

Characterizing, Supporting and Evaluating Exploratory Search

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1. *Characterizing Exploratory Search*

In the past 15 years, the Web has completely changed our relationship with information and the ways we organize, access, and use it [1]. In the current environment, information to support any query, musing, idle thought or urgent need, is as near as the nearest keyboard, and the ubiquitous Google toolbar may be used a dozen or more times a day. For many people, search has replaced memory or retention of personal information. We have become so used to this information extravaganza that it is hard to remember a time when this kind of information came from a print encyclopaedia or dictionary, commercial database, or perhaps the reference collection of a public or academic library. In this new environment we have the ability to instantly explore our information world based on any stimulus, major or minor. The barrier to searching for information has effectively disappeared. Where search was once a serious endeavour, undertaken with a significant investment of time, energy and often financial resources, or not at all, it is now casual, periodic and opportunistic. While it is often directed toward a specific outcome, the volume and range of information which is now readily available facilitates, and in fact encourages, search which is exploratory in nature.

We are aware that this change in information behaviour has taken place in people's daily lives and work environments, but attempts to model it are in their infancy. What motivates individuals to search, what collections do they access, what strategies do they employ, how much time do they invest, how successful are they, what use do they make of the information, what roles do collaboration and social interaction play, and what synergies and syntheses occur? Studies are needed which examine real tasks integrated into people's daily lives at work and at home, based on longitudinal studies which capture the complexity of information behaviour [2]. Choo

et al., [3] for instance, examined knowledge workers over a two week period and related their motivation in information seeking to the moves that they made online. While most such studies include only a small number of subjects and a limited time frame, at the other end of the scale is the Beauvisage study (described by Van Couvering [4]) which included 3,372 Internet users over 10 months and 597 users over 34 months. In this study 11.9% of sessions were "discovery" sessions, i.e. sessions in which the user seeks unknown information and expands his/her territory, a category which seems representative of exploratory search. We need more such studies which show how search is integrated into our lives.

2. *Supporting Exploratory Search*

Since exploratory search operates in areas which are unknown or poorly defined for the user, there are potentially many techniques to provide interactive system support for this activity, through tools for query development and improvement, navigation, organization and visualization [5]. Many such tools have been developed and evaluated in the context of defined search tasks, using metrics such as task time, error rate, success rate, and user satisfaction. However the challenge in providing tools to support exploratory search is in accommodating its external characteristics as an information-seeking activity. Modern search, particularly in the context of the Web, is ubiquitous, periodic, opportunistic, contextual, social, and progressive. What is needed is not simply a set of tools which make an information seeking task easier or more successful, but ones which are so well embedded in the overall information seeking environment and context that users turn to them automatically and integrate them in their work or everyday information seeking activities. This is a much greater challenge than simply developing a support system for exploratory search that performs well in a laboratory test or even on a set of realistic tasks.

3. Evaluating Exploratory Search

There has been much debate over the role of laboratory experiment in information retrieval, on which precision-recall based metrics are appropriate indicators of success in the real world, and on the degree to which metrics based on averages can predict individual query performance. Despite its limitations, the Cranfield model comprising test collections, queries and relevance judgements serves a very useful purpose in evaluating retrieval system performance, and certainly the model as implemented at TREC has led to significant improvements in term weighting schemes and rapid transfer of the technology to competing systems. It is important to know, at the system level, that best achievable performance is being delivered.

Evaluation at the operational level is far less standardized, more difficult to interpret. This is particularly true where the problem being searched is not well defined, or where the objective is to explore a new area rather than to arrive at a specific outcome. If the task is exploratory, then many paths through the information are possible, and the outcomes are fungible. Quality of support, nature of the interaction, learning outcomes, instances of synthesis or knowledge creation, and the quality of the experience are all difficult to measure but potentially important characteristics of a search support system.

The third stage of evaluation should move out of the laboratory or the staged experiment and into the real world of user behaviour. If the algorithms are as effective as possible, if the system supports exploratory search on controlled or user-generated tasks, then it will still not be successful unless users make it an automatic part of their information seeking activities. A successful system need not serve all areas of exploratory search or even a broad domain; Baby Names Wizard's NameVoyager¹ comes to mind as a tool which supports exploration and discovery in a very narrow domain, but does it very well. However, whether the system is designed for a specific workplace or search activity, or is intended to play a more general role in Web search, unless we design and evaluate systems to meet real-world, ubiquitous information needs they will not be successful in making the transition from the laboratory to the desktop.

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¹ <http://www.babynamewizard.com/voyager>