

Modeling the Impact of Search Engine Marketing on User Knowledge Gain

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1. Introduction

The amount of digital information in the world is immense, while people's ability to absorb that information is limited. Individuals cannot access all the available information on a given topic; instead, they need to rely on how Internet services select and present content. This situation creates a highly competitive online environment where content producers strive to capture users' attention. This competition is particularly evident in search engines. Users typically select results that are prominently displayed, while other documents that are less visible go unnoticed (Lewandowski, 2023, p. 160; White, 2016, p. 65). To stand out and make an impact, content producers generally employ two main strategies in search engine marketing (SEM): optimizing their online presence to improve rankings in organic search results (search engine optimization; SEO) and investing in search ads that position their websites above the organic results (Castillo & Davison, 2010, pp. 382–383). For businesses and organizations that depend on visibility from search engines, for example, when pursuing commercial goals, SEM is crucial. The more traffic they receive, the easier it becomes to sustain their businesses, such as through advertising revenue generated from their websites. However, organizations that lack adequate resources for SEM risk jeopardizing their business due to insufficient traffic (e.g., Mager, 2010, p. 102). This dynamic creates a scenario in which search engine marketing can be a double-edged sword for users. On the one hand, users encounter professionally prepared Web content due to SEM. On the other hand, this content primarily comes from providers who can afford to invest heavily in marketing, motivated by commercial goals like increasing sales or non-commercial interests such as political influence or enhancing personal reputation (Röhle, 2010, p. 81). Thus, there may be a trade-off between the positive relation of SEM to representational qualities (e.g., interpretability, ease of understanding; see Huang et al., 1999, p. 43) and its negative relation to intrinsic qualities (e.g., objectivity, believability; see Huang et al., 1999, p. 43). In this contribution, we explore how SEM activities are reflected in both the representational and intrinsic qualities of Web pages, and how these qualities influence user knowledge gain. The findings are presented in an information search behavior model.

2. Methodological Overview

We conducted an online survey together with an information quality evaluation from June to September 2024. The online survey was administered to a quota sample of 2,403 German Internet users. Central components of the survey included search tasks designed to examine how the selection of search results (organic results and textual search ads)² of varying quality influences participants' knowledge

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² AI Overviews, introduced by Google in Germany around May 2025, were not included in the methodological design of this study.

gain. In the evaluation of information quality, domain experts assessed all search results utilized in the online survey tasks based on their quality using the questionnaire by Y. W. Lee et al. (2002).

Data from both the survey and the quality evaluation were integrated to test and refine a preliminarily specified model empirically using the statistical procedure of structural equation modeling (see Hair et al., 2014, p. 609).

3. Key Results and Final Information Search Behavior Model

Figure 1 illustrates the final information search behavior model developed through the structural equation modeling process.

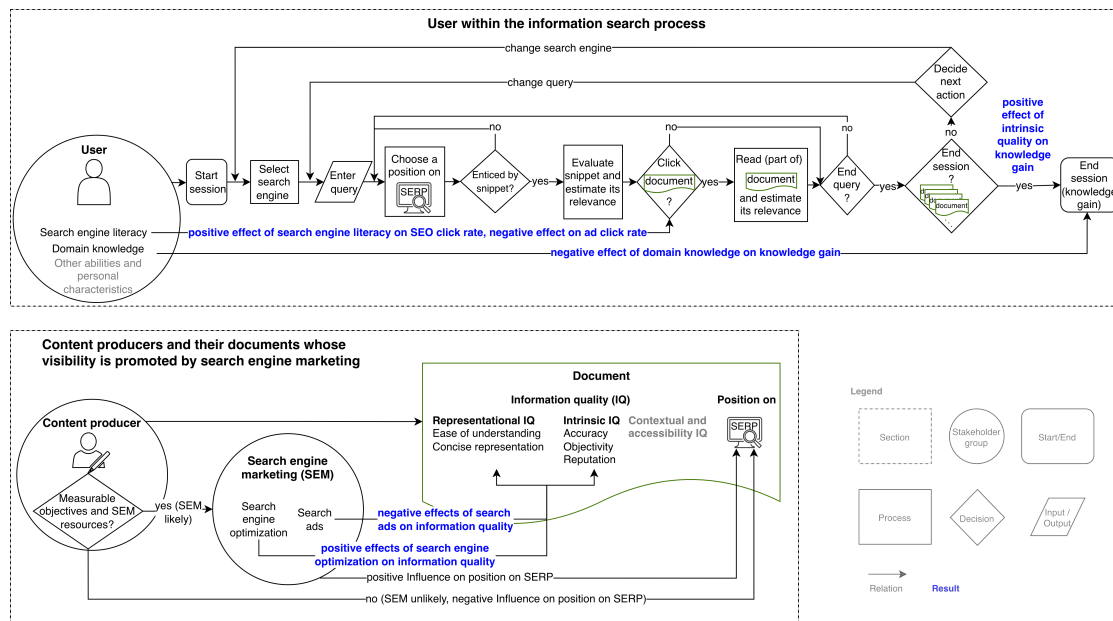


Figure 1: Final Information Search Behavior Model (results shown in blue)

The model is divided into two main sections. The *upper* section illustrates the user search process, primarily based on the model developed by Thomas et al. (2014). The search process is illustrated from left to right, starting with the beginning of the session, concluding with the knowledge gained by the end of the session. The *lower* section of the model examines how content producers utilize SEM to enhance the visibility of their documents in search engines. Additionally, we propose that SEM has implications for the representational and intrinsic quality of a Web page.

The key results are as follows:

- *Search engine literacy* significantly impacts user selection behavior. Higher levels of search engine literacy (see Häußler et al., 2025 for the questionnaire) are associated with a lower frequency of ad selection and a higher likelihood of selecting optimized organic search results.
- *Representational information quality* is significantly affected by SEM measures: SEO is associated with higher quality than non-optimized pages, while search ads are linked to lower quality than organic results.
- *Intrinsic information quality* is likewise significantly related to SEM measures: SEO corresponds to higher quality than non-optimized pages, whereas ads correspond to lower quality than organic results.



- *Knowledge gain* is influenced by the quality of documents users select: intrinsic quality has a significant positive effect, while representational quality shows no significant impact.

4. Discussion

The primary outcome is the development of an information search behavior model. This model enhances our understanding of the relationship between search engine marketing and information quality, as well as their effects on user knowledge gain. This represents a significant advancement in the field of research on Search as Learning (Hoppe et al., 2018). Looking at the key results, for simple tasks with informational intent, high-quality Web pages enhance knowledge gain among users. These high-quality pages primarily come from optimized organic search results. Users with search engine literacy tend to deliberately choose these high-quality organic results. Contrary to our initial assumptions, SEO does *not* seem to have any intrinsic disadvantages. Users with search engine literacy appear to recognize the quality benefits even at search engine result page (SERP) level. The results of the study indicate that search engine literacy is crucial for users when selecting high-quality search results, which, in turn, facilitates knowledge gain. Therefore, one key implication for education is the necessity of promoting search engine literacy. The studies are not without limitations. A key limitation is that the online survey format constrained search tasks to low complexity, resulting in a restricted range of measured knowledge gain. There are exciting opportunities for future research. The model can be tested in new search contexts and enhanced with additional SERP elements, including AI-generated summaries. Over time, it could serve as a foundation for new models that help us better understand how external factors shape what we see and learn while using search engines.

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