SOEN6811 – summer term 2022

Assignment 3 on Empirical Investigation and Quality-in-Use Measurement Model.

(5%, team work, 2-3 students in a team)
Posted on26/05/2022, due on 06/06/2022

Background:
Software engineers are always looking for ways to improve the quality of software products and the development processes by investigating new tools and techniques in all aspects of development. For this purpose, they need to know what kind of empirical investigation is appropriate, and what are the key elements involved in designing and conducting empirical studies.

In this assignment, we will practice empirical investigation of the effect of mobile user interfaces (MUI) on the quality-in-use in different applications. We will assess the quality of designing MUI with the desktop user interface (DUI) for the same social application with the same participants under the same environment.

In the following section, we explain the assessment techniques available and provide guidelines for deciding which technique is appropriate in a given situation.

1. Types of Empirical Investigation in Software Engineering

There are different types of empirical investigation such as: Controlled Experiments (including Quasi-Experiments); Case Studies (both exploratory and confirmatory); Survey Research; Ethnographies; and Action Research. Controlled Experiments, Case Study and Survey are the existing methods that we believe are most relevant to software engineering as each one makes a valuable contribution to the body of software engineering knowledge and involve careful measurement. In this assignment, we focus primarily on the *controlled experiments*.

2. Hypotheses

Two set of hypotheses, relating to the objective and subjective factors of the quality-in-use model, are formulated below:

List your Hypotheses for the objective factors here (please state separate sets of hypotheses of NULL and ALTERNATIVE hypotheses for each quality factor, see A3 sample for more details):

<u>For the subjective factor:</u>
HYP_0: students who use the social application on DUI are no different in their satisfaction than using the same application on MUI.

HYP$_{A1:}$ students who use the social application on MUI will be more satisfied than using the same application on DUI.

HYP$_{A2:}$ students who use the social application on DUI will be more satisfied than using the same application on MUI.

3. The design of Controlled Experiment:

In order to achieve the controlled experiment with very high control, we prepare a list of materials to be used during the test. The materials include the following:

3.1 List of Tasks (included also with Assignment 3 package)

A list of tasks was prepared that represent the set of tasks given to each participant before the test.

Task 1. Search for "Undergraduate Admissions" on the Concordia website.
Task 2. View the full program details for the undergraduate Software Engineering (BEng) Program.
Task 3. See the detailed instructions for each step of the application process.

3.2 Paper Log-in Form (form included with Assignment 3 package)

During testing, to collect performance measures, a paper log-in form will be used to evaluate each participant. This paper includes criteria for performance measures. The time that is taken to complete each task and the total time it takes to conduct all the tasks have to be recorded. In addition, number of correct actions, incorrect actions and number of views have to be recorded. Tasks in Paper Log-in form have to match the list of tasks given to the participants during the test.

3.3 Subjective Measure (data form included with Assignment 3 package)

A satisfaction questionnaire has to be given at the end of the test to gather and evaluate the impression participant had towards the DUI and MUI.

3.4 The Test Environment

Before conducting the controlled experiment test, preparing the physical environment and the people who will conduct the test, is necessary.

Use a similar type of desktop and similar type of mobile device in order to conduct the test with all the students. Use a stopwatch to measure the time it took to complete each task.

3.5 The Participants

In order to conduct the experiment, select 5 students with similar background (your teammates and other graduate students from this or other classes).

A3 deliverable:

Please follow the template of the A3 sample document. Use your own observations and collected data for sections Experiment, Execution, Analysis, Dissemination and Decision Making.

References

Dumas, J.L. and Redish, J.C. (1999) A Practical Guide to Usability Testing, 3rd ed. Great Britain, Wiltshire: Intellect
Fenton, 2013 (textbook). Chapter 4 Empirical investigation. Including contributions by Barbara Kitchenham and Shari Lawrence.

TERMINOLOGY

There is formal terminology for describing the components of our experiment. This terminology will help consult with a statistician, and encourage us to consider all aspects of the experiment. In Table 1, we describe all the components of the current experiment:

Table 1 The Components of the Experiment.

Components	Definition
Experimental design	Ddescribes how the test will be organized and run.
Treatment	Treatment is the new method or tool that we wish to evaluate (compared with an existing or different method or tool). In our assignment treatment is using the new quality-in-use model for MUI and DUI.
Individual test run	In any individual test run, only one treatment is used. An individual test of this sort is sometimes called a *trial*, and the *experiment* is formally defined as the set of trials. In our assignment, the individual test run consists of the same participant performing the test one time using the DUI and one time using the MUI for the same application
Experimental objects	The experimental objects or experimental units are the objects to which the treatment is being applied. DUI and MUI for different social applications.
Experimental subjects	*Who* is applying the treatment; these people are called the *experimental subjects*. In our assignment: graduate students
Control object	When we are comparing using the treatment to not using it, we must establish a *control object*, which is an object not using or being affected by the treatment. The control provides a baseline of information that enables you to make comparisons. In our assignment, the control object is the UI that has the higher value for effectiveness, productivity, and task efficiency. The lower value for the safety and task navigation.

Dependent variables	Effectiveness Productivity Efficiency Safety Task navigation.
Independent variables	Time for each task (T), # of correct actions (A), # of incorrect actions (X), # of views (V).