

# Searching the Web: Effects of Problem Solving Style on Information-Seeking Behavior

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## Introduction

Hypermedia, characterized as a non-linear multimedia system allowing an interaction with users, is one of new computer-based technologies, and has been adapted as an information system for a variety of different purposes. Because of its novel characteristics and perceived ease of use, hypermedia has attracted many end-users, but it also has been condemned for unusual burdens for the user created by its non-linearity. Many studies have been conducted to find how individuals cope with the unique feature of the hypermedia, and have revealed that hypermedia can be more effective than other information systems if used properly, i.e. for certain types of task or for users with certain characteristics (Marchiononi et al. 1990; Campagnoni & Ehrlich 1989; Korthauer & Koubek, 1994).

According to Foltz (1996), navigating a hypermedia system is more than just searching information. It involves a problem-solving process requiring decision-making as well as information recognition. It seems logical to think, then, that the way in which users' approach to solving a problem would influence the way in which they search information on a hypermedia system. Understanding relationships between users' problem-solving style and their information-seeking behavior should be useful in designing a user-centered hypermedia system and also an effective user training program.

## Pilot study

A pilot study was conducted to explore effects of users' problem-solving and cognitive styles on their use of search tools, navigational patterns and search performance on the Web. For the study, undergraduate students were recruited from a public university. In order to identify their problem-solving and cognitive styles, the Problem Solving Inventory (PSI) and the Group Embedded Figures Test (GEFT) were administered. On the basis of the PSI results, their problem-solving style was identified as either *emotion-focused* (EF) or *problem-focused* (PF). Their cognitive styles were determined based on the GEFT: *field-dependent* (FD), *field-independent* (FI), or *field-mixed* (FM). For distinguishing these different styles, norms from the manuals of both tests were used.

The combination of these two problem-solving styles (EF/PF) and three cognitive styles (FD/FM/FI) should result a 2x3 factorial design: (1) EF-FD (a subject group with Emotion-Focused problem-solving style and Field-Dependent cognitive style), (2) EF-FM (subject with Emotion-Focused problem-solving style and Field-Mixed cognitive style), (3) EF-FI (subject with Emotion-Focused problem-solving style and Field-Independent cognitive style), (4) PF-FD (subject with Problem-Focused problem-solving style and Field-Dependent cognitive style), (5) PF-FM (subject with Problem-Focused problem-solving style and Field-Mixed cognitive style), and (6) PF-FI (subject with Problem-Focused problem-solving style and Field-Independent cognitive style). To each of these groups, one subject with the corresponding problem-solving and cognitive styles was assigned. As none of the recruited students was identified as PF-FD, however, only five subjects (EF-FD; EF-FM; EF-FI; PF-FM; PF-FI) participated in the study. In an individual lab session, each subject was asked to search information on the Web for completing given tasks. During the search session, all the transactions and screen displays were recorded using a software program.

## Findings

Results indicated that individuals with different problem-solving styles tended to use different search tools. Problem-focused (PF) subjects seemed to have specific destinations of interest most of the time, and tended to reach the destination by using jump tools (like *Go*) or by typing the corresponding URL in the location window.

It was also found that the searchers' problem-solving style had some impact on their navigational patterns. When checking links embedded in a Web page, the emotion-focused (EF) subjects tended to traverse several layers of nodes before returning to the starting page. The problem-focused (PF) subjects, on the other hand, usually traversed only one or two layers of nodes. Interestingly, these search patterns were sharply contrasted when the problem-solving styles were combined with certain cognitive styles. That is, the emotion-focused subject with field-dependent cognitive style (EF-FD) checked a low number of links from the starting page, traversing a high number of layers of nodes, and, whereas the problem-focused subject with field-independent cognitive style (PF-FI) checked a high number of links from the starting page, traversing no more than one layer of nodes before returning to the starting page. As a result, the search pattern of the PF-FI subject could be typified as *spoke and hub* pattern.

Results of the study also indicated that cognitive style influenced the use of search tools. The field-dependent (FD) subjects tended to use the Home and the Back buttons more frequently than the rest, implying that they were prone to get lost and that they tended to navigate in a more linear mode. The FI subjects, on the other hand, seemed to use Find option more frequently than the rest, which suggests that the FIs prefer keyword searching approach – an analytical search strategy – to browsing. It should be noted, however, that effects of cognitive style on search patterns were less eminent than effects of problem-solving style.

With regard to search performance, the FDs and the EFs seemed to need longer time than the FIs and the PFs respectively, in order to complete search tasks. Findings from other study seems to support this results: in a study with a larger sample (n=48), a significant main effect of cognitive style was found on the search time (Kim, 1998).

## Work-in-Progress

Based on findings from this small pilot study, a study has been conceived and crafted to focus on the problem-solving style variable and to scrutinize how the users' problem-solving style affects their search behavior on the Web. Eighty undergraduate students will participate in the study. Their problem-solving style will be determined on the basis of the scores from the PSI (Problem Solving Inventory). Each participant will be asked to search information on the Web for completing assigned tasks. All transactions during the search session will be recorded and analyzed for identifying and evaluating search strategies, navigational patterns and search performance of individuals with different problem-solving styles. The study will be conducted this fall, and preliminary results will be obtained by the end of this year. Currently, another pilot study is being conducted for determining details of the study.

## References

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