Usability

Su-Ting Yong
Curtin University of Technology, Sarawak Campus, Malaysia

INTRODUCTION

This is a brief review of the history of usability and a discussion of usability in developing a computer-based learning program (CBLP). According to ISO 9241, usability is defined 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 (Bevan, 2001). The main focus of usability in this article is concerned with the user interface and interaction design. To create a usable computer-based learning program, one needs to understand the definition of usability and the goals of usability. Besides achieving usability goals, a usable CBLP should also be able to attain user experience goals. Design principles can be used to develop a CBLP featured with usability. Two design models will be discussed in this review.

According to McCracken and Wolfe (2004), when electronic computers first appeared in the 1950s and '60s, they were extremely expensive and were mostly used by companies and universities. However, in the late 1970s and early 1980s, things began to change as computers became smaller and cheaper. In 1981, IBM Corporation introduced the first IBM personal computer, targeted for home and small-business use. Since computers became cheaper, more and more people were able to purchase computers to assist them in their work and everyday life activities. As a result, the computer and software manufacturers started to consider the benefits of creating products that were user friendly. The term usability was coined to replace the term user friendly, which by the early 1980s had acquired a host of undesirably vague and subjective connotations (Bevan, Kirakowski, & Maissel, 1992).

Nowadays, as the need of information crosses all borders, CBLP in Web environments is becoming more and more popular. However, most of these CBLPs are not usable as little thought or effort is put into the design before the CBLPs are implemented. Many Web-based distance courses and elaborate multimedia are simply used to display information. Some CBLPs have not even been tested or evaluated prior to their introduction into the curriculum. Usability problems result in frustration, lowered learners' morale, decreased productivity, higher error rates, and emotional injury. These common experiences are probably caused by usability design faults. A new area of research has emerged to deal with these frustrations called usability engineering, human-computer interaction (HCI), or just usability (Marquis, Nichols, & Tedesco, 1998). To eliminate frustration from the users' experience, the usability of the CBLP needs to be considered thoroughly. The literature also indicates that a critical factor to the success of Web-based instruction is the incorporation of usability design into the development process (Henke, 1997). However, most of the CBLP designers tend to create a "bells and whistles" system that is focusing on technological efforts rather than focusing on learning objectives and the learners' needs. Too often we see the choice of technology being made first, and then the learning objectives being organized around what the technology can offer (Oliver, 1998). What promises a usable CBLP? Usability expert Jakob Nielsen (as cited in Gardner, 2000) urges designers to keep focused on the tasks that their site will be used to accomplish rather than on the design, and to observe users in their natural environment. It is apparent that to create a usable CBLP, the designer needs to consider the learning objectives and how learners interact with the system.

WHAT IS USABILITY?

Usability is considered as the most general ergonomic-quality concept that applies to all kinds of interaction between a user and a product within a given context of use (Dzida, 1996). Jakob Nielsen (as cited in Alexander, 2001) stated that usability has

five characteristics: learnability, efficiency, memorability, minimization of error frequency, and subjective satisfaction. Standards related to usability can be categorized as primarily concerned with the use of the product, the user interface and interaction, the process used to develop the product, and the capability of an organization to apply user-centered design (Bevan, 2001). Although there are standards in usability, it should not be seen as a constraint in developing a creative, usable CBLP. Interestingly, in spite of its brief history as a scientific and applied discipline, HCI has already produced five different perspectives on usability, which are general theory, usability engineering, subjectivity, flexibility, and sociality (Löwgren, 1995). The definition of usability may also be different from the perspective of novices or expert users, school children or adult learners, students or teachers, as well as users or designers.

USABILITY GOALS

Usability goals of CBLP should include user interface and interaction design. According to Preece, Rogers, and Sharp (2002), usability goals are broken down into effectiveness, efficiency, safety, utility, learnability, and memorability.

Effectiveness is a very general goal that refers to how good a system is at doing what it is supposed to do (Preece et al., 2002). The use of multimedia in CBLP can engage learners with meaningful activities through various forms of interactivity. These include making choices and decisions, discussing, sharing knowledge, listening, making evaluations, constructing, drawing, and controlling. The use of audiovisual presentations is highly effective (Tindall-Ford, Chandler, & Sweller, 1997), and effective working memory may be increased by presenting material in a mixed rather than a unitary mode (Mousavi, Low, & Sweller, 1995). However, the use of multimedia should be relevant to the learning objectives and it should also enhance comprehension, memory, or transfer of what is learned to real-world activities. According to Carr-Chellman and Duschatel (as cited in Oliver, 2000), the ideal online course is characterized by the provision for collections of student work and examples online. Besides that, Jonassen (as cited in Alessi & Trollip, 2001)

suggested an online notebook that enables learners to make notes as they go through the material. Although not all learners would choose to take notes, providing the tool can be beneficial for those who make good use of it.

Efficiency refers to the way a system supports users in carrying out their tasks (Preece et al., 2002). Efficiency also can be defined as a measure of how quickly users can accomplish goals or finish their work when using the system (McCracken & Wolfe, 2004). For example, efficiency can be measured by the number of keystrokes or clicks needed to get the required information. CBLP should be designed with a clear and easy-to-navigate structure to enable learners to get the learning materials easily. Besides that, activities in a CBLP should be designed with short, convenient learning sessions, and each session should take between 15 minutes and an hour depending on the methodology and content difficulty (Alessi & Trollip, 2001). This encourages learners to study for short periods of time on several occasions. Research has shown that learners can only concentrate for a short period of time and they get bored easily. Constructivist theory states that learners should be given as much control as possible pertaining to the use of CBLP in their learning process. Therefore, the design of CBLP should be flexible to fit the learners' needs. Instead of presenting learners with learning aids and learning material, the learning system should provide them with intuitive structures that they can adapt and modify as required (Thissen, 2000). Although control and flexibility are given, guidance is necessary for the efficient use of CBLP. Be wary of forcing learners down a single prescribed path by forcing them to answer a question correctly in order to proceed. They should not be forced to follow a rigid, linear navigation. Learners may get frustrated as the inflexible learning environment does not motivate them. Therefore, the navigation structure of a CBLP should be designed carefully to increase efficiency.

Safety involves protecting the user from dangerous conditions and undesirable situations (Preece et al., 2002). Safety can mean safety of users, safety of data, or both (McCracken & Wolfe, 2004). The safety of a CBLP should not be overlooked. The user should be prevented from making serious errors by reducing the risk of wrong keys being mistakenly activated. For example, the delete-file button should

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