1. INTRODUCTION

The integration of perspectives and models of information seeking and information retrieval (IS&R) into a holistic conceptual framework for research is currently under development (Ingwersen & Järvelin, in preparation). Epistemologically it is founded on the cognitive viewpoint (Belkin, 1990) and based on elements of the cognitive theory for interactive IR (IIR) put forward by Ingwersen (1992; 1996; 2001). Intentionality in the form of perceived work and search tasks or non-job related interests is central as the rationale underlying IS&R (see, e.g., Järvelin (1986)). Search tasks are the instrumental activities, cognitive-emotional as well as physical, that in IS&R serve to advance the fulfillment of the work task in terms of information provision.

The framework reflects the understanding that IS&R is a process of cognition for the information seeking actor(s) or team in context. Algorithmic and IIR, as well as information seeking (IS), involve cognitive and emotional representations from a variety of participating actors. Such representations are seen as manifestations of human cognition, reflection, emotion or ideas forming part of IS&R components and kinds of interaction in context — as shown in Fig. 1.

The framework operates with several kinds of contexts. First, algorithmic and IIR processes cannot stand alone, but are nested in IS behavior as special cases of information behavior (Wilson, 1999) – Fig. 2. Algorithmic IR, i.e., the study of the interaction between information objects and IT-based algorithms, arrow (4) in Fig. 1, has no real meaning without human information interaction with IR systems, arrows (2-3). IIR itself functions in the context of IS – but reversely IS becomes increasingly also only meaningful when considering the involvement of formal (algorithmic) IR engines and information structures. This is because progressively more informal communication channels, like mail, become formalized due to the overpowering and integrative effects of modern IT.

As information behavior is regarded, for instance, generation, acquisition, use and communication of information – as well as information seeking. Typical information seeking behavior is acquisition of information from knowledge sources, for instance, from a colleague, through (in)formal channels like social interaction in context (arrow 1), or via an IR system (arrows 2-4), Fig. 1; IIR involves information acquisition via formal channels like the Internet, or from other organized sources. In a cognitive sense, information behavior, information seeking and all forms of IR are activities driven by work tasks or interests – Fig. 2. We extend the notion of work task also to cover non-job-related emotional and cultural interests, e.g., entertainment, as depicted in Fig. 2.

Secondly, every information actor (or team of actors) operates in, and is influenced by, a dual contextual frame: that of the IT and information spaces surrounding the actor(s) — the systemic context on the left hand side, Fig. 1 — and the socio-cultural-organizational context to the right. By manifestations of practice and authorships the latter context influences over time the information space on the one hand (arrow 6) and the IT infrastructure (arrow 8) on the other.

Below, we will discuss in more detail the types of context that comes into play during information retrieval.
2. TYPES OF CONTEXT IN IR

As already emphasized by Wilson (1981), the current situation in context plays a central role in information seeking. Our cognitive framework extends this understanding by also stressing the role of the historic context – both contexts driving the shape of the current situation of the information seeker. In a narrow sense only the five central components of the framework, Fig. 1, and their interaction condition the shape of the situation at hand; but also the societal contexts in a wide sense – like economic and techno-cultural infrastructure, (5) Fig. 3 – influence the current situation as perceived by the information seeker or communicator. Fundamentally, the situation is a personal cognitive construct in contexts.

The seeking actor’s perception and interpretation of many levels and dimensions of contexts is central to how that situation develops. In this process the perceived work task or interest is an important interpretation outlining – but not totally defining – that situation at hand. Also included in the construct are the perceptions and interpretations of:

- Knowledge gap or ASK and relevance;
- Uncertainty and other emotional states;
- The potential sources for the solution (if any) of the work task or interest;
- The intentionality, i.e., goals, purposes, motivation, etc.;
- Information preferences, strategies, pressures (costs, time);
- Self, i.e., of own capabilities, health, experiences – and
- Systemic and interactive features and information objects.

According to the framework, the current context of a component is constituted by the other components immediately surrounding that component – Fig. 1. Hence, the study of one component (or an element), say interface functionality, should incorporate an awareness or direct involvement of the IT and information object components as well as of the searchers using the interface in some conceivable context. To the information seeker the real work task and preferences, influenced by the socio-organizational environment, forms a context to the situation at hand, as do the interface characteristics, information object presentation and the present mode of interaction. The searcher’s experiences act as a historic context – (6) Fig. 3.

Context is not only a searcher phenomenon. The system itself can be context-aware in use. Interacting with searchers, Fig. 1, means more to the system than capturing simple input data. Rather, temporal searcher interaction with a system forms a rich network of potential information regarding preferences, style, experience and knowledge as well as interests. This information helps to constitute a session context (arrow 2, Fig. 1, (3), Fig. 3) that can be made available for the system to interpret current searcher actions (Ruthven et al., 2003). In principle the IIR session context should be seen in the broader perspective of information seeking behavior (thus including arrow 1) and nested in information behavior as a special case – as stated above and shown in Fig. 1.

From the system’s point of view ergonomic behavior, like mouse or eye movements, patterns of relevance feedback or evidence of the immediate perceptions and interpretations by the searcher constitute this session context, with the seeking actors and their current situations in context (arrow 1) as more remote contextual phenomena – (4), Fig. 3. The latter may be manifestations of cultural conventions, organizational preferences, or domain-specific traditions. For IR systems design it is crucial to uncover patterns of objective, tangible evidence of actors’ interpretations as well as of the socio-organizational or cultural context. Without it the system cannot react properly during session time.

The application of evidence algorithmically from the session context involves intensive knowledge of what such evidence implies. For instance, Spink et al. (1998) found that searchers often assess a large proportion of the retrieved and viewed documents as partially relevant when in a state of uncertainty or they are unfocused on their work task. Later, during session time, a bigger proportion of documents is commonly judged highly relevant. This evidence may thus inform the system about the cognitive state of the current searcher and signal from which documents to derive potential novel search keys for query modification. Also the positioning of documents on the ranked output lists, assessed more or less relevant, may be applicable information to the weighting algorithms of the system – or give raise to research assumptions to be tested empirically.

The system in turn has technical characteristics relating to how information is presented during interaction (arrows 2-3, Fig. 1), that influence the session context and the searchers’ perceptions of the system competence and the quality of information sources. Consequently, models of context are representations of a shared process of interpretation and adaptation on both sides of the interface.

Within each component of the cognitive framework, at quite elementary levels, the representations of different cognitive nature form intra-component structures in IS&R – (2), Fig. 3. They form a group of elements, like information objects in the information space component – (1), Fig. 3, that themselves are contextual to one another. Parts of documents, like references or outlinks to other information objects as well as citations or inlinks, are seen as giving and taking context to the content of other objects. Within objects, for instance, images are contextual to a surrounding text or other structures attached to them, and vice versa, and paragraphs serve as context for their own sentences and words; signs are seen in context of sign structures that are media-dependent.

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1 A typical example of this (economic) influence - also directly on empirical research settings - was the high cost of public online searching in the 1970-80s. This lead to many investigations of the so-called "pre-search interview" – a phenomenon not applicable in free-of-charge in-house online systems or realistic to systems design.
Other components, like the IT platform or the interface, similarly contain inter-related elements and objects, such as pieces of software and algorithms. The seeking actor also constitute a component of interactive IR with his/her own inter-dependent (cognitive) structures, such as the central work task perception, problem state, uncertainty level and other emotional factors, information need, knowledge states, and search task comprehension. Such intra-component structures and manifestations actually constitute the evidence which, when tangible, is utilized in the principle of polyrepresentation (Ingwersen, 1992; 1994; 1996).

The historic context, (6) Fig. 3, functions across all other contexts at a given point in time and serves to produce expectations (models) concerned with the future steps in the IIR process and the surrounding components. However, present expectations relying on past experiences may indeed not always be satisfied by the conditions offered by the current context. For instance, the interface does not present documents in the expected form, the search algorithm seems incomprehensible, or the documents do not immediately satisfy the requirements as good as in previous IS&R situations. From the systems point of view similar disappointments may occur as to the searcher behavior and provision of information.

We summarize our stratified context definition for IS&R – Fig.3. In our framework five distinct but nested levels of context exist associated with each central component or actor: (1) The divergent representations of cognitive structures, often nested and always contextual to one another, like signs in context of sign structures constituting objects, embedded as (2) intra-component contexts in our framework; (3) the session context dealing with features of the interaction between two components or actors – with the situation at hand as a central cognitive-emotional element. Session context is embedded in broader seeking and information behavior. The situation at hand is constructed by the actor’s perception of work and search tasks (interest), knowledge gap and potential sources, etc. in the (4) context of the conceptual, emotional, systemic and social properties immediately surrounding the actor or component. All actors, components and interactive sessions are influenced to a certain extent by (5) remote contextual constructs, such as general techno-economic infrastructures and socio-cultural factors in society. Across this stratification operates an additional dimension, that of the historic context of actors’ experiences forming their expectations. All IIR processes and activities are under influence of this sixth form of context.

3. CONCLUDING REMARKS

Context, work and search tasks are interconnected concepts in IS&R. The various kinds of context are commonly nested, with the historic context in the form of experiences and learning of actors crossing the former. At the moment of IS&R the searcher is not only surrounded by a socio-organizational and cultural-epistemic context but also by session-based and systemic ones, which interrelate the IT and interface components as well as the information space. The situation at hand, dealing with work task or non-job related interest perception, is a cognitive-emotional construct thus heavily influenced by all those kinds of context. Similarly, the current search task execution is forced by the same contexts – but the historic context of the searcher, i.e., his/her earlier experiences with such contexts, plays the most central role in the situation. This can be seen as the main reason behind inter-searcher inconsistency, even though all contexts (except the historic one) including the work task or interest are the same across the searchers involved. Both search task implementation and relevance assessments are thus expected to be slightly different over several test persons or assessors (Vorhees, 1998).

IR in Context does not only deal with the contexts of searchers or searchers as context. IRIX also concerns the interaction between documents and IT platform in context of domains and different kinds of work tasks (and situations), i.e., an extension of the laboratory model, not necessarily involving test persons.

3. REFERENCES


