

Report on the First Workshop on Supporting Complex Search Tasks

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Abstract

There is broad consensus in the field of IR that search is complex in many use cases and applications, both on the Web and in domain specific collections, and both in our professional and in our daily life. Yet our understanding of complex search tasks, in comparison to simple look up tasks, is fragmented at best. The workshop addressed many open research questions: What are the obvious use cases and applications of complex search? What are essential features of work tasks and search tasks to take into account? And how do these evolve over time? With a multitude of information, varying from introductory to specialized, and from authoritative to speculative or opinionated, when to show what sources of information? How does the information seeking process evolve and what are relevant differences between different stages? With complex task and search process management, blending searching, browsing, and recommendations, and supporting exploratory search to sensemaking and analytics, UI and UX design pose an overconstrained challenge. How do we know that our approach is any good? Supporting complex search tasks requires new collaborations across the whole field of IR, and the proposed workshop brought together a diverse group of researchers to work together on one of the greatest challenges of our field.

The workshop featured three main elements. First, a keynote on an emerging theory of task difficulty by Diane Kelly. Second, a lively booster and poster session in which seven contributed papers were presented. Third, three breakout groups on: 1) user interfaces and user experience, 2) tasks and users, and 3) information needs on controversial topics. There was an general feeling that the discussion made progress, and built new connections between related strands of research in IR.

1 Introduction

One of the current challenges in information access is supporting complex search tasks. A user's understanding of the information need and the overall task develop as they interact with the

system. Supporting the various stages of the task involves many aspects of the system, e.g. interface features, presentation of information, retrieving and ranking. Many search systems treat the search process as a series of identical steps of submitting a query and consulting documents. Yet information seeking research has shown that users go through different phases in their search sessions, from exploring and identifying vague information needs, to focusing and refining their needs and search strategies, to finalizing their search. To be able to support exploring and discovering strategies we need to understand the characteristics of different tasks including open-ended, leisure-focused sessions. This is a highly complex problem that touches upon and bridges areas of information seeking, interactive information retrieval, system-centered (ranking, evaluation), and user interface design.

The background for this workshop is derived from the CLEF/INEX Interactive Social Book Search Track [6], which investigates scenarios with complex book search tasks and develops systems and interfaces that support the user through the different stages of their search process. Book search provides an excellent scenario to investigate these issues. Information needs in book search are highly complex, combining aspects of topical relevance (genre, subject), user relevance (background knowledge, reading level, preferences and interests) and social relevance (recommendations and opinions of friends and other trusted sources). Moreover, book search needs develop from vague notions of interest (books similar to X) to more specific criteria (likable characters, academic treatment of topic, etc.) This change in the users needs, and the development of the tasks associated with those needs, demonstrates that current search systems provide little active support for such scenarios. Examples from the ISBS collection, findings based on the user studies, and prototypes of information seeking stage sensitive search systems are available, and will be used to focus the discussion in the breakout groups.

The overall goal of the workshop was to create and foster an interdisciplinary forum where researchers can exchange and contribute to the development of alternative experiments and prototypes. The main aim was to better understand how to support complex search tasks, addressing many open research questions to be explored, including:

Context What are the obvious use cases and applications of complex search? In what sense are these “complex”? What generic characteristic do they share? How can search become an integral part of its context, and the context integral part of search?

Tasks What are essential features of work tasks and search tasks to take into account? And how do these evolve over time? How do can complex tasks be decomposed into manageable sub-tasks, and partial results composed into comprehensive answers? How can we monitor and support task progress?

Heterogeneous sources With a multitude of information, varying from introductory to specialized, and from authoritative to speculative or opinionated, when to show what sources of information? When to show more or other types of information than directly requested by the searcher? Do we know when the user has gotten enough?

Search process How does the information seeking process evolve and what are relevant differences between different stages? What search tactics and search strategies are effective? How can we promote the use of effective search strategies? How does the information need evolve

and what are relevant success criteria for the end result and intermediate steps? How can we cast these as effective complex queries, and how to (interactively) construct such queries?

UI and UX Does the need of complex task and search process management, blending searching, browsing, and recommendations, and supporting exploratory search to sense-making and analytics, make UI and UX design an overconstrained challenge? What affordances are required and in what stage of the search process? How can we make the search process transparent to the user? How and when does the initiative shift between system and user?

Evaluation How do we know that our approach is any good? Can we carve out one or a range of generic aspects testable on a suitable benchmarks? Is there enough empirical evidence to ground simulated interactive search? What kind of novel retrieval models are needed to combine topical, contextual and preferential aspects?

SCST 2015 was a half day workshop on supporting complex search tasks—a *workshop* proper where discussion was central, and all attendees were active participants. The workshop brought together a varied group of researchers with experience covering both user and system centered approaches, to work together on the problem and potential solutions, and identify the *barriers* to success and work on ways of addressing them.

The rest of this report will follow the program of the workshop. The workshop started with a round of introductions where each attendee introduced him- or herself, and explained their own interest in the topic. Next, it featured a keynote (discussed in §2) which helped frame the problems and reach a shared understanding of the issues involved among all workshop attendees. Diane Kelly (University of North Carolina at Chapel Hill) talked about an emerging theory of task difficulty. This was followed by a boaster and poster session in which seven papers (discussed in §3) were presented. The lively discussion extended over the coffee break. In the next session, participants divided over three breakout groups (discussed in §4), with in-depth discussion on three topics of importance in the area: 1) user interfaces and user experience, 2) tasks and users and 3) information needs on controversial topics. In the final session the results and progress of the workshop was discussed and preliminary conclusions were drawn (discussed in §5).

2 Keynote

The workshop started with a keynote to set the stage and ensure all attendees were on the same page.

2.1 Theory Of Search Task Difficulty

Diane Kelly (University of North Carolina at Chapel Hill) talked about “When Effort Exceeds Expectations: A theory of search task difficulty.” She presented an overview of key literature on task complexity and task difficulty, noting the lack of consensus on the meaning and use of the terms over different studies. Task difficulty is usually associated with the user’s perception of the task (such as the searcher’s performance or the solvability of the task), and task complexity usually associate with the task’s characteristics (such as the number of subtasks or subtopics or the cognitive complexity).

The cognitive complexity framework from educational theory was introduced—consisting of six stages: remember, understand, apply, analyze, evaluate, create—and applied to the search task design.

This framework and Campbell’s model of task complexity were used in a recent empirical study on expected and experienced task difficulty. Despite exhibiting varying amounts of effort, searchers rated most of these tasks the same with respect to difficulty, and it seems clear that more effort does not necessarily correspond to more difficulty or less satisfaction.

This led to the proposition of a theory of search task difficulty, based on the (lack of) match between the expected effort and the experienced effort: when the experienced effort conform the expectations, the difficulty is moderate; when the experienced effort is larger than expected the task is considered hard, and when the experienced effort is lower than expected the task is considered easy.

3 Accepted Papers

All papers had an one minute booster and were presented as posters in an interactive poster session. We received 8 submission and accepted 7 papers (87.5% acceptance rate). All submissions were peer reviewed by at least three reviewers. In this section we briefly describe each of the seven accepted papers.

Dori-Hacohen et al. [3] present searching on controversial topics as a complex search task. Challenges include how one searches for such views on such topics and in what way a system should engage users, by e.g. showing all the different views or censoring certain views.

Gunadi et al. [5] highlight the problems of distributed IR, such as dealing with heterogeneous document collections and information systems, which presents a challenge for systems to support users requiring information from multiple resources.

Balog [1] introduces the notion of task completion engines and argues for re-thinking the search experience. The author presents use cases such as travel planning and shopping and sketches an interface that integrates functionality to support users in the various steps of their complex tasks.

Walsh and Hall [9] discuss the scenario of users with no particular goal or information need, who engage the system with the aim to explore collections in the domain of cultural heritage, where the system helps them in the initial phase to discover areas or topics of interest.

Kumpulainen and Huurdeman [7] describe the relation between searcher’s confidence in their search skill and understanding of the search topic and/or the system, focusing on those users with limited knowledge but high confidence. For such users, the system could *shake up* the search experience to help them formulate their search goals better and change their search behaviour.

Toms [8] argues that search tasks in and of themselves are often not complex, but that the complexity arises from the related work task for which the searches are conducted. The focus of the system should be on supporting search within the larger work task. The author also describes different kinds of support that a system could or should give.

Dean-Hall et al. [2] present an evaluation framework for Point-Of-Interest recommender systems and scenarios where users want personalised suggestions that takes many aspects of their context into account, such as geographical location, time of day, season as well as their interests and previous experiences.

4 Breakout Sessions

The second half of the workshop consisted of 3 breakout groups, seeded from the open research questions (see §1) and the contributed papers (see §3). The three themes were 1) user interfaces and user experience, 2) tasks and users and 3) information needs on controversial topics.

4.1 User Interfaces and User Experience

Mark Hall chaired a breakout group on user interfaces and user experience. The discussion initially focused on defining what are “complex search tasks.” There was a distinction between “complex” and “complicated” tasks, with the consensus in this group going toward a definition in terms of tasks with a non-trivial internal task structure, rather than in terms of inherent difficulty of the request. There was also clear consensus that a standard search box is not sufficient, and that it is crucial what you do after (and for) basic, atomic search. As complex tasks can pose very different requirements, there is not a single solution and need for a “toolbox” of relatively generic components that can be composed into a tailored user interface for a specific task—as it were a multi-purpose swiss army knife rather than a single purpose phillips screwdriver. There was continued discussion on the exact shape and form of the resulting system, and the integration of such in complex tasks.

4.2 Tasks and Users

Elaine Toms chaired a breakout group on tasks and users. The discussion was essentially a continuation of the keynote, focusing on task complexity, task difficulty and effort, and the distinction between perceived and experienced complexity, difficulty, and effort. The general feeling was that more clarity and consensus is needed on the core task and user variables that play a role, and we shouldn't just take their meaning for granted. There was great support for attempts to clear up basic dependencies between these variables, as in Diane's proposed theory of search task difficulty based on divergence or congruence between the expected effort and the experienced effort. Yet at the same time, variables must be contextualized, for example, effort may be a negative thing in one context (as the user has to invest extra time and energy to obtain the same result, hence risking failure) but a positive thing in another context (as a user that reads information about multiple perspectives is more informed and can make better decisions).

4.3 Controversial Topics

Shiri Dori Hacoen chaired a breakout group on information needs on controversial topics. This was a rather specialized group, dealing cognitively challenging topics for which information with opposing facts, views, or opinions can be found. The discussion focused on how to help users deal with such controversial topics. There are challenges in detecting controversy or diverging views, in measuring the degree of controversy, and in the presentation of information with opposing facts, views, or opinions.

5 Conclusions

Finally, the breakout groups reported to the audience and a panel of experts, with continued discussion on what we learned, and concrete plans for the next year. The workshop provided a comprehensive overview of current work on supporting complex tasks in a variety of settings, and fostered new collaboration within our field on one of the most important topics in the coming years. Although there is a clear sense of direction emerging, it is less easy to pinpoint concrete insights or lessons learned. There was a general feeling that we made progress, and that the open discussion with participants across the fields of user-centered and system-centered information retrieval and human computer interaction was useful. There was great support for holding another edition of the workshop at a future ECIR.

Last, but certainly not least, the workshop lived up to its proud reputation of social events, leading to new papers, spin-off workshops, and new friendships. This tradition was continued with an informal program in the *1516 Brewing Company* in Vienna, attended by workshop participants and other ECIR attendees interested in the workshops topic, combining great discussion with a sheer endless supply of food and drinks. Intense discussion about complex search tasks and (scientific) life in general continued far into the Vienna night...

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The proceedings are available at <http://ceur-ws.org/Vol-1338>.

References

- [1] K. Balog. Task-completion Engines: A Vision with a Plan. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.
- [2] A. Dean-Hall, C. Clarke, J. Kamps, and J. Kiseleva. Online evaluation of point-of-interest recommendation systems. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.
- [3] S. Dori-Hacohen, E. Yom-Tov, and J. Allan. Navigating Controversy as a Complex Search Task. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.
- [4] M. Gäde, M. Hall, H. Huurdeman, J. Kamps, M. Koolen, M. Skov, E. Toms, and D. Walsh, editors. *Proceedings of the first international workshop on Supporting Complex Search Tasks*, volume 1338 of *CEUR Workshop Proceedings*, 2015. CEUR-WS.org. URL <http://ceur-ws.org/Vol-1338>.
- [5] E. Gunadi, T. Plumbaum, and S. Albayrak. Applied Distributed Information Retrieval in Enterprise Search. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.

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- [6] M. M. Hall, H. C. Huurdeman, M. Koolen, M. Skov, and D. Walsh. Overview of the INEX 2014 interactive social book search track. In L. Cappellato, N. Ferro, M. Halvey, and W. Kraaij, editors, *Working Notes for CLEF 2014 Conference, Sheffield, UK, September 15-18, 2014.*, volume 1180 of *CEUR Workshop Proceedings*, pages 480–493. CEUR-WS.org, 2014. URL <http://ceur-ws.org/Vol-1180/CLEF2014wn-Inex-HallEt2014.pdf>.
- [7] S. Kumpulainen and H. Huurdeman. Shaken, not steered – the value of shaking up the search process. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.
- [8] E. Toms. Complex Tools for Complex Tasks. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.
- [9] D. Walsh and M. M. Hall. Just looking around: Supporting casual users initial encounters with Digital Cultural Heritage. In Gäde et al. [4]. URL <http://ceur-ws.org/Vol-1338>.