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Parametric search engines: What makes them effective when shopping online for differentiated products?

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Abstract

Many online retailers try to assist consumers via parametric search engines (PSEs), i.e., attribute-based search engines. The objective of this study is to model the effectiveness of four PSEs in using search effort and domain knowledge to increase decision quality, decision confidence, perceived ease of use and perceived usefulness. Our model comprises a set of behavioral decision theory antecedents to the technology acceptance model. We tested users with four PSEs in a laboratory experiment and modeled the results with partial least squares (PLS) analysis. The main result of this paper is a PLS model showing that the effects of search effort and domain knowledge are mediated through decision quality and decision confidence to impact perceived ease of use and perceived usefulness. The model explains the variance in decision quality (17.3%), decision confidence (28.3%) and perceived usefulness (27.0%). Overall, this study shows that input, process and outcome variables are important for predicting the effectiveness of PSEs. Implications for research and practice are discussed.
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1. Introduction

Online shopping offers the customer a large search space, which can be attractive but overwhelming. When shopping for a differentiated rather than commodity product [3,11], the situation is amplified, because the online shopper considers several relevant dimensions, i.e., not only price, but also quality and other attributes. Despite advances in online shopping technology, some researchers have expressed doubts regarding the viability of online shopping for differentiated goods [8,63,81]. Some argue that the Web is simply too passive and indirect to engage shoppers [41].

One ambitious solution to online shopping challenges is to employ autonomous agents [38,44,55]. Such agents could be replicated in great number with slight variations in search criteria and endowed with the ability to execute a transaction. They could be knowledgeable, open-ended and able to have a dialogue with the user. Research shows that shopping agents are a possibility, but have thus far achieved mixed results [55,82,83]. As long as the agents are insufficiently informed and trusted, they are reduced to information gatherers; the user still has significant information filtering, weighing and integration to perform.

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A more realistic solution than autonomous agents is the parametric search engine (PSE), which is based on attributes rather than Boolean combinations of keywords. The objective of this paper is to model the effectiveness of four PSEs in using search effort and domain knowledge to increase decision quality, decision confidence, perceived ease of use and perceived usefulness.

In the next sections, we discuss the research background, model and hypotheses. We then describe the methods and present the data analysis. We conclude with a discussion of the results and the implications for theory and practice, as well as limitations and suggestions for future research.

2. Research background

Multiple attribute decision making has been deployed to solve complex problems, and multiple attribute decision support systems (DSS) have grown increasingly powerful [24]. In their review of multiple attribute DSS, Dyer et al. called for the development of easy-to-use, interactive software that supports decision makers. A system that advances the state-of-the-art in multiple attribute DSS and is easy-to-use, they argued, would be more likely to be effective. However, a system that is extremely easy-to-use, but lacking interactivity, i.e., a "black box" system that marginalizes the user, may not be advisable. One study noted that it may not be "possible or desirable for a multiple attribute DSS to have an automated system perform the entire decision process" [34]. An interactive multiple attribute DSS would be more effective by opening the "black box" and engaging the user in a dialogue to elicit user input.

The challenge of balancing multiple attribute DSS functionality, user involvement and ease of use is consistent with the main findings of the technology acceptance model [20,80]. Users want systems to be useful yet easy-to-use. A useful system that is hard-to-use or that introduces decisional conflict can diminish user acceptance [49]. Engaging the user too closely with a multiple attribute DSS, however, can overly tax the user or introduce excessive "noise" into the system, e.g., by incorporating well-intentioned yet erroneous judgments. In sum, a purely "black box" approach or a purely "clear box" approach is unlikely to be an effective PSE.

One study assessed DSS research in light of the Internet revolution and found a number of challenges, including the deluge of information accessible to unsophisticated online customers and the inaccuracy of search engines [12]. The study called for a joint effort from a variety of disciplines to design online DSS, possibly with optimization-based models from mathematical programming, to advance DSS research. The current study is a combination of behavioral decision theory and information systems theory which addresses the call articulated in that study.

To determine PSE effectiveness, we adapt a framework [54], shown in Fig. 1, which is based on the IS Success research of DeLone and McLean [22]. The framework includes two categories of impact variables: the impact of a DSS on (1) the decision making inputs and process and (2) the decision making outcomes. For each of those two categories, the framework distinguishes between relatively objective measures and relatively subjective measures. This framework addresses some of the more under-researched areas of DSS research.

3. Hypotheses and model

We employed the framework in Fig. 1 to study the effectiveness of PSEs, i.e., attribute-based DSS for
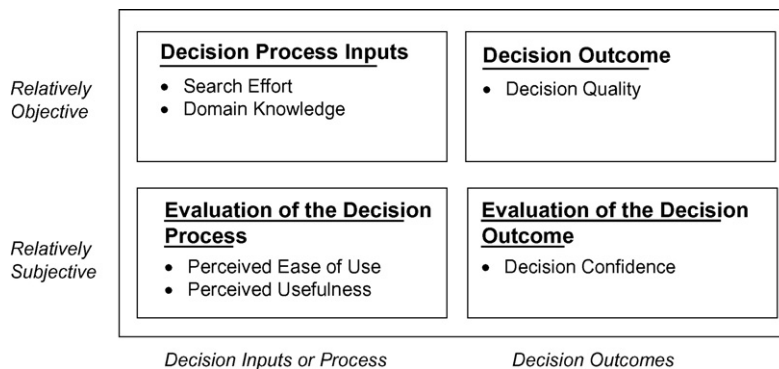

Fig. 1. Research framework for DSS impact.