organization of information and visual appearance.
2. This research will only evaluate Student Pre-registration System and modules of ITS-UTM used by student.
3. The data collection methods in this research are only performance measurement, observation and questionnaire.
4. This research involves only students of semester 20092010/2 in FSKSM who are going to take industrial training in next semester.

1.7 Significance of Project

This research will give the contributions to develop a model for usability testing of ITS-UTM. The data collected within usability tests will contribute in future works for ITS-UTM improvement. Besides, the operational criteria and strategy to measure effectiveness, efficiency, and satisfaction and user's criteria regarding ease of use, labeling, navigation, error, organization of information and visual appearance will be shown in this research. The analysis of relationships among effectiveness, efficiency and satisfaction is to provide information about how measures relate, which will help understand better what usability is and how to develop models of it, and select measures for usability studies.

1.8 Organization of Report

This report is divided into five chapters. The first chapter presents the introduction of the study, problem background, objectives and project scopes. Chapter 2 reviews on concepts of usability and usability evaluation methods. Chapter 3 discusses on the research methodology used to carry out the study systematically and chapter 4 provides implementation of usability testing and its' results. Finally in fifth chapter is conclusion and suggestion for future work.

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