

Examining Usability of E-learning Systems-An Exploratory Study (Research-in-Progress)

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Abstract. As universities worldwide have started using e-learning systems for their program delivery, the effectiveness and usability design of e-learning systems are becoming significant. E-learning researchers and practitioners have been examining the effectiveness and usability of e-learning systems to understand whether human computer interaction (HCI) usability standards have a direct impact on student interactions and learning. The study aims to assist instructors, instructional designers, and other practitioners in identifying the effectiveness of HCI usability factors in e-learning systems. The methodologies adopted for the study include heuristic evaluation, a usability survey questionnaire, a cognitive walkthrough experiment, and think-aloud and co-participant testing. The study is still in progress, but preliminary results indicate different learning styles and group dynamics played an important role in usability testing.

Keywords: E-learning, Usability, human computer interaction (HCI), online learning, user interface design

1. Introduction

The internet along with other information and communication technologies have offered an opportunity to universities to deliver many of their courses as well as programs through e-learning mode. Many universities in the past have been using their traditional learning management systems for the course delivery. As the pressure to enroll and engage students is increasing, the traditional learning management systems are getting more integrated with the portals and web sites. As more and more universities worldwide offer e-learning environments for their course delivery, researchers in e-learning systems are interested in understand how effective these e-learning systems are in respect to human computer interaction principles (Scott & Vanoirbeek, 2007, Zhang, & Galletta, 2006).

E-learning application for course delivery have been increasing exponentially in the last few years in higher education. The study, "Going the Distance: Online Education in the United States, 2011" reports that online learning in the form of e-learning is on the increase; however, it also suffers from higher non-completion or drop out course or program rates (Allen, & Seaman, 2011, Ozkan, & Koseler, 2009).

Usability testing may help to understand the students' learning and interaction experiences for effective learning outcomes. It may also provide some insight on student retention and reasons for the higher rate of non-completion of e-learning application based programs. For online e-learning application delivery, the quality and effectiveness of engagement for effective learning has always been a challenge. Usability testing was initially used by many researchers in the past to assess and improve web site interactions and experiences (Becker, & de Villiers, 2008, Ozkan, & Koseler, 2009).

Usability in the general term is defined as an attribute that assesses ease of use of user interfaces for completing a specific tasks. As per Jakob Nielsen (2012), usability is the measure of system acceptability, whereby usefulness of a system is assessed for learnability, efficiency of use, memorability, few and non-

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catastrophic errors and subjective satisfaction. These quality components, e.g. learnability, memorability, and errors, have a great impact on user satisfaction (Nielsen, 2012).

As we use more and more computer interfaces for our day-to-day work activities, including e-learning, it is important to understand that user interfaces which are designed to access e-learning applications and systems adhere to usability quality components. According to Nielsen (2012), usability quality components are learnability, efficiency, memorability, errors, and satisfaction. E-learning applications are much different from commercialized computer applications and thus requires different methods for evaluating their usability. Usability in context of e-learning applications is about providing easy and efficient navigation to support learners' goal of effective learning (Adebesin et al., 2009). E-learning applications should not only be evaluated for students' content interaction, but also assessing pedagogical effectiveness. Pedagogical usability effectiveness includes use of appropriate learning functionality tools and content interfaces in a learning context (Costabile et al., 2005). The design of e-learning applications or systems should be such that student's interactions with the e-learning application is more about learning the contents and beyond functional usability (Masemola, & De Villiers, 2006).

The usability attribute of human computer interaction has been very well researched to improve the effectiveness of web sites, web applications, and e-commerce in the past. Since more universities are offering e-learning, it is imperative to know how students are experiencing these e-learning courses and how to improve usability of e-learning applications for effective and quality learning experiences and outcomes. Usability testing would certainly help instructional designers and course instructors to understand whether the e-learning application is helping students achieve the desired educational goals efficiently and effectively (Yuqing et al, 2009, Harper, et al., 2008, Ozkan, & Koseler, 2009).

E-learning instructors, researchers and instructional designers are interested to study human computer interaction (HCI) usability standards used for e-learning. The findings from such studies would enable a better understanding of the interactions between students and instructors (Mazza & Botturi, 2007). The instructors are interested to know how students engage in their learning processes. Substantial empirical evidence indicates effective usability can dramatically enhance effectiveness of e-learning (Nielsen, 2012; Galletta, and Zhang, 2006; Shneiderman and Plaisant, 2004).

Assessing the usability of e-learning systems is a complex task since these systems involve many tacit and abstract components of e-learning (Zaharias and Poulmenakou, 2006). Additionally, e-learning systems are used by students of diverse backgrounds; therefore, apart from the technological nature of the systems, even the cultural background of learners may play a role in the usability of e-learning systems (Berners-Lee, 2007). The nature of anytime and anywhere e-learning systems, demand the usability benchmark to be different than traditional usability benchmarks (Harper et al., 2008). E-learning systems bring both learners and instructors together to interact in an interactional space. The diversity of learners, technological advancements, and radical changes in learning tasks adds further complexity to conduct usability research for e-learning systems. The usability of e-learning designs is directly related to their pedagogical value. An e-learning application may be usable, but not in the pedagogical sense and vice-versa (Quinn, 1996; Albion, 1999; Squires and Preece, 1999). Due to the nature of e-learning systems, traditional usability measures of effectiveness, efficiency, and satisfaction may not be adequate.

Although there have already been studies conducted in usability, not many studies have been in the usability of learning systems which study learning styles, pedagogical value, and the learning theory components in integration for usability (Lanzilotti, et al., 2006). Moreover, usability measures of the learning systems' quality are left to subjective interpretation. Therefore, this study certainly attempts to fill the aforementioned gap to critically examine the usability of e-learning systems.

2. Methodology

Participants in this study are drawn from our MBA classes, both on campus and off campus. Since our MBA program has over 200 students off campus and take all their classes online, the level of expertise among these students for computer use, navigation, and accessing online content is the same for all the participants. A total of 120 students over a two year period participated in this exploratory study. Students

are representative of a diverse learner population for their different learning styles. Most of the courses were typical MIS courses, which require content as well as software applications. Students were given the details of the tasks to be accomplished and the purpose of the study. On campus students were observed for the completion of their tasks. Through observations of the students, qualitative interpretations were drawn. Co-discovery testing and the think-aloud approach were used to assess the time spent in navigation and the time spent in actual learning activities. Students were asked to share their think-aloud activities for recording the data.

The methodology adopted for this study included heuristic evaluation, a usability survey questionnaire, a cognitive walkthrough experiment, and think-aloud and co-participant testing. Heuristic evaluation is a method of usability analysis where a number of usability experts are asked to evaluate the interface design of applications and asked to comment on it (Tang, et al., 2006). This approach is easy to conduct and is inexpensive relative to other evaluation methods. The cognitive walkthrough method is another usability inspection method which is used to identify usability issues through assigning tasks to users to complete. This method is used to observe the behavior of users for completing the assigned tasks. Cognitive walkthrough analyses helps to understand the ease of use with which users utilize the interface and the likelihood of user errors. The think aloud approach is a form of observation where the students are asked to talk through what they are doing when asked to complete the assigned tasks. Their actions and behavior are observed by the investigator. Co-discovery testing is where a group of students are asked to perform the assigned tasks (Nielsen, 1994).

Through questionnaire survey user demographics, the students' experience for e-learning systems, preferences, etc. are collected. As part of representative user testing, formal empirical observations are made as users interact with the e-learning systems. The study combines these observations with the think-aloud approach, in which individual users provide a running commentary on their thoughts as they perform particular tasks. The data is collected using all these methods. After the data is analyzed, a new set of guidelines will be developed for the usability assessment for e-learning systems. Five e-learning systems, in form of five courses, will be assessed and evaluated for their usability.

3. Discussion and Summary

This exploratory study was not only targeted to answer the question of the usability of the user interface of an e-learning application, but also to analyze whether e-learning application design is also effective for learners' learning activities. The usability of e-learning applications may throw an important light on the significance of such a study for improving course design, enhancing students' retention rate, and improving students' learning outcomes. The multi-method approach was intentionally used to get both quantitative and qualitative data. Interviews were conducted to validate the analysis of results.

The study is still in progress. Results of the study will be discussed in the conference. The findings from the study are beneficial to instructors and the instructional designers for e-learning applications. Preliminary broad findings reveal there is a significant amount of difference in learning styles, including navigational styles and group dynamics, which played an important role in usability testing. Co-participants were much quicker and keen to navigate and complete the tasks as compared to individuals. The discussion among co-participants reveal that students liked co-participant discovery, which supports the power of collaborative learning for e-learning applications.

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