Struggling and Success in Web Search

abstract

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Struggling and Success in Web Search (Abstract) *

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ABSTRACT

Web searchers sometimes struggle to find relevant information. Struggling leads to frustrating and dissatisfying search experiences, even if searchers ultimately meet their search objectives. When searchers experience difficulty in finding information, their struggle may be apparent in search behaviors such as issuing numerous search queries or visiting many results within a search session. Such long sessions are prevalent and time consuming (e.g., around half of Web search sessions contain multiple queries). Long sessions occur when searchers are exploring or learning a new area, or when they are struggling to find relevant information. Methods have recently been developed to distinguish between struggling and exploring in long sessions using only behavioral signals [1]. However, little attention has been paid to *how* and *why* searchers struggle. This is particularly important since struggling is prevalent in long sessions, e.g., Hassan et al. [1] found that in 60% of long sessions, searchers' actions suggested that they were struggling. Better understanding of struggling search sessions is important in improving search systems.

Fig. 1 shows an example struggling session of a searcher interested in watching live streaming video of the U.S. Open golf tournament.

9:13:11 AM	**Query**	us open
9:13:24 AM	**Query**	us open golf
9:13:36 AM	**Query**	us open golf 2013 live
9:13:59 AM	**Query**	watch us open live streaming
9:14:02 AM	**Click**	http://inquisitr.com/1300340/watch-2014-u-s-open-live-online-final-round-free-streaming-video
9:31:55 AM	**END**	

Figure 1: Example of a *struggling* session from June 2014.

The first two queries yield generic results about U.S. Open sporting events and the specific tournament. The third query might have provided the correct results but it included the previous year rather than the current year. At this stage, the searcher appears to be struggling. The fourth query is the so-called *pivotal query* where the searcher drops the year and adds the terms "watch" and "streaming". This decision to add these terms alters the course of the search session and leads to a seemingly successful outcome.

Understanding transitions between queries in a struggling session, and transitions between struggling and successful queries, can inform the development of strategies and algorithms to help reduce struggling. We address this issue using a mixed methods study using large-scale logs, crowd-sourced labeling, and predictive modeling.

We analyze anonymized search logs from the Microsoft Bing Web search engine to characterize aspects of struggling searches and to understand how some sessions result in success, while others result in failure. Through log analysis on millions of these search sessions, we show that there are significant differences in how struggling searchers behave given different outcomes. These differences encompass many aspects of the search process, including queries, query reformulations, result click behavior, landing page dwell time, and the nature of the search topic. We find that struggling searchers issue fewer queries in successful sessions than in unsuccessful ones. In addition, queries in unsuccessful sessions are shorter, fewer results are clicked and the query reformulations indicate that searchers have more trouble choosing the correct vocabulary.

Given these intriguing differences, we employ a crowd-sourcing methodology to broaden our understanding of the struggling process (beyond the behavioral signals present in log data), focusing on why searchers struggled and where in the search session it became clear that their search task would succeed. We show that there are substantial differences in how searchers refine their queries in different stages in a struggling session. These differences have strong connections with session outcomes. There are particular pivotal queries (where it became clear the search would succeed) that play an important role in task completion. This pivotal query is often the last query and not all strategies are as likely to be pivotal. We developed classifiers to accurately predict key aspects of inter-query transitions for struggling searches, with a view to helping searchers struggle less.

We develop a classifier to predict query reformulation strategies during struggling search sessions. We show that we can accurately classify query reformulations according to an intent-based schema that can help select among different system actions. We also show that we can accurately identify pivotal queries within search sessions in which searchers are struggling.

Search engines aim to provide their users with the information that they seek with minimal effort. If a searcher is struggling to locate sought information, this can lead to inefficiencies and frustration. Better understanding these struggling sessions is important for designing search systems that help people find information more easily. We use our findings to propose ways in which systems can help searchers reduce struggling. Key components of such support are algorithms that accurately predict the nature of future actions and their anticipated impact on search outcomes. Our findings have implications for the design of search systems that help searchers struggle less and succeed more.

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