The Impact of Query Suggestion in E-Commerce Websites

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Abstract. In this paper we propose a research agenda for studying the impact of query suggestion features on cognitive load and customer satisfaction during online shopping in e-commerce websites. Despite the popular use of query suggestion features in search engines and large e-commerce websites such as Amazon.com and eBay, there is little research in this area. Based on a review on prior literature in query suggestion and online shopping, a research model and five hypotheses are posed. A lab experiment is proposed to test the hypotheses and potential implications of the research are discussed.

Keywords: query suggestion; e-commerce websites; cognitive load; customer satisfaction; purchase intention

1 Introduction

There is a rapid growth in the number of people shopping via the Internet. Online shopping provides opportunities for customers to reach the businesses globally and directly. Accordingly, it is important for the online stores to understand the customers' behaviors and purchase intentions in order to sell their products effectively and satisfy their customers. The perceived ease-of-use of the online shopping websites directly influence customers' attitude towards online purchase, and hence, their intention to purchase online [22]. Therefore, it is critical that the working environment of the website is user-friendly and can help users to obtain desired results easily [10].

Product search function is always an important feature of online store navigation. Customers often reach a product they want to purchase through product search engines [16]. Thus, improving the search engine of online shopping websites is significant in increasing the efficiency of getting the results that can better satisfy consumers' needs. Some e-commerce websites, e.g. Amazon.com and eBay, have already added useful features in their search engines. The main idea of these features is to help the users form suitable queries by providing them with queries made by other users before. There are two ways to display these queries. One of the approaches is called real-time query suggestion, in which the recommended queries are shown interactively when users are entering the words in the query entry box. This is often implemented using AJAX technologies like the one used in Google Suggest [19]. Another approach is retrospective suggestion, where the

suggested queries are shown after retrieval has been executed [23]. However, the effectiveness of the use of such query suggestion features in online shopping website is little known.

The objective of this paper is to examine the effectiveness of query suggestion in online shopping websites. We propose a research model and an experiment design to test the impact of query suggestion on customers' cognitive load (e.g., number of reformulations, decision time) and satisfaction when using these systems. Two settings will be used in the experiment – a baseline setting that does not provide any query suggestion and a real-time query suggestion system. Knowing the features of the systems help online stores in developing search engines in order to benefit from the market.

2 Literature Review

It has been pointed out that customer satisfaction occupied a central position in the outcome of marketing activity and it is directly in relation to the post-purchase phenomena such as attitude change, repeat purchase and brand loyalty [8]. The increasing usage of e-commerce websites has drawn great research interests in analyzing the factors affecting user satisfaction. It was found that poor usability of websites leads to poor company image [3]. The service quality of online stores has significant effects on user satisfaction. It has been shown that since customers who have experienced high level of service will visit that e-commerce website again, financial success of the stores will be enhanced by high service quality [12]. In order to make a successful shopping website, online stores should actively seek ways to improve their websites [14]. It was also shown that the factors affecting user satisfaction of websites, including control, efficiency and helpfulness, which indicated the ease for user to navigate through the website, to find the information they needed at a reasonable speed, and to offer help when finding information and navigating [13].

In order to increase customers' satisfaction, some e-commerce websites such as Amazon.com and eBay have implemented query suggestion function in their product search engines. The suggested queries are the queries made by other users before or similar terms available in the databases of those e-commerce websites. Many researches focused on the design of query suggestion method to help users formulate better queries. One possibility is to analyze user queries submitted to search engines. A new query suggestion method has been proposed by using the relationships between query terms and document terms from user logs to aid the query suggestion [9]. A query recommendation technique was also proposed based on reusing previous search histories [2]. This research showed the way in which the queries are scored and ranked using relevance and coverage factors in order to prioritize the results. Semantic nets and ontologies have also been used to support query suggestion and found that the suggested queries provide more relevant results [21].

However, there are only a few studies on the effectiveness of this technique for real searchers. Some researchers have conducted experiments on three search systems: a baseline system which does not offer any query suggestion, a real-time query suggestion which displays the suggested queries when users are entering words in the query entry box, and a retrospective system which displays the suggested queries after the retrieval has been executed [23]. The results show that real-time query suggestion has the best performance in the quality of initial queries, engagement in search and the uptake of query suggestion. However, their study was on general search and may not be applicable to e-commerce applications. We have not been able to identify any study on the effectiveness of query suggestion in e-commerce websites.

3 Research Model and Hypotheses Development

The research model proposed in this study is illustrated in Figure 1. Cognitive load is one of the variable assessing the efficiency and effectiveness of the three systems. Cognitive load can be considered to be a multidimensional construct that represents the load that performing a particular task imposes on the cognitive system of a particular learner [18]. The cognitive load of using the systems will be measured by the number of reformulations [11] and decision time. It is also found that when the cognitive load decreases, user satisfaction of searching on that system increases [20]. Moreover, customer satisfaction leads to higher repurchase intention from the same online stores [1].

Hypothesis 1: When query suggestions are provided, the number of reformulations will be reduced.

One of the reasons why query reformulation occurs is that users may have a quite specific information need in mind but is uncertain how to express that need in query language [4]. Without the recommendation, users will doubt the correctness and effectiveness of the queries they entered. They cannot obtain assistance when they have difficulties expressing their intention of search until they read through the result displaying pages, and have limited adjustment ability to reformulate their search queries. With assistance provided, the cognitive load of searchers can be significantly reduced. When they are not sure of the spelling of words, the query suggestion function can generate help. When they type a very general term, the function can offer suggestions to make the queries more specific. When they are facing difficulties in presenting their queries, the function can provide suggestions based on the overall popularity of search strings by other users, which can be extracted from search logs [6]. Hence the suggestions displayed by the system can enable customers to express the products they want to find more effectively. The assistance by the query suggestion function will help customers figure out the best query and arrive at the products they intend to search in a minimal number of reformulations.

Cognitive Load　　　　　　　**Customer Satisfaction**
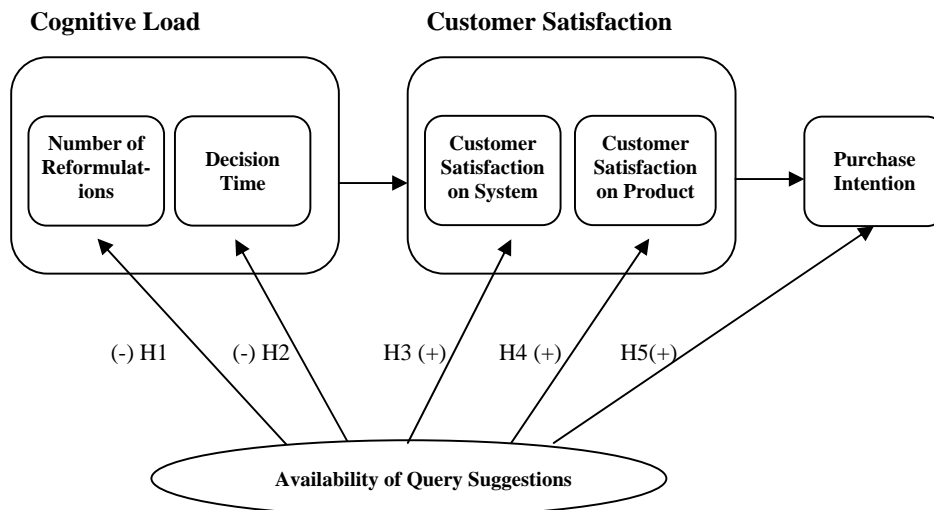
(+) denotes positive relation; (-) denotes negative relation between variables.

Fig 1. The research model

Hypothesis 2: When suggestions are displayed, the average time to complete the search on products is shorter than that without suggestions.

The product queries suggested can enable customers to express more keywords than they would otherwise have thought of so as to arrive at a solution more quickly. Customers can adjust their queries from the queries made by other users before and form a more effective query by relying on the suggestions from the query suggestion function. They do not have to look through the result displaying pages. Without the assistance of query suggestions, customers have to find a more effective query on their own by reading the result displaying pages and evaluating the products, which takes more time in adjusting the queries to find a suitable product than that when recommendations of queries are displayed.

Hypothesis 3: Customers will have higher satisfaction with the online stores when query suggestions are provided.

Since the query suggestion function can offer help for customers to express their intention of search, the products they found can satisfy their needs better. The customers will appreciate more on the website, and hence, improve the images of the company. The

customers will also be more satisfied with the usability features and technical sophistication of the online website. Therefore, the level of satisfaction of customers will be increased.

Hypothesis 4: Customers will have higher satisfaction with the product when query suggestions are provided.

If the query suggestion function is available, when customers are entering their queries in the search box, they can see the suggestions of similar items. They may try to explore these items due to curiosity. The more they explore, the more products they will discover. Since these products may be similar or are accessories to the item that the customers intend to find originally, they may be interested in these products after exploring them. Hence the customers will be more satisfied with the products that they find.

Hypothesis 5: Customers will have higher intention to purchase products when query suggestion function exists.

In e-commerce websites, information quality is considered to be one of the key design factors contributing to the success of online shopping websites [15]. If query suggestions are provided, customers would be able to express the products they intend to search in more specific ways. The availability of query suggestion function can increase the level of user-friendliness of the webpage. It allows customers to more easily determine the products they want to search and purchase. Therefore, customers' purchase intention will increase when query suggestion function is available.

4 Discussion and Future Work

To test the hypotheses, we plan to conduct a lab experiment on using the real-time query suggestion function in an e-commerce website such as Amazon.com. Lab experiment is a widely used method for assessing web search functionality [7]. About 200 subjects will be recruited to participate in this study. The experiment will be conducted using two settings, one with query suggestion and one without. Subjects will be required to perform two shopping tasks on the e-commerce website under each setting. The two tasks include one simple search and one complex search, which will help us reduce the effect of task complexity [5]. For simple search, subjects will be required to find some details of a particular product, such as the screen size and dimensions of a specific camera model. For complex search, subjects have to make purchasing decisions based on the situation provided. An example of the complex search task will be as follows:

> "Next Friday will be your friend's birthday. You want to give him a birthday gift. He is very interested in reading, and you would like to give him a book as present.

You have limited budget of $100. As you can choose only one gift in this case, you have to make your decision very carefully."

Subjects will do this experiment independently. Upon the arrival of subjects, they will be given the instructions and overviews of the tasks they need to accomplish in the experiment and will complete a demographics questionnaire focusing on their search and online shopping experience. Before each task, the descriptions of the shopping items will be provided to the subjects. The order of the systems used and the search tasks will be randomized. Number of reformulations and decision time will be automatically recorded. After using each system, subjects will have to answer the questions regarding their cognitive load and satisfactions on the systems used and products searched, and their purchase intention. Other control variables will be measured in the questionnaire as well. They can also give any other open opinions on this experiment.

We expect this research to have several implications. From an academic perspective, it will help us better understand the role of query suggestion functions in the online shopping process in e-commerce websites. From a practical point of view, the study is expected to provide some findings on how customers utilize and react to the query suggestion function and help decide whether query suggestion should be used in these sites. We also plan to study the impact of incorporating advertisements, such as sponsored links [17], in the query suggestion function.

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