Usability

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INTRODUCTION

In this article we will examine some important issues related to human-computer interaction (HCI). This will be followed by a discussion of usability and its underlying principles and properties. The dependability of computer systems is intrinsically multi-faceted. Dependable hardware is patently of limited value unless accompanied by dependable software. Neither helps greatly if human interaction with the hardware and software system is fault-prone and the dependable socio-technical performance of an inappropriate task may cause wider damage (MacKenzie, 2000).

HCI

HCI is a field of research and development, methodology, theory and practice, with the objective of designing, constructing and evaluating computer-based interactive systems – including hardware, software, input/output devices, displays, training and documentation – so that people can use them efficiently, effectively, safely and with satisfaction. HCI is cross-disciplinary in its conduct and multidisciplinary in its roots, drawing on – synthesizing and adapting from – several other fields, including human factors (e.g., the roots of task analysis and designing for human error in HCI), ergonomics (e.g., the roots of design of devices, workstations and work environments), cognitive psychology (e.g., the roots of user modeling), behavioral psychology and psychometrics (e.g., the roots of user performance metrics), systems engineering (e.g., the roots of much pre-design analysis) and computer science (e.g., the roots of graphical interfaces, software tools and issues of software architecture)(Hartson, 1998).

HCI is a simple concept, but difficult to explain in just a few sentences. This difficulty has to do in part with its origins – it draws upon many different but related disciplines that make it a true multi- and inter-disciplinary field. However, as the name indicates, it is a field that concerns itself primarily with what happens when humans and computers meet.

USABILITY

The success of any interactive product or system is ultimately dependent on it providing the right facilities for the task at hand in such a way that it can be effectively used, at an a appropriate price (Dillon, 1994). In the past, implementation of business software involved acquiring (purchasing) a piece of software in order to install and use an interface. The World Wide Web (WWW) and its associated standardized technologies have changed this and now provide the interface before transactions are deployed (Singh & Kotze, 2002).

Usability is generally regarded as ensuring that interactive products, such as e-commerce applications, are easy to learn, effective to use, have aesthetic integrity, are enjoyable from the user's perspective and involve the optimization of user interaction with these interactive products (Preece, Rogers & Sharp, 2002). Over time, several researchers have produced sets of generic usability principles that can be used in improving e-commerce Web sites as well as showing how to test usability and how to design software products, bearing usability in mind (Badre, 2002; Cato, 2001; Dix, Finlay, Abowd & Beale, 1998; Mayhew, 1999; Nielsen, 1993, 2000; Preece et al., 2002; Preece, Rogers, Sharp, Benyon, Holland & Carey, 1994; Shneiderman, 1998; Thimbley, 1990). These principles include aspects such as effectiveness, efficiency, safety, utility, learnability, flexibility, robustness, memorability and so forth.

ISO Definition

The ISO 9241 (ISO 9241, 1998; Travis, 2003) standard describes ergonomic requirements for office work with visual display terminals. This standard

defines how to specify and measure the usability of products, as well as defining the factors that have an effect on usability.

In order to specify or measure usability, it is necessary to identify the goals that pertain to and decompose effectiveness, efficiency and satisfaction, and the components of the context of use into subcomponents with measurable and verifiable attributes:

- **Effectiveness:** the accuracy and completeness with which specified users can achieve specified goals in particular environments
- **Efficiency:** the resources expended in relation to the accuracy and completeness of goals achieved
- **Satisfaction:** the comfort and acceptability of the work system to its users and other people affected by its use.

The standard states that when specifying or measuring usability, the following information is needed: a) A description of the intended goals; b) a description of the components of the context of use, including users, tasks, equipment and environments (This may be a description of an existing context, or a specification of intended contexts. The relevant aspects of the context and the level of detail required will depend on the scope of the issues being addressed. The description of the context needs to be sufficiently detailed so that those aspects of the context that may have a significant influence on usability can be reproduced.); and c) Target or actual values of effectiveness, efficiency and satisfaction for the intended contexts.

The context of use defined by the standard includes the following factors:

- **Description of users:** Characteristics of the users need to be described. These can include knowledge, skill, experience, education, training, physical attributes, and motor and sensory capabilities. It may be necessary to define the characteristics of different types of users; for example, users having different levels of experience or performing different roles.
- **Description of tasks:** Tasks are the activities undertaken to achieve a goal. Characteristics of tasks that may influence usability should be described; for example, the frequency and duration of the task. Detailed descriptions of the activities and processes may be required if the description of the context is to be used as a basis for the design or evaluation of details of interaction with the product. This may include descriptions of the allocation of activities and steps between the human and technological resources. Tasks should not be described solely in terms of the functions or features provided by a product or system. Any description of the activities and steps involved in performing the task should be related to the goals that are to be achieved.
- **Description of equipment:** The description of the hardware, software and materials may take place in terms of a set of products, one or more of which may be the focus of usability specifications or evaluation, or it may occur in terms of a set of attributes or performance characteristics of the hardware, software and other materials.
- **Description of environment:** Relevant characteristics of the physical and social environment need to be described. Aspects that may need to be described include attributes of the wider technical environment (e.g., the local area network), the physical environment (e.g., workplace, furniture), the ambient environment (e.g., temperature, humidity) and the social and cultural environment (e.g., work practices, organizational structure and attitudes).
- **Usability measures:** Usability measures include effectiveness, efficiency and satisfaction. These are measured in user trials of the product. The goal of the user trial is to identify what the projects are trying to find out in their trials. The goal of the user trial may be to help in defining user requirements, to confirm that the technology works in real conditions, to measure user attitudes, to start the marketing of the system or to measure accessibility.

USABILITY IN GENERAL

Guidelines are lists of rules about when and where to do things, or not to do things, in an interface. These guidelines can take a variety of forms and may be obtained from several sources, such as journal articles, general textbooks, company in-house style guides and so forth. (Singh, Erwin & Kotze, 2001).