Information Rich Systems and User's Goals and Information Needs

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INTRODUCTION

Currently, most of the Web is designed from the viewpoint of helping people who know what they want but need help accomplishing it. User goals may range from buying a new computer to making vacation plans. Yet, these are simple tasks that can be accomplished with a linear sequence of events. With information-rich sites, the linear sequence breaks down, and a straightforward process to provide users with information in a useful format does not exist.

Users come to information-rich sites with complex problems they want to solve. Reaching a solution requires meeting goals and subgoals by finding the proper information. Complex problems are often ill-structured; realistically, the complete sequence can't even be defined because of users' tendencies to jump around within the data and to abandon the sequence at varying points (Klein, 1999). To reach the answer, people need the information properly positioned within the situation context (Albers, 2003; Mirel, 2003a). System support for such problems requires users to be given properly integrated information that will assist in problem solving and decision making.

Complex problems normally involve high-level reasoning and open-ended problem solving. Consequently, designer expectations of stable requirements and the ability to perform an exhaustive task analysis fall short of reality (Rouse & Valusek, 1993). While conventional task analysis works for well-defined domains, it fails for the ill-structured domains of information-rich sites (Albers, 2004). Instead of exhaustive task analysis, the designer must shift to an analysis focused on providing a clear understanding of the situation from the user's point of view and the user's goals and information needs.

BACKGROUND

In today's world, data almost invariably will come from a database. A major failing of many of these systems is that they never focus on the human-computer interaction. Instead, the internal structure of the software or database was reflected in both the interface operation and the output.

The problem is not lack of content. Information-rich sites normally have a high information content but inefficient design results in low information transmission. From the psychological standpoint, the information is disseminated ineffectively. The information is not designed for integration with other information but rather is optimized for its own presentation. As a result, users must look in multiple sources to find the information they need. While hypertext links serve to connect multiple sources, they often are not adequate. Johnson-Eilola and Selber (1996) argue that most hypertexts tend to maintain the traditional hierarchical organization of paper documents.

Mirel (1996, 2003b) examined the difficulties users have with current report design and found that sites often provide volumes of information but fail to effectively answer a user's questions. The information needed by professionals exists within the corporate database, but with complex problems, there are no ready-made answers that can be pulled out with simple information retrieval techniques. Thus, it cannot be expected that relevant information can be found by direct means, but it must be inferred. Interestingly (and complicating the design), inferring results is what experts do best. While all readers need information to be properly integrated, the amount of integration and coherence of the information required varies. McNamara and her colleagues (McNamara, 2001; McNamara & Kintsch, 1996)

have found that users with a higher topic knowledge level perform better with less integrated information. Following the same idea, Woods and Roth (1998) define the critical question as "how knowledge is activated and utilized in the actual problem-solving environment" (p. 420).

Waern (1989) claims that one reason systems fail lies in the differences in perspective between the data generator and the information searcher. Much of the research on information structuring attempts to predefine user needs and, thus, the system breaks down when users try to go beyond the solution envisioned by the designers. Basden and Hibberd (1996) consider how current audience and task analysis methods tend to start with an assumption that all the information needed can be defined in advance and then collected into a database. In this view, the knowledge exists as external to the system and user. However, for systems that must support complex situations, the methods tend to break down. Spool (2003) found some designs drove people away by not answering their questions in the user's context.

DESIGN FOR INFORMATION-RICH SYSTEMS

Interface and content designers increasingly are being called upon to address information needs that go beyond step-by-step instruction and involve communicating information for open-ended questions and problems (Mirel, 1998, 2003b). Applying that approach to interface design can enhance user outcomes, as such systems can help to organize thinking rather than to suggest a course of action (Eden, 1988). The questions and problems that users bring to information-rich systems only can be addressed by providing information specific to a situation and presenting it in a way that supports various users' goals and information needs (Albers, 2003).

Addressing users' goals and information needs breaks with the fundamental philosophy of a design created to step a user through a sequence. Complex situations contain lots of ambiguity and subtle information nuances. That fact, if nothing more, forces the human into the process, since computers simply cannot handle ambiguity. From the computer's point of view, data are never ambiguous (if it has 256 shades of gray, then it can be assigned to one and only one of 256 little bins). The easiest design method, one that is much too prevalent, is to ignore the ambiguity. The system displays the information and leaves it up to the user to sort out the ambiguity. From the start, designers must accept that information, since a complex situation cannot be prestructured and must be designed to allow users to continuously adapt to it. Consequently, many of the standard considerations of stable requirements, exhaustive task analysis, and ignorance of cognitive interaction fail to apply and require reconsideration (Rouse & Valusek, 1993). This breakdown between the designer's and the user's thought processes explains why conventional task analysis works for well-defined domains but fails for the ill-structured domains of information-rich sites (Albers, 2004). Instead, the designer must have a clear understanding of the situation from the user's point of view, the user's goals, and the user's information needs.

Situation

The situation is the current world state that the user needs to understand. A situation always exists with the user embedded within it. To understand a situation, a user works within the situation by defining goals and searching for the information required to achieve the goals. An underlying assumption is that the user needs to interact with an information system in order to gain the necessary information and to understand the situation. In most cases, after understanding the situation, the user will interact with the situation, resulting in a change that must be reflected in an updated system.

Goal

User goals are the high-level view that allows the entire situation to be understood in context. To maximize understanding, the information should directly map onto the goal. Goals could be viewed from the user's viewpoint as plans and from the system's viewpoint as the road map detailing the possible routes to follow. Goals can consist of subgoals, which are solved in a recursive manner. Each goal gets broken into a group of subgoals, which may be broken down further, and each subgoal must be handled before the goal can be considered