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 utter-
ances 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 prac-
tices, 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) com-
puter system that already supports the user in per-
forming certain tasks.

In both situations, the identification and selection
of a representative sample of (potential) end users is
necessary. The subject sample should consist of per-
sons who are representative of those end users who
will actually use the system in the future. This
requires a clearly defined user profile, which de-
scribes the range of relevant skills of system users.
Computer expertise, roles of subjects in the work-
place, 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 care-
ful 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 is that the
subject performs the task at hand, possibly sup-
ported by a computer, and says out loud what comes
to mind.

A typical instruction would be, “I will give you a
task. Please keep talking out loud while performing
the task.” Although most people do not have much
difficulty rendering their thoughts, they should be
given an opportunity to practice talking aloud while
performing an example task. Example tasks should
not be too different from the target task. As soon as
the subject is working on the task, the role of the
instructor is a restrained one. Interference should
occur only when the subject stops talking. Then, the
instructor should prompt the subject by the following
instruction: “Keep on talking” (Ericsson & Simon,
1993).

Full audiotaping and/or videorecording of the
subject’s concurrent utterances during task perfor-
mance and, if relevant, videorecording of the com-
puter screens are required to capture all the verbal
data and user/computer interactions in detail. After
the session has been recorded, it has to be trans-
scribed. Typing out complete verbal protocols is
inevitable to be able to analyze the data in detail (Dix
et al., 1998). Videorecordings may be viewed inform-
ally, or they may be analyzed formally to under-
stand fully the way the subject performed the task or
to detect the type and number of user-computer
interaction problems.

The use of computer-supported tools that are
able to link the verbal transcriptions to the corre-
sponding video sequences may be considered to
facilitate the analysis of the video data (Preece,
2002).

Prior to analyzing the audio and/or video data, it
is usually necessary to develop a coding scheme to
identify step-by-step how the subject tackled the
task and/or to identify specific user/computer inter-
action problems in detail. Coding schemes may be
developed bottom-up or top-down. In a bottom-up
procedure, one would use part of the protocols to
generate codes by taking every new occurrence of
a cognitive subprocess code. For example, one could
assign the code guessing to the following verbal
statements: “Could it be X?” or “Let’s try X.” The
remaining protocols then would be analyzed by using
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