The Effect of Computer Experience on Subjective and Objective Software Usability Measures

George V. Kissel

Department of Psychology
University of Connecticut
Storrs, Connecticut 06269-1020
kissel@uconnvm.uconn.edu

ABSTRACT

In the user-centered approach to software design and development, end-users act as evaluators in usability tests at various points during the development life-cycle. Some usability professionals argue that these usability tests simply reflect the preferences of the participants and should not be used in place of objective performance measures. In an attempt to strengthen the validity of the user-centered approach, the present study examined the association between subjective preference measures and objective performance measures in relation to the user's hardware and software use and familiarity. The results suggest that not only do the subjective ratings of end-user evaluators often differ from objective performance measures, but also that this relationship is dependent on the user's past computer experience.

INTRODUCTION

One activity in a user-centered approach to software usability testing involves the evaluation of the product software by end-users. However, the testing methods used in this approach vary. Some usability professionals use subjective ratings, while others use objective measures, and still others use a combination. Several studies have examined the extent of agreement between both types of measures [3, 4, 5]. The results of these studies have been mixed suggesting the influence of other factors.

It is possible that hardware and software familiarity of end-user evaluators could strongly influence their subjective ratings of a software interface/system. Such an effect might explain the lack of correspondence between subjective ratings and objective measures. Thus, a better understanding of this relationship would help usability professionals recruit an appropriate distribution of end-users for the evaluation process. Information regarding the potential relationship between subjective and objective usability measures may also be helpful when only subjective ratings of systems are available.

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METHOD

Participants

Volunteer participants (N=12) stated that they had experience using a computer keyboard and mouse. The participants received course credit for participating.

Survey information

The computer experience survey was designed to show individual differences between evaluators. The survey addressed participants' years of experience with computers, experience with different types of systems, hardware and software familiarity and use, and demographic information. Measures of preference, perceived ease-of-use, and expectation of high performance were collected using a 7-point Likert scale with left and right anchors of *not at all* and *very much*, respectively.

Task

A simple data retrieval task was used to assure that participants with varying levels of computer experience would be able to understand and evaluate the processes involved. The three interfaces used in the data retrieval task were 1) a command line, 2) a 2-level menu, and 3) a listbox. All three interfaces accessed the same database. The difference between interfaces was related to the method used to access the information. The *command line* interface had participants type in a customer name in order to retrieve the customer's account number. The *2-level menu* had participants access information by first categorizing the customer name within alphabetical ranges (i.e., A-E, F-H, etc.) by clicking on the appropriate button, then the participant searches a list of customer names from within the alphabetical range chosen and clicks on the appropriate

button to access the customer's account number. The *listbox* interface used a listbox "widget" that contained every customer name in alphabetical order; the participant accessed a customer's account information by manipulating the listbox to display the customer name and then clicking on the appropriate customer name directly.

Procedure

At the beginning of the study, participants were asked to complete a survey related to computer use and familiarity. Participants used the interfaces in orders that produced a counterbalanced design. A demonstration of each interface was then given. Participants were asked to access and record a list of customer account numbers using each of the three interfaces. Measures of preference, perceived ease-of-use, and expected performance were collected from each participant at the following times: 1) after the demonstration, 2) after ten practice trials, and 3) after an experimental task (20 trials per interface). The computer system recorded the time to access each customer account number using each interface.

Analysis

The subjective ratings and objective performance measures were checked for agreement. Information from the computer use and familiarity survey was then tested as a predictor of the agreement score using stepwise regression.

RESULTS

About half (41.7%) of the participants' rated the *listbox* interface as the best, while performance measures showed the *menu* interface to be superior with regard to data access time. All participants rated the *command line* interface lowest and performance data supported this rating. *Familiarity with a variety of types of* software (R^2 = .6163; $p<.0134$) and the *amount of time participants had been using computers on a regular basis* = .4504; $p<.0169$) reliably predicted whether participants' ratings corresponded with performance measures.

DISCUSSION

The present study examined the relationship between subjective ratings and objective measures from software usability tests and its relation to measures of computer experience. The results indicate that subjective ratings and objective measures of performance often do not correspond. There is evidence that making decisions to satisfy preferences will not automatically lead to optimal user performance (Bailey, 1993). The results of the present study suggest that computer experience of end-user evaluators can influence their subjective ratings of a software interface/system. The results also suggest that measures of computer familiarity and use can predict the relationship between subjective and objective measures of software usability. Such an effect might explain the lack of correspondence between subjective ratings and objective measures often found in studies of the validity of the user-centered approach.

The results of the study have implications for the methodology of user-centered software development and usability testing. A better understanding of the relationship between computer experience and the association between subjective and objective usability measures would help usability professionals better interpret the results of usability tests based on end-user ratings. Information regarding the potential relationship between subjective and objective usability measures may also allow usability professionals to recruit the most appropriate evaluators given the limitations of many usability testing methodologies. When only subjective ratings methods are available to test a system, evaluators with greater experience and exposure to hardware and software may be the best candidates to evaluate software design.

CONCLUSIONS

The subjective ratings and objective measures of performance of software usability evaluators do not necessarily correspond. This level of correspondence is, in part, dependent on past computer experience.

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