Chapter 2.13
The Think Aloud Method and User Interface Design

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INTRODUCTION

Daily use of computer systems often has been hampered by poorly designed user interfaces. Since the functionality of a computer system is made available through its user interface, its design has a huge influence on the usability of these systems (Carroll, 2002; Preece, 2002). From the user's perspective, the user interface is the only visible and, hence, most important part of the computer system; thus, it receives high priority in designing computer systems.

A plea for human-oriented design in which the potentials of computer systems are tuned to the intended user in the context of their utilization has been made (Rossen & Carroll, 2002).

An analysis of the strategies that humans use in performing tasks that are to be computer-supported is a key issue in human-oriented design of user interfaces. Good interface design thus requires a deep understanding of how humans perform a task that finally will be computer-supported. These insights then may be used to design a user interface that directly refers to their

information processing activities. A variety of methodologies and techniques can be applied to analyze end users' information processing activities in the context of a specific task environment among user-centered design methodologies. More specifically, cognitive engineering techniques are promoted to improve computer systems' usability (Gerhardt-Powels, 1996; Stary & Peschl, 1998).

Cognitive engineering as a field aims at understanding the fundamental principles behind human activities that are relevant in the context of designing a system that supports these activities (Stary & Peschl, 1998). The ultimate goal is to develop end versions of computer systems that support users of these systems to the maximum in performing tasks in such a way that the intended tasks can be accomplished with minimal cognitive effort. Empirical research has indeed shown that cognitively engineered interfaces are considered superior by users in terms of supporting task performance, workload, and satisfaction, compared to non-cognitively engineered interfaces (Gerhardt-Powels, 1996). Methods such as the think aloud method, verbal protocol analysis,

or cognitive task analysis are used to analyze in detail the way in which humans perform tasks, mostly in interaction with a prototype computer system.

BACKGROUND

In this section, we describe how the think aloud method can be used to analyze a user's task behavior in daily life situations or in interaction with a computer system and how these insights may be used to improve the design of computer systems. Thereafter, we will go into the pros and cons of the think aloud method.

The Think Aloud Method

Thinking aloud is a method that requires subjects to talk aloud while solving a problem or performing a task (Ericsson & Simon, 1993). This method traditionally had applications in psychological and educational research on cognitive processes. It is based on the idea that one can observe human thought processes that take place in consciousness. Thinking aloud, therefore, may be used to know more about these cognitive processes and to build computer systems on the basis of these insights. Overall, the method consists of (1) collecting think aloud reports in a systematic way and (2) analyzing these reports to gain a deeper understanding of the cognitive processes that take place in tackling a problem. These reports are collected by instructing subjects to solve a problem while thinking aloud; that is, stating directly what they think. The data so gathered are very direct; there is no delay. These verbal utterances are transcribed, resulting in verbal protocols, which require substantial analysis and interpretation to gain deep insight into the way subjects perform tasks (Deffner, 1990).

The Use of the Think Aloud Method in Computer System Design

In designing computer systems, the think aloud method can be used in two ways: (1) to analyze users' task behaviors in (simulated) working practices, after which a computer system is actually built that will support the user in executing similar tasks in future; or (2) to reveal usability problems that a user encounters in interaction with a (prototype) computer system that already supports the user in performing certain tasks.

In both situations, the identification and selection of a representative sample of (potential) end users is crucial. The subject sample should consist of persons who are representative of those end users who will actually use the system in the future. This requires a clearly defined user profile, which describes the range of relevant skills of system users. Computer expertise, roles of subjects in the workplace, and a person's expertise in the domain of work that the computer system will support are useful dimensions in this respect (Kushnirek & Patel, 2004). A questionnaire may be given either before or after the session to obtain this information. As the think aloud method provides a rich source of data, a small sample of subjects (eight to 10) suffices to gain a thorough understanding of task behavior (Ericsson & Simon, 1993) or to identify the main usability problems with a computer system (Boren & Ramey, 2000). A representative sample of the tasks to be used in the think aloud study is likewise essential. Tasks should be selected that end users are expected to perform while using the (future) computer system. This requirement asks for a careful design of tasks to be used in the study to assure that tasks are realistic and representative of daily life situations. It is recommended that task cases be developed from real-life task examples (Kushnirek & Patel, 2004).

Instructions to the subjects about the task at hand should be given routinely. The instruction on thinking aloud is straightforward. The essence

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