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Thinking style impacts on Web search strategies

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Abstract

Web searches entail complex cognitive processes influenced by individual differences, and users with similar cognitive or skill factors tend to develop multiple search strategies. The authors analyze such strategies in terms of level of thinking style (global versus local), search targets, and six search behavior indicators and report (a) a significant relationship between different thinking style levels and individual search target types and (b) that different thinking style level conditions can cause significant differences in search behavior performance regarding maximum depth of exploration, revisited pages, and Web pages visited for refining answers. The findings suggest that high global style users tend to disperse their targets to comprehend the search task while high local style users elaborate on a few specific topics. Furthermore, high global style users skim more, require less explicit answers, and are less likely to explore an issue in depth compared to high local style or bi-high style individuals. The results confirm that thinking style level is an important factor affecting search intention. To improve search experiences, search engine designers should incorporate human factors into their products so as to take advantage of personal learning approaches.

Keywords: Thinking styles; Search strategies; Information seeking; Human factors; Search interface design

1. Introduction

As one of the most prevalent applications in today's network computing environment, Web search engines are widely used for information seeking and knowledge elaboration.

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However, search-related technology has not yet reached a level of maturity, therefore academic and private researchers continue to look for "the perfect search technology" (Battelle, 2005). Many researchers are experimenting with ways of predicting user search intentions, with some testing new ideas on presenting information visually so as to help users locate information more efficiently. Our assertion is that the concept of *thinking style*—a distinguishing human factor—should be incorporated into any search engine interface design for better search intention prediction and to help users comprehend search results.

1.1. Predicting user intention for narrowing search results

Most search engines use keyword-based techniques as part of their primary interface design. This presents a problem: should users search for what they already know or what they do not know? The answer most likely lies somewhere in between—that is, most searches are for what users "partly" know, since they need prior knowledge of precise keywords in order to find the information they desire. According to Bilal (1998), users without this knowledge frequently choose imprecise keywords and therefore must adjust and readjust keywords and filter out large numbers of hits in order to locate information of interest. Even individuals with considerable search engine experience and/or good domain knowledge must deal with this issue.

Many search engine users—especially children and people with little Information Technology (IT) experience—have problems selecting precise keywords. Bilal and Kirby (2002) note that children usually fail to find desired information due to an inclination to use complete sentences, misspelled words, or over-generalized terms. They observe that children have problems formulating adequate or alternative keywords for completing search tasks and usually do not evaluate the quality of search results. In an attempt to help inexperienced users by predicting their intentions to create better search experiences, designers of advanced search engines such as *Ask.com* and *A9.com* recommend the use of relative search results for locating targeted or more precise information. For instance, users who type in the query "How do elephants sleep?" to Ask.com will be presented with such questions as "Why is an elephant called an elephant?" and "How do elephants eat?" This relieves users of the task of keying in relative keywords to explore core search topics.

1.2. Structured presentation of search results

Regardless of the internal algorithm employed—e.g., Bharat and Mihaila's (2001) *Hilltop*, Brin and Page's (1998) *PageRank*, Haveliwala's (2002) *topic-sensitive PageRank*, or Kleinberg's (1998) *HITS*—search results are sorted using relevance-ranking mechanisms that for the most part do not provide significant or structured presentations to help users quickly comprehend the retrieved information. Thus, users are usually required to sift through long lists of excerpts to create an overall picture of the search topic or to glean the best information. Children find it especially difficult to judge and analyze the correctness and value of search results and rarely evaluate or supplement the ones they receive (Hsieh-Yee, 2001).

Categorizing search results is one obvious solution for dealing with information overload. Clustering is one method that allows users to view categorized results without having to deal with the costs and complexities of building taxonomies (see, for example,