Illusive, Ineffective, Inefficient, Ideal: Standardized Coordination Task Assessments of Awareness Support

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Abstract

Awareness support in cooperative systems provides users with mutual information on each others' presence and activities. Measuring its effectiveness is a complex task since people tend to forget quickly. Therefore, it becomes imperative to use a technique generating results while a user's awareness is still present. The Standardized Coordination Task Assessment measures response times and error rates visualizing the results in a four quadrant system distinguishing illusive, ineffective, inefficient, and ideal systems. This helps awareness support researchers and designers to drive their effort into the right direction already at early development stages.

1 Introduction

Awareness in cooperative systems provides users with mutual information on each others' presence and activities. It was shown long time ago that providing awareness has its merits – for instance, Dourish and Bellotti (1992) showed that awareness in group editors has positive effects on the coordination in work teams. Yet, it is still difficult to measure the effectiveness of awareness support (as it is to evaluate CSCW systems in general (Grudin 1988)). There are many measuring approaches in CSCW originating from various research areas like interviews, questionnaires (social psychology), ethnographic studies (sociology), conversation analysis (ethnomethodology) etc. (Ross et al. 1995). Some methods are more or less disruptive while others capture more or less universal behavior (McGrath 1993). However, only few regard awareness peculiarities: Not only being rather secondary to the original task, awareness is also ephemeral by nature. People tend to forget quickly. Having Ebbinghaus' (1885) forgetting curve in mind, it becomes quite obvious that there is only limited time for researchers to measure awareness in order to judge on the effectiveness of an awareness support system. They gain the greatest benefit conducting this assessment as early and often as possible in order to direct their research effort in the right direction. However, this approach sounds not feasible using field studies. This paper presents the *Standardized Coordi-*

nation Task Assessment for measuring awareness support effectiveness. We introduce its features and application. We also discuss early findings and point out future work.

2 Approach

The *Standardized Coordination Task Assessment (SCTA-4I)* grounds on the following hypothesis: if somebody is aware of something, then s/he can answer questions about it quickly and without error. As the name suggests the SCTA consists of a standardized task and a measurement approach that eventually yields a result depictable in the 4I (illusive, ineffective, inefficient, ideal) diagram (see Figure 1).

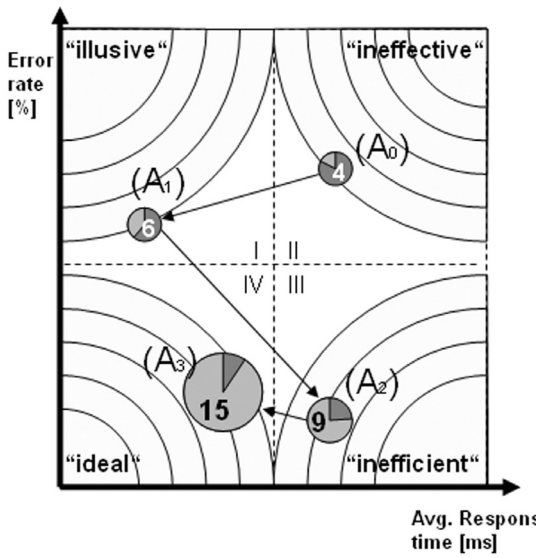

Figure 1: The 4I diagram. Error rate, average response time, performance, and coordination errors are shown in a single diagram. The system's initial version A_0 is developed to A_1, A_2, and finally A_3 (the most ideal).

The task itself merely involves the counting of letters. The letters have a random order and are displayed as document on the user's screen. The task has its roots in the research concerned with subliminal messages. Karremans et al. (2006) used the counting of Bs as primary task while displaying subliminal messages (the name and logo of an ice tea brand) and later investigating their impact. Opposed to Karremans et al.'s original task ours not only contains Bs but all letters of the alphabet in upper and lower case. These are to be counted by a team of at least two people. This is where the coordination effort comes into play (Karremans et al.'s task is performed by individuals not teams). The counting activity and coordination creates the mental load to be measured. Our measurement approach borrows freeze probes from the Situation Awareness Global Assessment Technique (SAGAT) (Endsley 1988). However, opposed to SAGAT we do not use predetermined situation awareness requirements. Three freeze probes (i.e. the halt of the task, blanking the screens and then probing the subjects for a short period of time) are used to quickly ask questions (e.g. "Who counted Cs?", "How many Ds?", "Were Es counted?", "Which of the following letters did your partner count?") concerning the counting task measuring the *response times*. Additionally, the number of errors in relation to the number of questions (*error rate*) is determined. In general, quick response times and low error rates are desirable indicating reasonable awareness support. Error rate and the average response time make up the x- and y axis in our (4I-) visualization. It is divided into four quadrants. Each quadrant has a label according to the

contained system type. Quadrant I contains systems with high error rates and low response times since users present wrong answers quickly indicating *illusive* systems. Quadrant II encompasses systems with high error rates and high response time indicating *ineffective* systems since users cannot answer questions correctly even after thinking longer. Quadrant III contains systems with high response times but low error rates where users appear to need some time for thinking but finally come up with correct answers. Quadrant IV has correct answers provided quickly which is the characteristic of *ideal* systems. Besides the above measures, the overall *performance* and the number or *coordination errors* are recorded. The former is measured by limiting the task's duration. A test run ends after 15 minutes. The number of different letters counted during this time period indicates a team's performance. Coordination errors occur for instance when team members count the same letters. Again, high performance and a low number of coordination errors are desirable and indicate reasonable awareness support. In our visualization the tested system (A) is depicted as pie chart relating its coordination errors (dark-grey) to the number of letters counted (light-grey). The pie chart's radius conveys its performance (letters counted/15 min). An absolute value shows the number of letters counted.

3 Application

The SCTA-4I can be used by awareness support researchers and designers at early stages in iterative system development. We recommend setting up a starting point (A_0 in Figure 1) with an early version of the system to be developed or with similar already existing applications. Further assessments are done (A_1, A_2, and A_3 in Figure 1) while the system evolves in small steps. Placing the results in the 4I diagram visualizes the effort's direction. Research staff is relieved from the manual work these assessments would cause by our software that allows the setup and recording of assessment sessions, conducting freeze probes asking questions and documenting results.

4 Discussion

The SCTA-4I is simple, universally usable (e.g. compared to SAGAT) and concentrates especially on awareness support. The setup of the task is straight forward allowing heavy (re–)use at very low preparation cost (i.e. new tasks are created easily). Opposed to questionnaires it delivers quantitative data and a visualization that helps to direct further development steps. Awareness is measured when it is still available using freeze probes. However, as an experimental simulation it lacks the situatedness often needed in CSCW application assessment (Twidale et al. 1994). We think that this situatedness is not exactly needed at these early stages of development – it becomes mandatory at later stages using other methods. Since larger team sizes increase the coordination effort we recommend creating one 4I visualization per team size. The SCTA-4I currently focuses on the communication activity during the task. Future versions will include other areas of awareness information like location or presence. Another issue: exact quadrant border values have not been determined, yet (for

instance, answering the question as to when a system starts to become illusive). Current borders exemplify different areas while the main goal remains to get closer to the lower left corner – the ideal. Therefore having a starting point set is of greater importance.

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