Adapting a Faceted Search Task Model for the Development of a Domain-Specific Council Information Search Engine

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Abstract. Domain specialists such as council members may benefit from specialised search functionality, but it is unclear how to formalise the search requirements when developing a search system. We adapt a faceted task model for the purpose of characterising the tasks of a target user group. We first identify which task facets council members use to describe their tasks, then characterise council member tasks based on those facets. Finally, we discuss the design implications of these tasks for the development of a search engine.

Based on two studies at the same municipality we identified a set of task facets and used these to characterise the tasks of council members. By coding how council members describe their tasks we identified five task facets: the task objective, topic aspect, information source, retrieval unit, and task specificity. We then performed a third study at a second municipality where we found our results were consistent.

We then discuss design implications of these tasks because the task model has implications for 1) how information should be modelled, and 2) how information can be presented in context, and it provides implicit suggestions for 3) how users want to interact with information.

Our work is a step towards better understanding the search requirements of target user groups within an organisation. A task model enables organisations developing search systems to better prioritise where they should invest in new technology.

Keywords: Task analysis · User studies · Information seeking behaviour · Information needs · Domain analysis

1 Introduction

Users and information needs at the municipality of Utrecht are diverse. Some of these user groups have complex information needs [28], which may require specialised search functionality before search satisfaction can be achieved [12]. If organisations do not identify these specialised requirements they risk investing in search solutions that are unsatisfactory, which must then be replaced

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within a few years. We investigated the needs of council members as a target user group because they perform complex intellectual tasks [28] and are therefore likely to benefit from specialised search functionality. Our main research goal was to extend an existing (search) task model from the information seeking and retrieval literature to adapt it for the purpose of identifying council member search requirements. We applied this design approach to develop an e-government search application that supports council member search tasks.

We found that existing task models are not designed for the purpose of representing domain-specific information needs. To address this, we adapted an existing task model based on users' descriptions of their tasks, which includes a domain-specific topic facet that describes how tasks relate to information subsets in that domain. Below we discuss how the adapted task model can inform the design of a search engine, as the interface should clearly reflect where users can perform each of their tasks; what information is necessary for each task; and how users want to interact with this information.

We first contextualise the tasks by describing the information seeking of council members, which we do by describing the users, information sources and channels involved. We then identify council member tasks and relate these to the available information systems. This reveals tasks that are not adequately supported by those systems. We then discuss the design implications of the task model for better support of those tasks, by extending the information model and creating a better interface. We end by discussing how the proposed system is more suitable to council tasks than the pre-existing system.

We performed our analysis at two Dutch municipalities with consistent findings, suggesting that the search functionality for council members in similar contexts can be standardised.

2 Related Work

Developing useful search tools for target user groups requires an understanding of how and why they search. Users start searching for information as a part of performing some broader (work) task [15]. In professional settings work tasks often follow from the professional's responsibilities [7,17,21], which in turn follow from their role within the organisation [20]. If we can model the situational context of information tasks, we can assess whether a search engine is able to aid the user in their goals [13] and therefore whether useful for the user in task completion [2,35].

We introduce several domain-independent task models from the information seeking and retrieval literature as complementary perspectives at the basis of the current work. We start with the broadest model and ending with the narrowest, and then introduce increasingly domain-specific models.

2.1 Domain Independent Task Models

Different research purposes have resulted in different kinds of conceptual models, with characteristics such as 1) how much is modelled (broad or narrow), 2)

whether a process or static situation is modelled, 3) whether something directly observable or something more theoretical is modelled (concrete or abstract) and 4) how much the model generalises beyond domains (general or specific) [15,16].

Ingwersen and Järvelin argue that all information seeking and searching is performed by actors, who interpret information and their tasks through their own perspectives. Therefore, they propose a model of information seeking from the cognitive perspective [15]. This broad and abstract framework contains five main components, where the interrelation between these components (over time) provide important context for each individual component. The five components are 1) the information seeker/user, 2) the interface, 3) the IT systems underlying the interface, 4) the information objects in those systems and 5) their social/organisational/cultural context. They note that work tasks may originate from the organisational context, but they may also originate from e.g. newly found information. In this model, work tasks arise as a result of interactions between the actor and the other components. Work tasks are directed from components towards the actor, and search tasks are directed from the actor towards other components.

Taylor proposed that all information acquisition and use in a professional setting is performed in a contextual environment [32], and defined such contextual factors. Byström et al. extended this work [6] to represent the context of Workplace Information Environments. These describe important variables grouped in four categories: 1) sets of people, 2) work tasks, 3) settings and 4) task resolutions. They note that one's profession leads to work activities, which in turn necessitate (work) tasks.

Byström and Hansen present a narrower conceptual model focusing on what work tasks, information seeking tasks and search tasks are, and how they are interrelated [5]. In their definition, an information seeking task includes all steps a user takes to gather information, including interpersonal ones. Information seeking can consist of several information search tasks, which are search episodes with their own search goal. A search task performed within a search engine or database is also known as a retrieval task. Rather than focusing on tasks from an individual's perspective, Byström considers how to characterise the tasks of a user groups, and the social practices that will affect task performance [7].

Li and Belkin reviewed the literature on information tasks and proposed a narrower model [21]. They characterised tasks with independent facets that affect the information behaviour and the subtasks that a given task produces. This framework has been used to describe tasks and create simulated tasks [14,30]. An extension included the information level of results as a facet [8].

Byström and Hansen show that we can describe an information need in three levels of increasing context [5]. At the lowest level there is a topical description and query, similar to traditional laboratory experiments [15]. The second level includes a situational description, which is the context of the task at hand. The faceted task framework is a step towards gathering research on this area [21]. The third level is all the contextual factors that affect the search, such as the four

categories of the workplace information environment [6] and the five components of the cognitive framework [15].

These models have some overlap, but also different strengths. Ingwersen and Järvelin's model is useful for a cognitive user centered perspective. The model by Byström et al. model for the workplace information environment is valuable for investigating work practices in the workplace. Byström and Hansen's task level model is good at describing tasks from a process perspective. Li and Belkin's model is a powerful tool for describing information behaviour. These models all generalise beyond domains, which gives them explanatory power in a wide range of settings. We find however, that there is a trade-off between a model's ability to generalise beyond domains, and its expressive power within a narrower domain. Li and Belkin were unable to add task topic as a facet because without a domain a list of topics would be unlimited [21]. Byström and Hansen noted the importance of finding a better way to characterise context- and situation-aware descriptions based on real-life data [5]. Ingwersen and Järvelin noted that our increased understanding of tasks had not yet translated to better design criteria for information (retrieval) systems. To address these concerns we now turn to increasingly domain-specific task models.

2.2 Domain Specific Task Models

The above models are applicable during information seeking and retrieval in most domains. We now focus on smaller domains, which allows us to introduce task descriptions that capture increasingly more situational and contextual context.

The classic example to model the user's goal is the web search taxonomy of query intents [4,24]. Within enterprise search there may exist a similar taxonomy of search tasks [27], and between search tasks there seem to be recurring sequences of task types [27]. User interfaces can better support the search experience when they are designed to reflect the typical flow of the users' tasks. When we consider tasks within professional search domains we find complex tasks with similar characteristics [36,37]. When we focus on the tasks within a single organisation we can introduces an element of the organisations' objectives [17], but these are still far removed from the users' immediate goals.

There are also examples of search task studies outside of a professional/work setting, which often analyse all users of a system collectively [31,34], or focus on supporting specific tasks [10,33].

Taylor provided a contextual description of the information use environment of American legislators [32]. This information use environment describes the people, problems, setting and problem resolutions. Legislative culture is described as verbal, non-hierarchical, time-constrained and as having the political party as a major centralising force. An observational study of knowledge workers at a municipal administration identified four main types of work tasks that involved search tasks [28]. Working on legislative processes includes complex information seeking tasks [22,28], possibly because knowledge creation (such as the creation of legislation) is cognitively complex [19]. Complex tasks are more likely to require specialised search functionality.

The present study approach focuses more specifically on one target user group, and adapting an existing task model for the purpose of search design. This approach contrasts with previous work for similar user groups (e.g. [11,18], http://zoek.openraadsinformatie.nl), which typically focus on the data- or technology-driven innovations.

3 Council Member Information Seeking

Council members in the Netherlands have three main responsibilities:

1. Prescribing guidelines for new legislation
2. Verifying whether the municipal workers have adequately translated the council's decisions to concrete policy
3. Representing the citizens' interests while forming legislation guidelines

These are the same responsibilities that Taylor identified for American legislators [32]. Work responsibilities form the highest level of motivation for work tasks and subsequent search tasks [7]. The first and second responsibilities lead to active tasks, whereas the third occurs passively during the other tasks. In performing the first responsibility the council is informed by experts, debates solutions, and decides on new policy over a series of meetings. Members aim to create solutions and arguments that extend or modify existing policies. Members then try to persuade others to support their solutions during meetings. Most of these solutions and knowledge are created during the preparation for domain-specific commission meetings. When the council is not unanimous on a solution, members refine and prepare their proposals before a final discussion in a council meeting. In this article we investigate the sub-tasks of preparing for council meetings, because all council work is oriented around these meetings. Users complained that the previous system was not satisfactory for performing the search tasks within this work task, and hence specialised search functionality may be valuable. A critical challenge is that council members must often extend existing policies, that were created before the members joined the council. It is thus crucial that they understand the existing policy and how it was formed.

3.1 Council Members and Supporting User Groups

Multiple user groups support council members during their tasks. Because of space limitations we only briefly and informally introduce these in Table 1. Here we characterise them using their knowledge types [15]. Domain knowledge can be declarative (what is it about) and procedural (how to do it). Search knowledge can also be declarative (where will I be successful) procedural (how do I search effectively). Professional searchers typically have a high domain and search knowledge, and are thorough when searching [1,20,26]. Table 1 is based on observations of search behaviour and interviews at two municipalities.

Council members become professional searchers with domain expertise over time, but the election cycle leads to the replacement of experts with inexperienced members. A notable difference from typical professional search domains is

Table 1. Characterising the knowledge of council members and supporting groups

User	*Domain knowledge*		*Search knowledge*		Thoroughness
	Declarative	Procedural	Decl.	Proc.	
Council member	Experience dependent		Diverse	Diverse	Time-limited
Faction staff	Experience dependent		Diverse	Diverse	Thorough
Adviser	High	High	Unknown	Unknown	Unknown
Search expert	Low	Low	High	High	Thorough
Public servants	High	High	Unknown	Unknown	Thorough

that council members are not trained to search effectively, unlike other experts [1,25]. Many are unfamiliar with Boolean operators and strategies for effective query formulation. Council members may therefore benefit from search training and/or a search interface that supports them in expressing complex queries.

3.2 Information Sources

Due to space limitations, we will only briefly contextualise the information systems we observed during interviews and interactive search sessions at two municipalities. The two primary information sources were web search engines (mainly Google) and an internal system called iBabs. iBabs is an app used for planning meetings and archiving the official policy documents used during these meetings. A copy of the public data can be accessed at http://api.openraadsinformatie.nl/ (accessed May 2022).

Information seeking on a new topic typically began with performing a web search to find general background information (from indexed news outlets or information published on the municipality's homepage for example). This was followed up by searching in iBabs. This archival system provides an internal search engine that allows users to (re)find known documents by filtering facets such as the date and title of the meeting. This type of functionality is less useful for non-specific needs. This is consistent with findings at a Finnish municipality, which showed that the organisation's internal systems tended to perform well for specific tasks (such as re-finding a known document), but less well for more amorphous tasks (such as exploring a topic) [29].

As we may expect from previous literature [29], the other prominent internal information sources and channels included e-mail (personal or collective faction inboxes) and human sources (colleagues, party-neutral advisers and a temporarily appointed clerk whose main responsibility was to search for information). Some larger political parties created internal solutions to share information (e.g. documenting plans in the cloud), although their main information advantage appears to be in having council members with more experience. Experienced council members remember older events and documents, which is a significant benefit given the difficulties in exploring archived information.

4 Methodology

In the first of two analyses we used a codebook to analyse interview data to identify what tasks facets council members used to describe their tasks. In the second analysis we summarised the council member tasks we identified in the interview data and an observational study and characterised them based on the facets we previously identified.

The two analyses were based on interview data from three studies. Both analyses were initially performed on the interview data that resulted from two studies performed at the municipality of Utrecht, and then a third study was conducted at the municipality Hollands Kroon to test if the results could be reproduced with a similar user group in a different organisation.

The municipality of Utrecht is one of the largest and oldest municipalities in the country, whereas municipality Hollands Kroon is of average size and was formed less than 10 years ago as a fusion of smaller municipalities. Selecting municipalities of such different sizes and histories allows us to determine whether the work tasks we identify are organisation-dependent, or whether council member tasks are similar across organisations.

4.1 Participants

Each study included a sample of council members that were diverse in terms of experience (years in council), demography (gender, age) and the political parties that they represent (size, ideology). This sample was selected by council clerks.

4.2 Data Collection

The first study was a series of six one-hour interviews performed to construct a customer journey for preparing a council meeting. These semi-structured interviews were not limited to search-related questions, but aimed to identify all work tasks. The study aimed to map out relevant information channels and sources; relevant user groups; communication channels; the triggers that move users to actions; and noted which steps went well and which did not. We only report the aspects relevant to the present research scope.

During the second study these same participants (except for one replacement) performed simulated search tasks in an interactive session. These simulated tasks were recreations of real council tasks in a laboratory setting where we asked users to search for pre-defined topics. Each participant in the session had an observer who asked them unstructured questions about their information seeking. This setup allowed us to observe more instrumental search tasks (i.e. tasks that were not explicit user goals, but necessary sub-steps).

The third study at municipality Hollands Kroon consisted of five semi-structured interviews designed to first identify the work tasks performed in preparation of a council meeting. For each work task we focused on the search tasks involved, and we concluded by asking for (recent) examples of each search task.

4.3 Analysis 1: Identifying Task Facets

We first identified which task facets characterised tasks in the domain. We analysed the task facets that users used to describe their tasks by developing a codebook based on the interview data. Coding is a qualitative method used to analyse interview data by annotating (potentially overlapping) fragments of interviews with codes by theme. It allows the researcher to identify concepts and relations between concepts [9]. The development of a codebook is an iterative process that occurs over multiple studies. With every study analysed, one tries to improve the codebook until it explains all new data from new studies. New codes are found in two main ways. Data-driven codes emerge to represent themes and recurring concepts in the data. Theory-driven codes are added when the data reflects themes from the relevant literature. In our case the theory driven codes include the task facets. We focused on analysing the task-related themes and generate the codebook on data from of Utrecht. We then apply the codebook to the data from Hollands Kroon to test whether its completeness for describing tasks performed in this new context.

4.4 Analysis 2: Characterising Council Member Tasks

We characterised the work tasks that users described and showed us during the studies at Utrecht using the task facets we identified using the codebook. We then compared the tasks identified to those we found at Hollands Kroon to identify whether our list of tasks is exhaustive.

5 Results 1: Identifying Task Facets

By applying the codebook to the data from the first study we found four task-related codes: the task objective, information sources, topic aspect and task specificity. We applied the codebook to the second study at of Utrecht to find further evidence for the previous codes and the retrieval unit as a new code.

The task objective is a description from the users' perspective. The information sources are the systems they mentioned, implying which underlying datasets are necessary for the task. The topic aspect represents different types of declarative domain knowledge. Consider the example topic 'the sound leak in Tivoli'. Over time users may be interested in different aspects of this, such as the background of the issue; how the council has dealt with this topic in the past; and what aldermen have previously promised to do about the issue. We found a limited set of topic aspects that are important for many topics. These aspects are reflected in the interview data when users implicitly switch their definition of what a topic's 'context' is. These topic aspects are closely related to the four kinds of information that Taylor identified among American legislators [32]. The only difference is that we found a distinction between background information and policy information, which Taylor grouped as one information type.

The retrieval unit code reflects that users do not always seek documents, but can instead seek, for example, a fact or (the contact details of) a person [23]. It

Table 2. The work tasks identified at of Utrecht, described using the task facets council members use to describe their tasks

Task ID	Task objective	Topic aspect	Information sources	Retrieval unit
WT1	*Understand the agenda item*	Background information	Google	Facts
WT2	*Evaluate existing or proposed policy*	Policy	iBabs, Google	Document
WT3	*Analyse previous council decisions*	Decision history	iBabs	Document(s), timeline
WT4	*Understand political positions*	Political context	iBabs, Google	Statement
WT5	*Create an argument*	Mixed	iBabs, Google	Mixed
WT6	*Create or defend a perspective*	Mixed	iBabs, Google	Mixed
WT7	*Evaluate progress on policy execution*	Administrative context	BMT	Statement

Table 3. The search tasks identified at of Utrecht, and the work tasks during which they occur

Task identifier	Search task	Associated WTs
ST1	Find news articles, municipality publications and other substantive public documents	WT1, WT2, WT6
ST2	Find reports and other (internally generated) substantive documents	WT1, WT2
ST3	Find the aldermens' commitments (formal agreements to the council)	WT7
ST4	Find agenda items and corresponding transcripts where this topic was previously discussed	WT3
ST5	Find documents that were key in the previous discussion of this topic	WT3
ST6	Find documents containing the current policy	WT4
ST7	Find previous statements from aldermen or colleagues	WT4, WT2, WT6
ST8	Find public articles containing political standpoints	WT4
ST9	Find sources supporting an argument	WT5
S10	Find the alderman responsible for this topic	WT3, WT4, WT2

Table 4. Characterising the search tasks identified in Table 3 using the task facets. Many tasks can be either amorphous (am) or specific (spec). These are joined in the Table for formatting.

Task ID	Topic aspect	Info sources	Retrieval unit	Task specificity
ST1	Topic background	Google	Document	Am or Spec
ST2	Topic background	iBabs	Document	Am or Spec
ST3	Decision history	BMT	Statement	Am or Spec
ST4	Decision history	iBabs	Timeline	Am or Spec
ST5	Decision history	iBabs	Document(s)	Am or Spec
ST6	Policy	iBabs/Web	Document	Am or Spec
ST7	Political context	iBabs	Statement	Am or Spec
ST8	Political context	Google	Mixed	Am or Spec
ST9	Mixed	Mixed	Mixed	Mixed
ST10	Administrative context	Google	Mixed	Specific

is related to the information level facet but captures more of the user's goal. The final facet is the task specificity, which indicates how specific the information is that users are looking for in a search task.

5.1 Generalisation of Codebook

We applied the codebook developed at of Utrecht to the data from Hollands Kroon. The codebook was able to explain all task-related themes. This suggested that the codes we used for task facets were stable (also known as theoretical saturation) and can properly represent tasks in this domain.

Five task codes were found based on how council members characterised their tasks: the task objective, the information sources, the topic aspect, the retrieval unit and the task specificity. We adopt these five codes as the task facets to describe the domain-specific task context.

6 Results 2: Council Member Tasks

Table 2 introduces the work tasks found at Utrecht. Tables 3 and 4 respectively describe and characterise the search tasks identified.

6.1 Generalisation of Tasks

To test whether the list of council member tasks is exhaustive we performed a study at Hollands Kroon and compared the findings to those at Utrecht. At Hollands Kroon we found work tasks WT1-6 from Table 2, but not WT7: evaluating the progress on alderman's commitments. This may be because the municipality is smaller, making it easier to keep track of such commitments.

At Hollands Kroon we found all search tasks except ST3 and ST8. ST3 is less significant in this municipality because WT7 is less significant. It is unclear why users here search for fewer public articles containing political standpoints (ST8). Perhaps the municipality has a smaller profile in the news because it is smaller. There is a slight difference in how users search for previously discussed topics (ST4), as the municipality Hollands Kroon does not maintain transcripts of each meeting. Their council is only provided with the video recordings of meetings. Because these are not searchable, this search task is not well supported. This is because Hollands Kroon has less resources.

The council tasks identified at municipality of Utrecht are a superset of those found at municipality Hollands Kroon. We therefore expect our that our list of council member tasks within the Netherlands is fairly exhaustive.

7 Supporting Specialised Council Task Functionality

When comparing tasks identified with the existing systems (see Table 5) we found that 1) filter-based search functionality is insufficient for non-specific tasks and 2) there is no support for investigating different topic aspects. We discuss how to design a more suitable domain-specific search engine based on the task model. We specifically consider how the interface should enable each of these tasks, what information is necessary for each of these tasks and how users want to interact it. We introduce the domain-specific search engine we developed in cooperation with Spinque, publicly available at https://ureka.utrecht.nl/app/.

7.1 Linking Tasks to Information Subsets

The task topic aspect indicates which datasets and document genres are relevant for a given task, informing how information in the domain should be modelled.

Within council information we found that tasks related to the topic background aspect should search within public web sources. Tasks involving the political context aspect involve searching the political statements made during meetings (i.e. segments of the council meeting minutes). A search engine that supports the policy aspect should enable searching all council documents. Tasks involving the decision history aspect involve the specific document genre council proposals, and finding the meetings that discuss these proposals.

The retrieval unit facet indicates how these document genres should be indexed: users search for the official council proposal documents in some tasks, but only look for segments of the meeting minutes in other tasks. Identifying the relevant document genres and retrieval units can indicate how the information model that the search engine is based on should be extended (e.g. by extracting political statements from meeting minutes).

7.2 Interface Design Implications

Work tasks reflect user goals and inform how the user approaches the system. Hence it should be clear to the user where he should go for any given work task.

Information is ideally presented in a useful context, which depends on the topic aspects we identified. The format and presentation of individual results depends on the retrieval units we identified.

Based on these guidelines we designed a different view (page) in the interface for each topic aspect, as shown in Figs. 1, 2, 3 and 4. We developed search verticals for existing policy, political context and administrative context. The decision history of council proposals was added as a contextual view when clicking a search result. We did not include functionality for the background information topic aspect, as interviews indicated that web search is satisfactory for this.

The search tasks reflect how users want to interact with the information within these views. The current model does not capture these requirements explicitly, but is a step in that direction. The task specificity facet indicates whether users will need filtering functionality (with high precision) or explorative functionality (with high recall). For example, when users search for statements by specific people (ST7) there is an implied requirement for filtering statements by the speaker. We could investigate the concrete requirements (e.g. on what information features does the user want to filter) by asking users about example tasks or by observing users perform the tasks in questions. Future work may include a search task facet that captures which filters should be included for specific tasks, and which dimensions are of interest in amorphous tasks.

7.3 Comparing the Proposed Improvements

In this paper we focus on the design process that resulted in a new search system, rather than individual improvements for specific tasks. As a result, the new system introduces many changes (e.g. the interface, result ranking, the datasets included) and it is both unfeasible and not our goal to evaluate the impact of each variable we changed. To show the value of our design approach we instead compare the proposed system to the existing system. We compare systems based on their ability to facilitate user tasks, because the best search system is the one that is most useful for the user's goals [3,35].

Table 5. A comparison of the existing and proposed search systems. We summarise the tasks by their facets, because tasks with the same facets require the same functionality.

Requirement	iBabs	Proposed
TA: Background info	Web search	Web search
TA: Existing policy	Filtering	Vertical in Fig. 1
TA: Political context	None	Vertical in Fig. 2
TA: Administrative context	None	Vertical in Fig. 3
TA: Decision history	None	Result page in Fig. 4
Retrieval unit	Document/meeting	TA dependent (Figures)
Specific search tasks	Filters	Filters on the same features
Amorphous search tasks	None	Timeline of decision history

Fig. 1. Vertical for the Policy topic aspect.

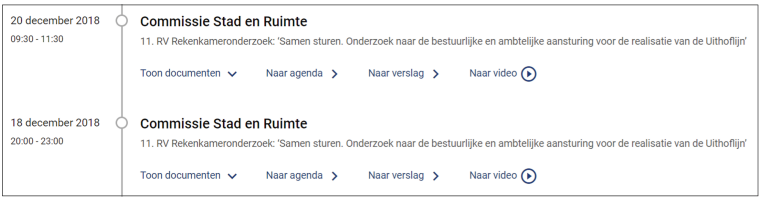

Fig. 2. Vertical for the Polical Context topic aspect.

Fig. 3. Vertical for the Administrative Context topic aspect.

Fig. 4. Search result view for political documents (Decision History topic aspect).

Table 5 summarizes the tasks that users want to perform (based on our previous results), and how both systems support these tasks. Because our design approach led to a better understanding of the target user group's requirements,

we were able to develop more useful functionalities. This can aid developers and organisations in prioritising the importance of different functionalities. An enthusiastic response by its users and the interest of other local municipalities suggests that our approach was successful at specifying the user search requirements.

8 Conclusion

A target user group may require specialised search functionality to perform their work effectively. In this paper we investigate how to model the search requirements by extending the faceted task model with facets that capture domain-specific information. Comparing these tasks to the existing systems allows us to find initial design implications for improving the search experience, because it illustrates 1) how each task relates to subsets of information in the domain and 2) how users want to interface with this information.

We characterised council members as professional searchers who have not had time to specialise in their domain, and have not had any search literacy training. We found that council members information seeking usually begins with a web search to identify background information, using news sites and municipal websites. They then access internal council information systems to inform themselves about different topic aspects.

We found that existing task classifications were generic by design, and unable to represent domain-specific aspects of tasks. We extended this work by identifying the five task facets that council members used to characterise their tasks, and discussing how these can be used to represent domain-specific tasks. We found the task objective, the topic aspect, the information sources, the retrieval unit and the task specificity. We discussed how tasks have implications for how the information should be modelled, and how the interface should facilitate them.

We used the topic aspect to determine which datasets and document genres are important for which tasks (similar to search verticals). We used the retrieval unit to determine how to index (segments) of documents. For the interface design we used the task aspect of work tasks to present information in a useful context, resulting in different a different interface views for different topic aspects. The retrieval unit informed how individual search results should be presented. The search task specificity is a first step towards understanding how users want to interact with the information. Once we identify task specificity, we can investigate what type of filters are beneficial for a (high precision) specific task, or what dimensions users want to explore in (high recall) explorative tasks.

We found the same task facets and the same tasks at two municipalities. If the task model generalises to municipalities in similar contexts, then the search functionality we developed could be standardised across Dutch municipalities.

References

1. Anderson, M.J.: A comparative analysis of information search and evaluation behavior of professional and non-professional financial analysts. Acc. Organ. Soc. **13**(5), 431–446 (1988)

2. Belkin, N.J.: On the evaluation of interactive information retrieval systems. The Janus Faced Scholar (2010)
3. Belkin, N.J.: People, interacting with information. SIGIR **49**(2), 13–27 (2015)
4. Broder, A.Z.: A taxonomy of web search. SIGIR Forum **36**(2), 3–10 (2002)
5. Byström, K., Hansen, P.: Conceptual framework for tasks in information studies. J. Am. Soc. Inf. Sci. Technol. **56**(10), 1050–1061 (2005)
6. Byström, K., Heinström, J., Ruthven, I.: Information at Work: Information Management in the Workplace. Facet Publishing (2019)
7. Byström, K., Kumpulainen, S.: Vertical and horizontal relationships amongst task-based information needs. Inf. Process. Manag. **57**(2), 102065 (2020). https://doi.org/10.1016/j.ipm.2019.102065
8. Cole, M.J., Hendahewa, C., Belkin, N.J., Shah, C.: User activity patterns during information search. ACM Trans. Inf. Syst. **33**(1), 1:1-1:39 (2015)
9. DeCuir-Gunby, J.T., Marshall, P.L., McCulloch, A.W.: Developing and using a codebook for the analysis of interview data: an example from a professional development research project. Field Methods **23**(2), 136–155 (2011)
10. Donato, D., Bonchi, F., Chi, T., Maarek, Y.S.: Do you want to take notes? Identifying research missions in Yahoo! search pad. In: Proceedings of the 19th International Conference on World Wide Web, WWW 2010, pp. 321–330. ACM, Raleigh, NC (2010)
11. Erjavec, T., et al.: The ParlaMint corpora of parliamentary proceedings. Lang. Resour. Eval. 1–34 (2022). https://doi.org/10.1007/s10579-021-09574-0
12. Findwise: Enterprise search and findability survey 2015. Technical report, Findwise (2015). https://findwise.com/en/enterprise-search-and-findability-survey-2015
13. Hansen, P., Järvelin, A., Eriksson, G., Karlgren, J.: A use case framework for information access evaluation. In: Paltoglou, G., Loizides, F., Hansen, P. (eds.) Professional Search in the Modern World. LNCS, vol. 8830, pp. 6–22. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-12511-4_2
14. Hienert, D., Mitsui, M., Mayr, P., Shah, C., Belkin, N.J.: The role of the task topic in web search of different task types. In: Proceedings of the 2018 Conference on Human Information Interaction and Retrieval, CHIIR 2018, pp. 72–81. ACM, New Brunswick, NJ (2018)
15. Ingwersen, P., Järvelin, K.: The Turn - Integration of Information Seeking and Retrieval in Context, The Kluwer International Series on Information Retrieval, vol. 18. Springer, Dordrecht (2005). https://doi.org/10.1007/1-4020-3851-8
16. Järvelin, K., Wilson, T.D.: On conceptual models for information seeking and retrieval research. Inf. Res. **9**(1), 9-1 (2003)
17. Jonasen, T.: Automatic indexing in e-government: improved access to administrative documents for professional users? Ph.D. thesis, Aalborg Universitet (2012)
18. Kaptein, R., Marx, M.: Focused retrieval and result aggregation with political data. Inf. Retr. **13**(5), 412–433 (2010). https://doi.org/10.1007/s10791-010-9130-z
19. Kelly, D., Arguello, J., Edwards, A., Wu, W.: Development and evaluation of search tasks for IIR experiments using a cognitive complexity framework. In: Proceedings of the 2015 International Conference on The Theory of Information Retrieval, ICTIR 2015, pp. 101–110. ACM, Northampton, MA (2015)
20. Leckie, G.J., Pettigrew, K.E., Sylvain, C.: Modeling the information seeking of professionals: a general model derived from research on engineers, health care professionals, and lawyers. In: The Library Quarterly, vol. 66, no. 2, pp. 161–193. University of Chicago Press, Chicago, IL (1996)
21. Li, Y., Belkin, N.J.: A faceted approach to conceptualizing tasks in information seeking. Inf. Process. Manag. **44**(6), 1822–1837 (2008)

22. Marcella, R., Baxter, G., Davies, S., Toornstra, D.: The information needs and information-seeking behaviour of the users of the European parliamentary documentation centre: a customer knowledge study. J. Documentation **63**(6), 920–934 (2007)
23. Ramirez, G., de Vries, A.P.: Relevant contextual features in XML retrieval. In: Proceedings of the 1st International Conference on Information Interaction in Context, IIiX 2006, pp. 56–65. ACM, Copenhagen, Denmark (2006)
24. Rose, D.E., Levinson, D.: Understanding user goals in web search. In: Feldman, S.I., Uretsky, M., Najork, M., Wills, C.E. (eds.) WWW 2004, New York, USA, 17–20 May 2004, pp. 13–19. ACM (2004)
25. Russell-Rose, T., Chamberlain, J.: Expert search strategies: the information retrieval practices of healthcare information professionals. JMIR Med. Inform. **5**(4), e33 (2017)
26. Russell-Rose, T., Chamberlain, J., Azzopardi, L.: Information retrieval in the workplace: a comparison of professional search practices. Inf. Process. Manag. **54**(6), 1042–1057 (2018). https://doi.org/10.1016/j.ipm.2018.07.003
27. Russell-Rose, T., Tate, T.: Designing the Search Experience - the Information Architecture of Discovery. Morgan Kaufmann (2012)
28. Saastamoinen, M., Järvelin, K.: Queries in authentic work tasks: the effects of task type and complexity. J. Documentation **72**(6), 1114–1133 (2016)
29. Saastamoinen, M., Kumpulainen, S.: Expected and materialised information source use by municipal officials: intertwining with task complexity. Inf. Res. **19**(4) (2014)
30. Singh, J., Anand, A.: Designing search tasks for archive search. In: Proceedings of the 2017 Conference on Conference Human Information Interaction and Retrieval, CHIIR 2017, pp. 361–364. ACM, Oslo, Norway (2017)
31. Sohn, T., Li, K.A., Griswold, W.G., Hollan, J.D.: A diary study of mobile information needs. In: Proceedings of the 2008 Conference on Human Factors in Computing Systems, CHI 2008, pp. 433–442. ACM, Florence, Italy (2008)
32. Taylor, R.S.: Information use environments. Prog. Commun. Sci. **10**(217), 55 (1991)
33. Teevan, J., Collins-Thompson, K., White, R.W., Dumais, S.T., Kim, Y.: Slow search: information retrieval without time constraints. In: Symposium on Human-Computer Interaction and Information Retrieval, HCIR 2013, pp. 1:1–1:10. ACM, Vancouver, BC, Canada (2013)
34. Trippas, J.R., et al.: Learning about work tasks to inform intelligent assistant design. In: CHIIR 2019, pp. 5–14. ACM, Glasgow, Scotland (2019)
35. Vakkari, P.: The usefulness of search results: a systematization of types and predictors. In: O'Brien, H.L., Freund, L., Arapakis, I., Hoeber, O., Lopatovska, I. (eds.) CHIIR 2020: Conference on Human Information Interaction and Retrieval, Vancouver, BC, Canada, 14–18, March 2020, pp. 243–252. ACM (2020). https://doi.org/10.1145/3343413.3377955
36. Vassilakaki, E., Garoufallou, E., Johnson, F., Hartley, R.J.: Users' information search behavior in a professional search environment: In: Paltoglou, G., Loizides, F., Hansen, P. (eds.) Professional Search in the Modern World. LNCS, vol. 8830, pp. 23–44. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-12511-4_3
37. Verberne, S., He, J., Wiggers, G., Russell-Rose, T., Kruschwitz, U., de Vries, A.P.: Information search in a professional context - exploring a collection of professional search tasks. CoRR abs/1905.04577 (2019)