

User Effort in Query Construction and Interface Selection

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ABSTRACT

This study was designed to examine user beliefs and behavior on the selection and use of search features and search interfaces. Five weeks of user logs were taken from a user-targeted collection and surveys were administered immediately before and after this time period. Survey results indicate a significant correlation between a user's level of effort and their perceived benefit from that effort. Reported search feature use increased by more than 35% over the five weeks. This raises the question of how the behavior of an Internet user changes over time. Results from the log files were inconclusive but suggest a reluctance to use the advanced search interface.

KEYWORDS: World Wide Web Case Studies, End User Searching.

INTRODUCTION

How much effort is a searcher willing to expend creating a web based search? The answer to this question is important in designing and building interfaces and the system capabilities to support those interfaces. One way to determine effort is to examine the query a searcher constructs. While this does not give the whole picture of a search session, it does provide a starting point. In this study, we measured user effort in query construction using direct surveys and examination of web logs. We also surveyed users on their belief in the perceived benefit of various aspects of query construction.

METHODS

Participants for this study were drawn from two sections of a class on Internet technology at the UNC, Chapel Hill. Approximately 65% were graduate students, 25% were undergraduate students and 10% were continuing education students. The study was comprised of two surveys and a search engine with a collection built as a resource to the class. Those

opting to participate fully filled out the pre-survey, used the search engine over the course of five weeks and then filled out a post-survey.

Search Engine. We used Ultraseek Server (<http://www.ultraseek.com/>) as the search engine software. Ultraseek provides both a basic and advanced search interface. The advanced interface provides proximity matching, Boolean operators, filtering based on modification date, and result list customization. User sessions were sequenced and alternated between starting on the basic or advanced search page. This was the default interface for the session unless the user explicitly switched to the other. The collection was created by indexing resources included on resource pages for the class and by adding one or two prominent repositories to that list. Our Ultraseek license allowed for 25,000 documents to be indexed. New sites were added until this capacity was reached.

Effort. We measured effort in both the pre and post survey based on the answers to eight search behaviour questions. The first question, Q1, was

- Q1. I have used a web search engine within the last: Day Week TwoWeeks MonthOrMore Never

This question established a base line time step for the next six (6) questions, an example of which follows:

- Q2. I have used quotation marks ("") to specify an exact phrase in a search within the last: . . .

Questions Q3-Q7 asked about the use of boolean operators, advanced search interfaces and proximity operators. The last question, Q8, dealt with the use of search terms:

- How many terms do you typically enter before submitting your search? [1][2][3][4-6][7-11][11+]

Each answer for Q2-7 that was within one time step of the answer for Q1 was counted as one point towards total effort, for a range of 0-6 points for Q2-7. This was then added to the average number of terms specified by the last question. In the case of ranges such as 4-6, the lowest number in the range was selected. These ranges were developed from results reported in [1]. We gave terms a higher weighting as they are the most common search "feature" used. Thus, total calculated scores for user effort are in the range 1 17.

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Perceived Benefit To calculate perceived benefit of effort, we used answers from the following (paraphrased) questions:

- Specifying more terms and options decreases the number of pages I have to look through.
- Specifying more terms and options finds more of the pages I'm looking for.
- Specifying more terms and options decreases the time I spend looking for information

The possible answers "rarely", "some", "often", "always" were given values of one through four respectively yielding a possible range of perceived benefit of 3 to 12.

RESULTS AND DISCUSSION

Overall a total of 50 participants supplied data used in this study, with 45 of these supplying both pre and post surveys.

	Pre Survey	Post Survey	Change
Terms Used	2.63	2.71	+0.08
Features Used	2.31	3.20	+0.89
Total Effort	4.94	5.91	+0.97

Table 1: User effort in formulating search queries for the two surveys. Surveys were taken six weeks apart.

Table 1 contains our summary measures of effort for both the pre and post surveys. Actual effort scores ranged from one to ten on the pre-survey and one to nine on the post-survey. The average number of search terms used increased only slightly over the duration of the study, but the use of features grew by 38%. One explanation for these increases is due to increased use of search engines, but in other data we collected (not shown here) the frequency of search engine use was the same at the beginning and end of the survey.

We ran a comparison of effort vs. the perceived benefit of effort using the Pearson Correlation test. We also recalculated effort using a "no-time-step" constraint on survey answers. Table 2 shows the results of those correlations. There is a correlation between effort and benefit for each measure of effort in the pre-survey and for the less restrictive measure of effort in the post-survey. We had expected a very high correlation between these two measures, so the relatively low, though significant correlations were a surprise. Of particular interest is the fact that the correlation increased using the "one-time-step" data, but decreased for the "same-time-step" data. The effort versus perceived benefit are also shown in Figure 1 for the "one-time-step" data.

Search Engine Use Use of the search engine over the five week study period was slight. We logged 32 sessions, only 17 of which resulted in the actual submission of a query. This is clearly not enough data to offer any conclusive evidence regarding query construction. Perhaps the most striking finding was that 10 of the 15 sessions where no query was submitted, were when the advanced search interface was presented, suggesting that this interface provided a barrier to use.

	Same Time Step		One Time Step	
	Pre	Post	Pre	Post
Pearson Correlation	0.421	0.280	0.350	0.542
Significance (2-tailed)	0.002	0.063	0.013	0.000

Table 2: Correlation of effort and its perceived benefit.

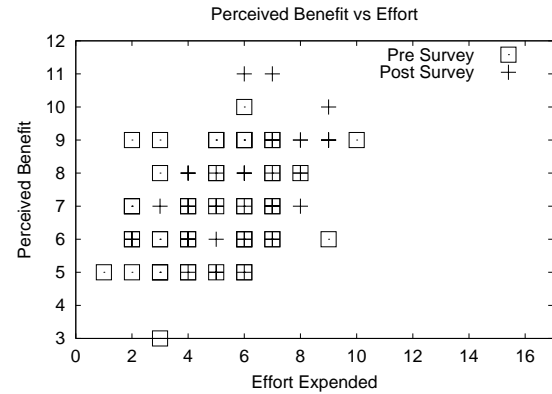


Figure 1: Scatterplot of effort vs perceived benefit for both pre and post surveys. Effort calculated by the "one-time-step" rule.

CONCLUSIONS

Overall feature use was high for both surveys. This may be because of the "one-time-step" definition of effort, which will count feature use even if that feature is not used in every query. User reported levels of effort in query construction increased about 38% in the five week period of this study, with the increase attributed to elevated use of search features rather than formulating longer queries. We are unsure how to explain this change. It is possible that these users are on the steep part of a learning curve, but our anecdotal experience with these users suggests otherwise. A longitudinal study monitoring specific user search and browse behavior is warranted.

Actual use of the provided search engine and collection was sparse, preventing any conclusive interpretation. Users were twice as likely not to conduct any search if they were presented with the advanced search interface than if they were presented with the basic search interface. This underscores the need to create intuitive, appealing interfaces that themselves don't present a barrier to use.

Acknowledgements We thank Infoseek for donating the Ul-traseek software. Thanks to Drs. Greg Newby and Bert Dempsey and the students who participated.

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