A Study of Immediate Requery Behavior in Search

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Introduction

Users begin processing search engine result page (SERP) with the goal of making one of three decisions:

1. Click a search result and view page content.
2. Without clicking on any results, abandon the query and reformulate the query to get a new SERP.

We define this choice as an immediate requery.

3. Abandon the query and quit the search process.
Questions

1. What is the **probability** of an immediate requery at different levels of search result quality?

2. How much **time** does it take for users to decide to make an immediate requery at different levels of search result quality?
Summary of Findings

1. The probability of an immediate requery increases as the search result quality decreases.

2. Users decide quickly to make an immediate requery (median = 7.7 seconds), and the time appears to be independent of search result quality.
Overview of Study Design

• We asked study participants to search for answers to simple questions.
• We manipulated the search results quality by controlling the rank at which an answer to the question can be found.
• We measured the probability of an immediate requery and the time to requery.
Study Design - Search Tasks

• 12 search tasks - 1 factoid question on each task.

• We designed each question:
  • To be easy for users to find a relevant document containing the answer, and
  • To have an answer that is unknown to most people.
Study Design - Search Tasks

• Example questions:
  • How long is the Las Vegas monorail in miles?
    Answer: 3.9 miles.
  • Which year was the first Earth Day held?
    Answer: 1970.
  • What is the scientific name of Mad Cow Disease?
    Answer: Bovine Spongiform Encephalopathy
Study Design - Search Interface

• Similar to common commercial search engines.

• Displays 10 results per query. No pagination.

• We log client-side timestamps of all behavior actions. (e.g. clicks, keystrokes)
### Study Design - SERP Manipulation

- We crafted SERPs with different qualities prior to the study.
- Users need to enter any of **trigger query words** to trigger the manipulated SERP.

<table>
<thead>
<tr>
<th>Question</th>
<th>Trigger Query Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long is the Las Vegas Monorail in miles?</td>
<td><strong>Las, Vegas, monorail</strong></td>
</tr>
<tr>
<td>Which year was the first Earth Day held?</td>
<td><strong>Earth, Day</strong></td>
</tr>
</tbody>
</table>

- All **further queries** return Bing API results.
Study Design - Quality of Search Results

1. One Good: 1 relevant result containing correct answer and 9 non-relevant results.
   Rank of relevant result varied from 1-10.

2. All Bad: All 10 results are non-relevant.

3. Control: Unmodified search results from the Microsoft Bing Search API.
Example Manipulated Search Results

Walt Disney World monorail - Disney Transportation Information
http://www.wdwdinfo.com/Transportation/monorail.htm

Walt Disney World monorail - The Walt Disney World monorail system has been in continuous operation since 1971 with double beam track that circles the Seven Seas ...

**las vegas** Monorail, **las vegas** Nevada monorail - Tickets ...
http://www.lasvegastourism.com/las_vegas_monorails.htm

... las vegas, monorail, map ... **las vegas** Monorail! **las vegas** Nevada Monorail, Official ... The system operates on a route approximately miles long, ...

**las vegas** Casinos and Gambling in **las vegas**
http://nevada.casinocity.com/las-vegas/

**las vegas** casinos, gambling information and **las vegas** gambling news and tweets. Let us keep you informed!

10 of the best **las vegas** casino secrets | Travel | The ...

Want to look like a vegas hotshot? Then learn the bar, casino and free-stuff rules from **las vegas** Weeklys
Rick Lax
Key Study Details

• Balanced design.
• 60 participants.
• 12 questions, each given a different SERP quality:
  • 10 One Good at ranks 1 to 10.
  • 1 All Bad treatment.
  • 1 Control with Bing results.
• Measures:
  • Probability of immediate requery.
  • Time from query to immediate requery.
As search quality decreases, the probability of an immediate requery increases.
Probability is significantly different when the rank of the correct result is 1 or all results are non-relevant.
Bing SERP is effectively the same as placing a correct result at rank 1, i.e. rank 1 Bing result is likely correct.
Median time to decide to do an immediate requery is 7.7 seconds.

Time appears to be independent of search result quality.
Other Results and Discussion

1. For queries that did not result in an immediate requery, how long does it take from a query to the first click on a search result?

2. Do all users have the same propensity to immediately requery?
Results - Time to the First Search Result Click

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Results - Time to the First Search Result Click

Linear increase in time to click from rank 1 to 4. Median time to click at rank 1 is 3.1 seconds.
Results - Time to the First Search Result Click

The time to click documents at ranks 5 - 7 have a different pattern.

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Participants appear to scan up from rank 10 to rank 8.
Existing SERP Behavior Research

• Several studies have found two types of user behavior for examination of SERPs. In the language of (Aula et al., 2005):
  1. Economic users scan at most the first three results before acting, c.f. depth-first users of (Klöckner et al., 2004).
  2. Exhaustive users examine more than half of the visible summaries and sometimes even scroll to see the remaining summaries before acting.

• Eye-tracking (Lorigo et al., 2008) and mouse-tracking studies (Huang et al., 2011) find that users focus on top 3-4 results before deciding to requery. Cutrell and Guan (2007) found users to view the first 8 results before requerying.
There appears to be two groups of users:

- **Low rate** of immediate requery ($\leq 3$ immediate requeries in total): 12 Users.
- **High rate** of immediate requery ($\geq 4$ immediate requeries in total): 48 Users.
Results - Two Classes of Users

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Results - Time From Query to Answer

High users took 86 seconds to answer and low users took 112 seconds.
High users able to keep time to answer nearly uniform for ranks 5-10 and "AllBad".
Possible explanation: high users scan ranks 1-4 and then requery, which gets them the good Bing results.
Conclusion

• As search result quality decreases, the probability of immediately requerying increases.
• Users can quickly decide to immediately reformulate.
• There appears to be two types of users:
  1. High probability of immediately reformulating.
  2. Unlikely to immediately reformulate unless no relevant documents can be found.
• While requerying takes time, it is the group of users who are more likely to immediately requery that are able to find answers to questions the fastest.