Seeking Information with a More Knowledgeable Other

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DOI
10.1145/3573364

Publication date
2023

Document Version
Final published version

Published in
Interactions (New York): experiences, people, technology

Citation (APA)
Ekstrand, M. D., Pera, M. S., & Wright, K. L. (2023). Seeking Information with a More Knowledgeable Other. *Interactions (New York): experiences, people, technology*, *30*(1), 70-73. https://doi.org/10.1145/3573364

This forum provides a space to engage with the challenges of designing for intelligent algorithmic experiences. We invite articles that tackle the tensions between research and practice when integrating AI and UX design. We welcome interdisciplinary debate, artful critique, forward-looking research, case studies of AI in practice, and speculative design explorations. **— Juho Kim and Henriette Cramer, Editors**

Seeking Information with a More Knowledgeable Other

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Internet users encounter numerous AI-powered systems throughout their daily life. One class of systems they frequently use directly and explicitly are *information access systems*: search engines, recommender systems, and other systems that facilitate users locating and accessing relevant information, products, and so on from large digital inventories. There is a rich literature on both the human and technical aspects of designing, deploying, and evaluating such systems to meet users' information needs in information retrieval, human-computer interaction, information science, and other disciplines. Most of these information access systems are increasingly using sophisticated AI techniques across their architecture to interpret users' needs, model their preferences, estimate the relevance of candidate resources, rank and explain results, and more.

There are, however, different ways that people can make use of information access systems. Consider the following user stories:

- Summer is around the corner and so you turn to your favorite search engine to find information about your preferred vacation destination.
- You just moved. You turn to the Web along with some international friends (some of whom are more aesthetically inclined than others) to shop for furniture that will make your new home comfortable and uncluttered.
- You are a parent helping your children choose a book from the ones presented by a recommender system at an e-commerce site.
- You are a researcher gathering information on an unfamiliar topic. In your exploration, you rely on expertly curated tags and labels to identify good resources among those offered by search and recommender systems.
- You are a teacher preparing for an upcoming lesson on geology. To help engage the students and deepen their knowledge acquisition, you use a search engine to find recent news articles for students to read that illustrate the impact earthquakes have on modern life.

Each of these vignettes highlights a different task and context for which users need to access information and, crucially for our purposes, showcases a distinct structure of how one or more users play different roles as they participate in the *information-seeking process*.

A variety of existing theoretical frameworks and outcomes from empirical explorations can guide researchers and industry practitioners in developing systems that people can use; Donald Case and Lisa Given [1] provide a thorough treatment of this literature. Most of this work, however, focuses almost exclusively on the needs of users who access the system for and by themselves. This is illustrated in Figure 1.1, *Traditional Use*, where an individual employs the information access system to locate resources to satisfy their own information need. It is not surprising that this is the form of information seeking that attracts the most attention among researchers, practitioners, and users alike, since it is the information access structure that captures the bulk of our daily interactions with search engines and recommender systems.

Close to 15 years ago, Meredith Ringel Morris and Eric Horvitz [2] noted that although "studies of search habits reveal that people engage in many search tasks involving collaboration with others, such as travel planning, organizing social events, or working on a homework assignment," existing tools were designed for a single user working alone. This remains mostly true, at least in widely available systems, but the paradigms for interaction between people and search and other information access tools continue to evolve beyond peer collaboration.

Looking at the remaining vignettes and the associated structures of information seeking, we discern a new participant in the information-seeking process beyond the user(s) ultimately intending

Insights

- Information access systems not only assist individuals, they also serve groups of users with different roles and skills in collectively seeking information.
- The educational theory of more knowledgeable others provides a framework for understanding and supporting such interactions, thus enabling information systems.

to use the retrieved information. This participant often has greater knowledge or skill than the information user(s). Borrowing from educational theory, the more skilled participant can be understood to be a *more knowledgeable other* (MKO), who serves as a bridge between what an individual information user can do on their own and what they can do with support [3]. An MKO does not necessarily need to be a teacher; they could be anyone (e.g., a parent or a peer) who has more skills in a specific area than the person needing support. The MKO provides targeted and scaffolded support based upon the needs of the individual. In vignettes two to five in Figure 1, an MKO explicitly or implicitly takes part in the information-seeking process to support an individual's knowledge acquisition, information retrieval skill-building, or both.

We have identified several ways in which MKOs can play a role in information seeking from the existing literature and our research and experience. *MKO as Collaborator* (Figure 1.2) is inspired by work on collaborative information retrieval that considers multiple users, often with different levels of expertise, working together to meet an information need. *MKO as Mentor* (Figure 1.3) emphasizes the scaffolding effort of MKOs, representing cases where the MKO can offer guidance on the type of resources to access or the types of search prompts to use; but the information-seeking process is still driven by the information user who will ultimately take advantage of accessed information—for instance, when a parent or teacher is teaching a child how to search. *MKO as Resource* (Figure 1.4) captures a less obvious scenario where the MKO and learner do not directly interact; the MKO provides additional input that the system can use to better respond to the learner's needs. Examples include a search system for students that a teacher can tailor to classroom needs, early versions of Pandora where music experts provided the system with song metadata that was used to meet end users' musical information needs, and the common practice in Web platforms today of incorporating professional editorial, curatorial, and review input to improve the results of the platforms' algorithms. *MKO as Intermediary* (Figure 1.5) shows the MKO seeking information *on behalf* of other users, without the interaction of the people who will ultimately use the retrieved information.

The MKO provides targeted and scaffolded support based upon the needs of the individual.

There is, unfortunately, little guidance on how to build and study systems that support MKO-involved information-seeking tasks and scenarios. To our knowledge, scant research—empirical or theoretical—is available about what changes in information seeking and user-AI interaction when a person is using the system for or with others, particularly MKOs. Our central goal with this article is to promote such research and to encourage the community to build out a body of results and guidance for the design, development, and deployment of information access and other AI systems that explicitly support the inclusion of a variety of MKOs.

Filling this gap in the literature

IMAGE BY EAMESBOT/SHUTTERSTOCK.COM

does not need to start from scratch; several existing lines of work approach the core concern but do not fully solve it. As previously mentioned, research in collaborative information retrieval, Web information literacy, and domain-specific information retrieval can serve as a foundation for theoretical modeling of MKOs as collaborators, mentors, and resources. MKO as Intermediary, however, remains relatively unexplored. Readers' advisory and reference librarianship are longstanding practices of finding information for others, but work in this area has not yet yielded theories of information seeking in the presence of MKOs, particularly as intermediaries, on par with the documented mechanisms of solo information-seeking efforts. The growing body of work on human-in-the-loop AI systems also has much to contribute.

The MKO as Intermediary case is particularly fascinating, as it involves a user of the system who is not the end user of the information: The MKO directly interacts with the information system to locate resources that others will ultimately use, unlike the cases depicted in Figures 1.1 through 1.4, where the user of the information interacts with the system. In our own recent work, we have sought to understand and support the information needs of teachers looking for resources for their students [4]. The concept of teachers turning to search engines to prepare lessons or seeking resources for their students to make the theoretical concepts presented in class more practical is not new for teachers or research in education, but there is a clear gap between existing information-seeking theory and this use case.

The MKO as Intermediary case involves a user of the system who is not the end user of the information.

For example, in her theorization of information-seeking processes, Carol Kuhlthau [5] discusses at length how uncertainty and the desire to resolve it drives users' interactions with an information system, but this uncertainty largely involves the users' own state of knowledge and information needs. In the context of teachers looking for materials for their students, what role does uncertainty play? How do we understand the motivations of teachers' interactions with the system, if it is not resolving their own uncertainty or anomalous states of knowledge?

Our line of research aimed at supporting teachers' curricular information seeking prompted many more questions about information access in the presence of MKO. Who decides in this case what is relevant, and how? A teacher might consider the readability level of the resources or their suitability for the classroom content, whereas the students might be expecting something else entirely. Is the information-seeking process really "completed" by the teacher identifying the sources of information when the last stage of search—closure—depends on the students distilling the presented resources into their own knowledge [5], which takes place at a later time?

MKOs looking for information for others is not limited to classroom settings. Additional examples that illustrate how prevalent this form of information seeking is include: a) A sales representative is on a call with a client, and their product catalog interface displays recommendations that may help the client's business; b) A volunteer at a refugee center is seeking resources online that can help new arrivals navigate challenges such as language and cultural barriers; and c) A nurse practitioner is looking online for resources to help a patient better understand a newly diagnosed illness.

Robust theories and empirical guidance for developing information systems will enable classes of applications that are designed to make MKOs more effective and efficient, in contrast to direct-to-end-user information technologies

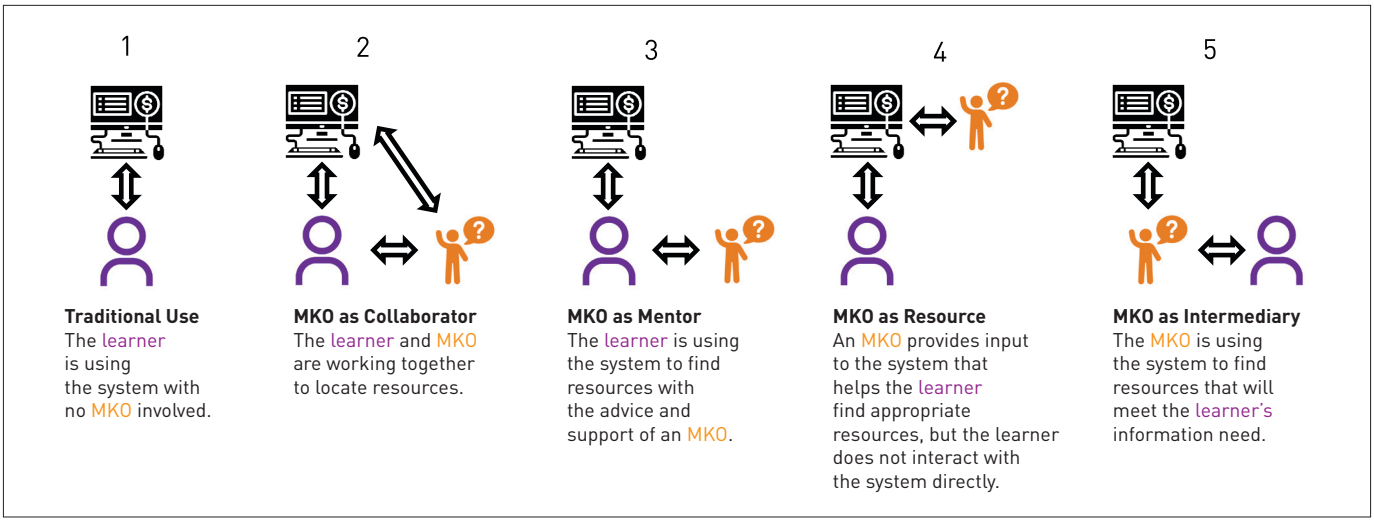

Figure 1. Different structures of information seeking with more knowledgeable others. The purple icon represents the primary user of the information; the orange icon represents an MKO.

that often replace MKOs (in purpose or practice). One example of this kind of development in a consumer recommendation space is in use at Stitch Fix [6]: Stylists select a customer's wardrobe for a month, with the assistance of a recommendation system that suggests apparel to include. The system models both relevance to the end user and the probability that the stylist will identify an item to prioritize the recommendation of items the stylist is more likely to overlook.

We expect many more such adaptations to MKO-involved situations are likely and useful, but this development requires a body of knowledge that so far is thin: What changes when people use a system for others? Many elements of information access may have room for improvement for these use cases, including query elicitation interfaces, ranking and filtering algorithms, result-page generation and navigation, model explanations, and more. Further, while we have focused on the MKO as a human participant in the information-seeking process, there are additional scenarios that could be considered and would benefit from the grounding that a theory of MKOs provides, including the development of AIs that fill the role of an MKO in certain situations, or systems that mediate access to MKOs, such as recommender systems for finding experts or question-routing algorithms in online question-answering systems.

The future research we envision is not limited to information access systems. Many types of AI applications can involve MKOs in their use and operation, and there are numerous possibilities for AI to augment human expertise and intelligence; we also see opportunity for a robust understanding of MKOs to inform work on human-in-the-loop AI. The science of user experiences needs to expand and explore the rich space of MKO-involved applications and contexts of use, and to develop systems that empower MKOs to increase their effectiveness and impact.

Endnotes

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DOI: 10.1145/3573364