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Beyond the search process – Exploring group members' information behavior in context

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ABSTRACT

This paper reports on the findings from a longitudinal case study exploring Kuhlthau's information search process (ISP)-model in a group based academic setting. The research focus is on group members' activities and cognitive and emotional experiences during the task process of writing an assignment. It is investigated if group members' information behavior differ from the individual information seeker in the ISP-model and to what extent this behavior is influenced by contextual (work task) and social (group work) factors. Three groups of LIS students were followed during a 14 weeks period in 2004/2005 (10 participants). Quantitative and qualitative methods were employed, such as demographic surveys, process surveys, diaries and interviews. Similarities in behavior were found between group members and the individual in Kuhlthau's ISP-model with regard to the general stages of information seeking, the cognitive pattern associated with focus formulation and the tendency towards an increase in writing activities while searching activities decreased. Differences in behavior were also found, which were associated with contextual and social factors beyond the mere search process. It is concluded that the ISP-model does not fully comply with group members' problem solving process and the involved information seeking behavior. Further, complex academic problem solving seems to be even more complex when it is performed in a group based setting. The study contributes with a new conceptual understanding of students' behavior in small groups.

1. Introduction

Many models of information seeking and behavior exist (Case, 2006; Wilson, 1999), which help us to conceptualize the information seeking process and employ this conceptualization in research and practice. However, implicit in many of these models is the assumption that the information seeker is an individual, though individuals often work in groups or teams involving *collaborative* information behavior (Foster, 2006). Moreover, *contextual* and *situational* factors are often a priori to the information seeking process in these models, rather than integrated dimensions of influence (Byström & Järvelin, 1995; Ingwersen & Järvelin, 2005; Kracker, 2002; Kracker & Wang, 2002; Spink & Cole, 2005; Vakkari, 2003). In this paper, the focus is on Kuhlthau's (1991, 2004) well known and acknowledged Information Search Process (ISP)-model.[1] More specifically it is explored to what extent this model represents the information behavior of *group members* in terms of individuals engaged in a group based problem solving process.[2]

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[1] Other models of the information seeking process exists, e.g. the general sense making model by Dervin (1983) or the integrated model of information behavior by Spink and Cole (2005). In this study the ISP-model frames the research design as well as constitutes the research object of interest.

[2] The work presented in this paper is based on a thesis by Hyldegård (2006c).

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This paper is a follow up on Hyldegård (2006a), which presented a preliminary case study with the aim of exploring the impact of socially determined work task activities on group members' information (seeking) behaviour. The research focus of the study was to explore if group members would behave differently from the individual modeled in the ISP-model and why. Further, it was explored if the group members' behavior would differ from each other or assimilate during time.

Case study 1 was carried out from April to May in 2002 and followed two voluntarily formed groups of information science students (5 participants) during the process of making a project assignment. During a four-week period each student of the two groups kept a diary of his or her information related activities and affective experiences. Further, each student was interviewed three times during the period with reference to his or her diary statements.

Though only preliminary in its form, some findings were found which form the basis of the second case study. Not only information seeking activities, but also activities associated with the work task (contextual factors) and group work (social factors) seemed to dynamically affect the outcome of the process, cognitively as well as emotionally. Concerning, for example, group members' emotional experiences, they did not perceive similar emotional experiences as the individual information seeker in the ISP-model; uncertainty and disappointment were still perceived by some group members at the end of the project period, which to some extent were related to social and work task factors associated with mismatches between group members' motivations, ambitions and perceived project focus. Based on the results from case study 1 it was hypothesised that the ISP-model may not represent a complete model of the information seeking process of groups. In addition, it was hypothesized that the work task and its effect on students' performance seems to be *even* more complicated when it is solved in a group based setting. These hypothesis are forming the basis of case study 2 presented here.

Section 2 presents the background of the study, which concerns the ISP-model and its influence on information science research as well as previous studies on collaborative information behavior (CIB). Section 3 addresses the two factors of influence in the study, that is, the 'work task'-dimension and the 'group work'-dimension. Section 4 describes the research design of the case study, while Section 5 and 6 present and discuss the results. Finally, Section 7 presents the conclusion of the study and the implications for further research.

2. Background

2.1. Kuhlthau's information search process (ISP)-model

Kuhlthau's ISP-model consists of 6 stages, which show the individual information seeker's activities, thoughts and feelings over time while engaged in a work task such as a project assignment (Fig. 1). The stages are: (1) work task initiation, (2) topic selection, (3) pre-focus formulation, (4) focus formulation, (5) information collection and (6) presentation (which implies search closure). After work task initiation, a topic generally has to be selected and further explored in order to find and formulate a focus of the assignment. According to the model the formulation of focus often results in the collection of more pertinent information (relevant to focus) and the writing of the assignment. Depending on the specific stage of the process activities, thoughts and feelings will change. At the initial stage, for example, the information seeker often feels uncertain deriving from a lack of knowledge or a vague understanding to solve the problem at hand. This will change as he/she gets knowledge, constructs meaning and formulate a focus. Finding of a focus represents a 'turning point' for the information seeker. Negative feelings start to decrease whereas positive feelings start to increase. Search activities also tend to decrease at this point, while writing activities tend to increase and replace search activities (the presentation-stage). In spite of the neat division of stages, the movement from one stage to another is performed in spirals and caused by a complex interplay between activities, thoughts and feelings.

The ISP-model represents a milestone in information science research by focusing on the *information seeker's* process of sense-making in association with information seeking activities. This is in contrast to earlier approaches such as the Cranfield experiments in the 1960s reflecting an idealistic conceptualization of the information retrieval process. In line with the cognitive approach in library and information science (LIS) (Ingwersen & Järvelin, 2005; Spink & Cole, 2005) the ISP-model may be regarded as a metaphor for *common* experience in the information seeking process.

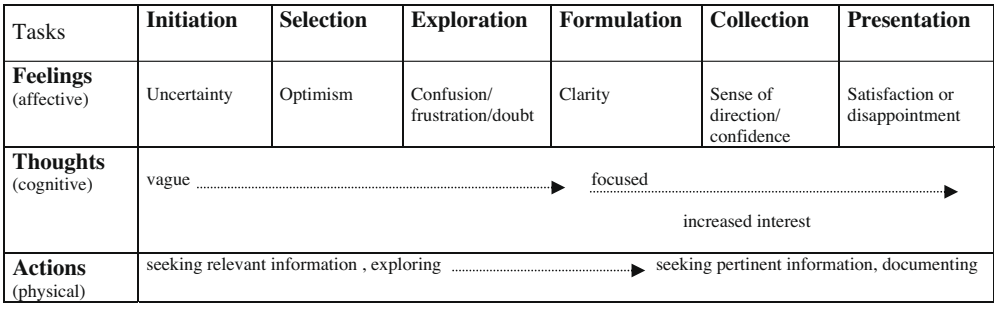

Fig. 1. Kuhlthau's model of the information seeking process (Kuhlthau, 2004, p. 82).

The model has contributed to several also recent studies of the individual's process of information seeking and meaning construction during time (e.g. Cheuk, 1998; Heinström, 2002; Holliday & Li, 2004; Kracker, 2002; Limberg, 1998; Vakkari, 2001). However, no prior study has employed the ISP-model in order to explore, understand and describe information behavior and meaning construction of individuals acting as *group members* during the work task process of producing a collective product. Further, no study has investigated group members' information behavior in an academic setting in terms of the *interplay* between activities and cognitive and affective experiences in association with contextual and social factors.

The motivation behind this research interest should be found in the underlying assumption of the ISP-model, meaning that the individual problem solver's process of knowledge construction and associated behavior tends to be influenced (almost) solely by *information seeking* activities at various stages of the ISP. Though strong empirical evidence of the ISP-model has been found, no strong correlation was, however, found in Kuhlthau's studies between the information seeking activities at each stage and the cognitive and affective experiences. This may indicate that *other* factors intermingle with the complex process of knowledge construction and meaning making. The influence from the context or situation framing any search process only plays a minor role in the ISP-model. Though work task activities, such as writing, are mentioned by Kuhlthau (2004) as an important element that may support the process of construction, it is only referred to as part of the topic selection stage and in terms of 'note taking'. Further, when 'task' is mentioned it generally refers to the 'search task' – not to the work task itself. Moreover, impact from social factors, such as 'discussing the assignment with others' or 'discussing the assignment with informal mediators' is primarily mentioned in association with the initiation and topic selection stage and not as a factor of influence *during* the process. The research interest in the social dimension of information behavior has only recently been reflected in the LIS literature and studies of collaborative information behavior (CIB).

2.2. Previous CIB studies

Despite a growing interest in the social dimension of information behavior only few information seeking and retrieval studies have provided empirical knowledge of the involved *process* of collaboration (e.g. Allen, 1977; Bruce, Fidel, Pejtersen, Dumais, & Grudin, 2003; Fidel et al., 2000; Hansen & Järvelin, 2000, 2005; Hertzum, 2000, 2002; Hyldegård, 2006a; O'Day & Jeffries, 1993; Prekop, 2002; Reddy & Jansen, 2008; Reddy & Ruma Spence, 2008; Sonnenwald & Pierce, 2000; Talja, 2002).[3]

The most well known example of collaborative information seeking (CIS) in this context is probably Allen's (1977) identification of the gatekeeper phenomenon, based on a study on engineers and scientists information seeking behavior. According to Allen (1977), the gatekeeper takes the responsibility to look for information and forward it to colleagues in his or her team or organization. In this way, the recipient of the information and the gatekeeper collaborate to find information that is useful to the work they are engaged in. Besides identifying a difference in the two group's information seeking behavior, e.g. their choice of information sources, the importance of personal contacts and discussions was found. Prekop (2002) explored the information seeking behaviors of a military working group established to review the Australian Defence Force's command and control capability. In this three-year project, Prekop identified seven different information related roles that were explicitly assigned to project participants or informally adopted by them. The mapping between roles and project participants was dynamic and changed with the participants' workload and other responsibilities within the project as well as with the progress and staffing of the project. O'Day and Jeffries (1993) investigated the sharing of information within group situations which resulted in the identification of information sharing at four levels. These levels have been further challenged by Talja (2002) in a study of scholars' information sharing. Based on an explorative case study of the collaborative activity of information sharing Talja (2002) developed a conceptual framework for the description of types and levels of information sharing in relation to document retrieval in academic communities and groups. According to her collective aspects of information behavior have often been conceptualized as 'one-way' processes in which an individual consults another individual, though information acquisition and filtering often takes place as a collective and collaborative activity. To further explore the information sharing practice in relation to document retrieval in different academic communities Talja (2002) interviewed 44 researchers from nursing science, history, literature, cultural studies and ecological environmental science. Besides their personal seeking activities, each participant was asked about his/her group activities and collaboration – at the group level as well as at the department level. This resulted in the identification and classification of five types of information sharing: 'strategic sharing', 'paradigmatic sharing', 'directive sharing', 'social sharing' and 'non sharing'. Kuhlthau (2004) has also pointed to information sharing as a strategy, especially at the first stages of the ISP, but she did not address this issue any further. From a task based approach, Hansen and Järvelin (2000, 2005) have investigated information seeking and retrieval processes performed by patent engineers in a real-life work setting. The first study showed that collaborative activities and collaboration were associated with both internal or external activities and with individual or group activities. The latter study reported in 2005 further explored the expressions of collaborative activities within the process of the patent work task. It was found that collaborative activities of information seeking behavior take place *throughout* the work task process and might even be categorized according to the specific work task step in the process. More recently, Reddy and Ruma Spence (2008) explored CIS-activities within a patient care team focusing on the urgent care component of the emergency

[3] When looking into other research domains such as computer supported collaborative work (CSCW) and social psychology, social issues such as group dynamics and group behaviour have a long tradition.

department. Seven categories of information needs were found and three triggers for CIS activities were found: (1) lack of expertise, (2) lack of immediate accessible information and (3) complex information needs.

Bruce et al. (2003) analysed two design teams during the initial stage of a software-engineering project and an aviation-engineering project. Collaborative activities took place when the engineers were identifying, analysing, and defining their information problems as well as when devising strategies for information seeking. The act of retrieval itself was generally performed individually. In addition to this the work context seemed to have a strong effect on the engineers' collaborative information seeking behavior. Sonnenwald and Pierce (2000) reported on a qualitative study exploring human information behavior in a command and control military context. During data analysis three important themes emerged highlighting the 'why', 'what' and 'how' as well as the consequences of information behavior: (1) the concept of 'interwoven situational awareness' consisting of individual, intra-group and inter-group-shared understanding of the situation, (2) the need for 'dense social networks' or frequent communication between participants about the work context and the situation and (3) the concept of 'contested collaboration', that is, the phenomenon where team members maintain an outward stance of cooperation, but actually work to further their own interests, some times destroying the collaborative effort. Apart from these empirical studies, Karamuftuoglu (1998) has outlined a theoretical framework for understanding the collaborative nature of information seeking. The core of his framework is that information seeking is just as much about *producing* new knowledge implying a creative and inventive activity, as it is about finding extant information. More recently, Hertzum (2007) has pointed to the need for a new way of conceptualizing collaborative information seeking to avoid individual reductionism as well as group reductionism. He suggests that collaborative information seeking should be defined as a combined activity of information seeking and collaborative grounding implying that information needs to be shared among collaborative actors to establish and maintain a common understanding and ground of their collaborative work. Reddy and Jansen (2008) have developed a conceptual model of collaborative information behavior along the axes of participant behavior, situational elements and contextual triggers. The model is based on a study exploring information behavior in a professional health care team.

According to these previous CIB studies, mostly of longitudinal nature, social aspects have been seen to affect information (seeking) behavior in various ways – both at the individual and the group level. In addition, the work task and its context has demonstrated to influence the participants (information seekers) involved, the information sources retrieved and used as well as the outcome of the problem solving process. Many CIB studies have, however, focused on engineers' or professionals' information seeking behavior whereas only few studies have addressed the collaborative behavior of *academics*, that is, students and researchers (e.g. Bjørn & Hertzum, 2006; Hyldegård, 2006a; Limberg, 1998). Moreover, previous CIB studies have often been concerned with the roles of group members or their motivations for either seeking, selecting, assessing, using and sharing information. We need more research into the behavior associated with group based problem solving in terms of group members' activities as well as cognitive and affective experiences. If looking at the problem solving process from a group member perspective, the information seeking process can be seen as an integrated part of the group work process *and* the work task process. This means that the information seeking process cannot be stated to exist isolated from, but rather as imbedded in other processes. This further stresses the importance of taking such 'other' processes and factors into account when studying information behavior of individuals, in this case group members.[4]

3. Two factors of influence

3.1. The work task dimension

The work task dimension addresses the work task *product* and the work task *process*.[5] At a conceptual level a task can be defined as an *activity* to be performed to accomplish a goal (Vakkari, 2003) focusing on a particular item of work (Byström & Hansen,2005). A task generally has a recognizable beginning and end. In addition, every task has requirements to fulfil that either may be conditional (must fulfil certain criteria) or unconditional. Moreover, a task often consists of specificable smaller *subtasks*, such as reading, writing and information seeking activities, which again may have their own individual goals and requirements (Vakkari, 2003). Tasks may also be characterized according to their degree of authenticity in research settings (Byström & Hansen, 2005). A distinction is here made between real-life tasks, seen as properties of different communities of practice, and simulated tasks, which are tasks that may be manipulated.[6] Though the two task types have many elements in common, real-life task performance is closely related to its context in contrast to simulated task performance. When tasks are viewed as *process*, which is the case here (in contrast to an á priori task description) the researcher often tries to recognize how people perceive their tasks and why and how different information sources are used during task performance. The same task may, for example, be perceived differently by its performers. Students in a group setting may not share the same perception of a project assignment, hence approach and address the work task differently. According to Byström (1997) any task performance process can be divided into three stages: the construction stage, the performance stage and the completing stage. Concerning the research process Vakkari (2001) have designated these three stages as the 'pre-focus'-, 'focus formulation'- and 'post-focus' stage.[7] In this paper, the work task product,

[4] From a methodological point of view more factors may also imply more complex research designs constraining data analysis accordingly.

[5] The task concept is further explored in Hyldegård and Ingwersen (2007).

[6] Borlund (2000), for example, has investigated the use of simulated search goals associated with a simulated work task, e.g. by using a 'cover story' that describes a problematic situation that triggers and frames information needs and information searching accordingly.

[7] These stages derive from a study by Vakkari (2001) comparing the ISP-model with the research process.

the assignment, is a real-life and *complex* academic task meaning that it constitutes a new and genuine decision task that cannot *a priori* be determined (Byström & Järvelin, 1995). In line with the process perspective, task complexity here refers to the task performer's *perception* of complexity, which has been found to further affect behavior and the need for problem formulation and information accordingly. Perceived task complexity, however, cannot be separated from the task performer's work task knowledge and experience (Ingwersen & Järvelin, 2005). According to Byström and Järvelin (1995) the perceived task constitutes a relevant point of departure for exploring task complexity and implications for need formulation and behavior. Further, the process-oriented task approach calls for a longitudinal research strategy (Vakkari, 2003).

3.2. The group work-dimension

The group work-dimension involves in this paper the*group development process*, *groups as problem solving units* and individuals acting as '*group members*'.[8] The focus is on 'small groups', that is, less than 12 persons (Atherton, 2003).

According to Tuckman (1965) new groups idealistically develop through four stages, also known as the 'forming'-, 'storming'-, 'norming'- and 'performing'-stages.

At the *'forming'*-stage the group members first come together. They are generally polite to each other at this stage and conflicts are seldom seen. At the *'storming'*-stage, in turn, fractions are formed, personalities clash and conflicts are dominating. At the *'norming'*-stage the group starts to recognize the merits of working together, thus, subsides the in-fights. From the new spirit of cooperation each group member begins to feel more secure and express his/her thoughts that now are discussed more openly. In addition, work methods are established and recognized by the group as a whole. Finally, at the '*performing*'-stage the group has settled on a system of norms, which allow for an open and frank exchange of thoughts as well as a high degree of support by the group. Conflicts may, however, still arise at this stage and momentary return the group to the 'storming'-stage. These stages of the group development process are conceptualized as integrated stages of the work task process and the information seeking process.

In contrast to individual problem solving, *group based problem solving* is often motivated by two sometimes conflicting motivations: (1) an interest in developing a *good* group product (cognitive motivation) and (2) to reach at a solution that is satisfying to *all* members of the group (social motivation) (Kaplan & Wilke, 2001). In this way, groups are both concerned about the work task and its cognitive requirements *as well as* intra-group issues that may affect group members' well being and social identity.[9] In addition to this, Sedikes and Gaertner (2001) propose that 'acting as a group member' always will imply at least three definitions of 'self' (1) the identity derived from personality traits and unique characteristics (the individual self), (2) the identity derived from a certain group membership (the collective self) and (3) the identity derived from contextual characteristics, influencing a given behavior. These different perceptions of 'self' may also interact with existing 'we'-modes and 'I'-modes in group work and further affect the cooperative group intelligence (Akgün, Lynn, & Yilmaz, 2006). Whereas the we-mode refers to a *strong* group perspective and orientation towards the group's interests, that is, the group's negotiated goals, values, opinions and norms which bind the group together, the I-mode refers to a *weak* group perspective and an orientation towards own interests (Tuomela & Tuomela, 2005). The same difference in orientation was identified by Limberg (1998) in her study of 25 students (18–19 years old) who were required to work in groups while preparing an assignment of 20 pages to be submitted within a four-months period.[10] The identified differences in orientation resulted in two categories signifying two different approaches to group work: the atomistic approach (I-orientation) and the holistic approach (group orientation).

4. Research design

To explore group members' information behavior during problem solving and the impact from social and contextual factors a longitudinal case study was carried out among three groups of LIS students preparing an assignment at the Royal School of Library and Information Science in Denmark. In order to explore the ISP-model in a group based setting the research design of the case study has to a large extent been construed in accordance with the methodological framework leading to the ISP-model. The aim has been to develop concepts or hypothesis of group members' information behavior in context to be further tested and enriched in future studies.

The study is a follow up on case study 1 presented in Hyldegård (2006a), hence, also referred to as case study 2 in this paper.

4.1. Research questions

Case study 2 has been guided by four research questions with the aim of exploring and describing group members information behavior, here defined as "...those activities a person may engage in when identifying his or her own needs for information, searching such information in any way and using or transferring that information" (Wilson, 1999, p. 249).

[8] In this paper, group work constitutes the social dimension of information behavior, but group work may as well constitute a work task from a task oriented point of view.

[9] 'Intra-group' refers to issues *within* the group, whereas 'inter-group' refers to issues *between* groups.

[10] The social dimension of information seeking and problem solving was, however, not the focus of the study.

1. Will group members behave differently from the individual modelled in the ISP-model? If so, in which way do they behave and why?
2. Will intra-group-members demonstrate different activities as well as different cognitive and emotional experiences? If so, in which way do they differ and why?
3. How is group member behavior related to contextual factors (work task)?
4. How is group member behavior related to social factors (group work)?

4.2. Participants

The participants were ten Danish graduate students in library and information science studying at their fifth term. At this level the curriculum is dedicated to problem based project work and group work accordingly. The students followed two type of courses, one with internal exam (A-courses) and one with external exam (B-courses). At both courses they were required to make an assignment. The ten students who agreed to participate followed two different B-courses within cultural studies. The students ranged from 23 to 48 years of age, nine were females and one was male. They voluntarily formed two 3-person groups and one 4-person group (the male was in the last group). Participants were experienced information seekers and had previous experience with group based project assignments, and most of the participants had experience with individual based project assignments as well.

4.3. Work task

The work task, the project assignment, was a mandatory part of the B-courses, which covered various subjects, such as cultural heritage studies, children's literature, music mediation and bibliometric studies. The project period lasted fourteen weeks, from week 41 2004 to week 01 2005. During this period the students had to formulate a problem within a specific project topic, explore the topic and find a focus, find and digest relevant literature, collect and analyse data, devise a structure for presenting their argument and finally write a project report. The project report approximated 20 pages for students working individually and 30–40 pages for groups of students.

The work task will be addressed at the *descriptive* level as well as at the *process* level focusing on group members' work task processes during time.

4.4. Data collection

To recruit participants an invitation describing the project was published on the students' intranet. In addition, the involved teachers were contacted in order to make an introduction to the project in class. The only condition laid down was that the participants had to be group members. The participants were promised a fee (80 €) and ensured full anonymity. Ten students (three groups) accepted the invitation. In advance they were given a thorough two-hour introduction and guidance to the study and the implied data collection methods. Further, to facilitate the data collection process and establish a visual memory cue a ring binder was handed out to each participant containing all relevant material to be used in the study. All participants signed a consent of participation.

In line with Kuhlthau (1991, 2004), the focus was on participants' *actions* as well as *cognitive* and *affective experiences* during an project assignment. In this study, however, actions and experiences did not only relate to information seeking activities, but also to actions and experiences derived from group work (social factors) and the work task (contextual factors).

Further, many of the methods used by Kuhlthau (1991) were also applied in this study to get participants' perceptions and experiences expressed in utterances, descriptions, stories and explanations. Three methods were selected for data collection: *questionnaires* (demographic questionnaire and process surveys),*diaries* and *interviews*.[11] The data were collected at three points in the process: *start*, *midpoint* and *end*.

The *demographic* questionnaire consisted of 23 questions and statements. The aim was to collect profile data on each participant in terms of personal information, such as gender and age, as well as information related to prior experience in terms of group work, the subject of interest, IT and information seeking.

To elicit behavior data associated with information seeking as well as with the project assignment and group work over time a printed *process survey* was filled out by participants and handed in at three selected points (dates) in the process: at start, midpoint and end.[12] The process survey was divided into three parts with questions concerning activities and cognitive and emotional experiences in relation to the project assignment (part A), information seeking (part B) and group work (part C). The three process surveys were identical in order to observe changes over time. Concerning the cognitive aspect of the project assignment, for example, the first question in each process survey asked for a short description of the topic and the title of the assignment as a way to observe progress in focus formulation during time. This was in line with Kuhlthau (1991, 2004). Affective aspects associated with the project assignment were addressed in the process survey by asking each participant to state his

[11] The use of various methods – triangulation – is often seen in case studies as a way to provide an in-depth exploration of a complex phenomenon as well as to help validate important findings in the data.

[12] The process surveys were handed in at three selected dates: (1) 22 October 2004, (2) 19 November 2004 and (3) 17 December 2004.

or her emotional experiences with a number from 0 (not recognized) to 5 (high) in relation to 6 positive feelings (confident, satisfied, optimistic, relieved, motivated and clarity (a sense of direction) and 7 negative feelings (confused, doubt, stressed, frustrated, uncertain, worried/cautious). The cognitive aspect of the *information seeking process* was associated with participants' relevance judgement over time, e.g. whether it changed from 'relevant' information at start to 'pertinent' information at the end of information seeking. To address specifically the affective aspects of information seeking in the process survey, each participant should indicate his or her experience of information seeking according to four pairs of positive and negative feelings on a scale from 1 (positive) to 5 (negative). The positive feelings and their corresponding negative feelings were: easy/difficult, relaxing/stressing, simple/difficult and satisfying/frustration. If other pairs of positive and negative feelings had been experienced, the participants were allowed to note these in the survey and mark the value accordingly. In the final part of the process survey a number of questions addressed activities and cognitive and emotional experiences related to group work.

Each process survey was followed by a one week *diary* period (7 days) to collect data on a daily basis on each group member's activities and experiences related to the work task, information seeking and group work at three selected points. In addition, the diary should guide the interviews with the participants afterwards; both when deciding which issues to address in the interviews and during the interviews when referring to specific incidents. Moreover, the diary should serve as a surrogate for direct observation as it was difficult to predict where and when relevant activities may take place. To ease the diary keeping the diary form was printed out and inserted in the binder that was handed out at the beginning of the study. In this way, the participants could bring the diary with them and record activities immediately after the activities had taken place. In contrast to the diary format in case study 1 (Hyldegård, 2006b), this diary allowed for a more open and free description of activities in the participants' own words. The larger amount of text-data deriving from the unstructured format was limited by the shortness of the diary period and the physical form of the printed diary. The participants were instructed to record on a daily basis and in their own words any assignment-related activity. The activities should be described chronologically and at best immediately after the activity had taken place. Further, the start and end of the activity as well as the time the diary had been filled out should be noted. In the final part of the diary, the participants should indicate their recognition and experience of each of the listed positive and negative feelings with a number from 0 (not recognized) to 5 (highly recognized).[13] Recognized feelings not represented on the list should be noted with a value under 'Other'. The emotional part of the diary should be filled out daily, even if no assignment-related activities had taken place. To clarify the use of the diary and qualify recorded diary data the diary was pilot tested for two days prior to the official start of the study.

After the process survey had been handed in and the seven-days diary period had ended, each group member participated in an *interview*. Each interview at start, midpoint and end lasted about 45 min. By interviewing the participants individually it became possible to explore whether and how group members would differ in their perception and experience of identical situations; whether and how their work task and information related activities were individually or collaboratively based and, further, how perceptions and experiences evolved over time. A semi structured guide was made for each of the three interview sessions, which addressed different aspects related to the work task, information seeking and group work in accordance with the specific point in the process. The form of the interview was guided by the micro-moment time-line technique derived from the Sense Making approach (Dervin, 1983). The aim was through dialogue to get out the informant's feelings, thoughts and experiences in relation to various situations and phenomenons while the informant made sense of his or her reactions. All 30 interviews were recorded.

4.5. Data analysis

The *demographic questionnaire* generated categorical data of each group member on personal issues, group work, the project assignment and information seeking. The data were tapped into a printed demographic matrix showing all questions at the vertical line and the answers for each group member at the horizontal line. The three *process surveys* from each group member resulted primarily in categorical data focusing on activities as well as cognitive and emotional experiences related to the work task process, the information seeking process and the group work process at start, midpoint and end. The data from the 30 process surveys in total were plotted into Excel and matrices and graphical diagrams were generated to show relevant process data across group members and across time.

The 30 *diaries* generated descriptive data on 'activities' and comments associated with the recorded data or the project in general. Since diary data were given in physical form all text-data in the diaries were transcribed directly from paper to electronic form (Word) and coded in the qualitative data analytical program *ATLAS.ti*. The diaries also generated categorical data on 'feelings' as perceived by the participants during the project assignment. These feelings were registered and analysed in MS Excel.

The 30 *interviews* were transcribed for coding in ATLAS.ti but only those parts that were associated with the research questions, hereby leaving out side leaps, repetitions and unimportant details. The coding of diaries and interviews was based on the 'dynamic coding process' presented by Strauss and Corbin (1998) involving primarily open coding and axial coding.

[13] The feelings were similar to the feelings associated with the work task in the process survey.

Pre-focus stage	Focus formulation stage	Post-focus stage
Planning, Information searching, Reading	Reading, Writing	Data analysis, Writing

Fig. 2. Common work task activities during the work task process.

Pre-focus stage		Focus formulation stage		Post-focus stage	
Group	Group/Individual	Group/Individual	Individual	Group/Individual	Group

Fig. 3. Shifts in perspective during the work task process.

5. Results

This section presents the 10 group members' activities as well as cognitive and affective experiences in association with three dimensions of influence: *work task*, *information seeking* and *group work*. In this way group members' behavior is not only addressed in association with the information seeking process, but also in association with the work task and group work process in order to understand the influence from these dimensions and the interplay. 'Start', 'midpoint' and 'end' refer to the formal data collection points in time whereas 'pre-focus-', 'focus formulation-' and 'post-focus stage' refer to group members' stages in the work task process.

Groups are referred to as group A, B and C and group members are accordingly referred to as A1, A2, A3; B1, B2, B3; C1, C2, C3, C4.

The result section leads to a discussion of the four underlying research questions of the case study.

5.1. Work task dimension

This section presents results associated with the work task dimension.

5.1.1. Activities

Looking at the work task activities across groups and group members in the 30 process surveys activities were found to differ according to point in the work task process. In addition, some activities were common to all group members,[14] whereas others were performed by only one or some group members. Moreover, some activities were performed collaboratively whereas others were performed on an individual basis. Fig. 2 shows the distribution of *common* activities during the work task process.

Activities performed by only one or some group members in a group were primarily identified at the focus formulation stage and generally associated with the beginning of writing. It turned out that at that time parts of the assignment were distributed to individual group members, often implying that group members started to work on an *individual* basis. A deadline at midpoint on another project assignment (in another course) further implied that the group members did not concentrate fully on the present group work. For all groups this resulted in a more fragmented group work at the focus formulation and post-focus stage, thus, in more *individual* activities, which is shown in Fig. 3.

At the focus formulation stage, for example, each group member was engaged in finding a focus of his or her delegated part, search information as well as read and write on the specific topic in focus. The fragmented problem solving activities within the groups resulted in different subtask knowledge that further constrained the construction of a shared focus of the work task (the assignment). In addition to that, the complexity of the subtasks differed. Group members who were assigned to a normal decision subtask (e.g. a descriptive part of the assignment) had less difficulties in finding the subtask-focus, find pertinent information and start writing than group members who were assigned to a genuine decision subtask (e.g. an analytical part of the assignment). The difference in group members' subtasks was not only reflected in their cognitive experiences, but also in their affective experiences.

5.1.2. Cognitive experiences

The cognitive experiences associated with the work task dimension were primarily related to focus formulation and knowledge construction. To assess focus formulation over time the group members' working titles and descriptions of the assignment subject in each of the three process surveys were assigned a number from 1 (weak) to 3 (strong) to indicate the degree of focus in the formulations. 'Subject' was here equivalent to problem description. If the subject was described

[14] Though the same activities were performed by *all* group members in a group, it did not necessarily imply that group members were performing these activities *together* or on a *collaborative* basis.

Table 1
Degree of focus in group members' subject descriptions according to the three process surveys at start (22 October 2004), midpoint (19 November 2004) and end (17 December 2004)

Group member	Start	Midpoint	End
A1	2	2	2
A2	2	2	2
A3	1	3	3
B1	1	2	3
B2	1	1	3
B3	2	2	3
C1	1	1	2
C2	1	2	2
C3	2	2	3
C4	1	2	2
Sum	14	19	25

1 = weak, 3 = strong; max = 30 across group members.

Table 2
Group perception of 'clarity' during time

Group	1. Diary	2. Diary	3. Diary
A	24	19	22
B	13	9	25
C	15	15	14

Average values on a scale from 0 to 5 for each diary period (7 days) and for each group (max = 7 × 5 = 35).

in rather broad and general terms, the text was given a '1'; if the subject was described in specific and exact terms, the text was given a '3'.[15] The result is shown in Table 1.

The descriptions in the first process survey were often very broad and without a clear goal, while the descriptions in the second and third process survey tended to be more focused. The same tendency was seen in the interview data. In addition to this, the formulations in the first interview were generally related to the motivations for topic selection, whereas the second formulations were related to the group members' understanding or decisions regarding the structure or specific elements of the assignment. Finally, the last formulations concentrated on the specific 'problem' in focus. Though more of the participants' descriptions have been assigned the same degree of focus across time, the subject being referred to may not be the same. In more cases, the subject was reformulated or the object of interest changed across the process surveys, without affecting the degree of focus. The form of the process survey itself may, however, have constituted a constrain to the determination of focus, implying that focus determination *solely* based on short written formulations is difficult. In this case, though, the interviews proved valuable to nuance the group members' focus formulations.

The focus formulations in the process surveys and interviews were compared across group members to get an impression of the *collective* and *shared* intra-group understanding of focus.

The titles and descriptions of the assignment in *group A* generally reflected a shared understanding of focus, though group member A2 tended to have a slightly different perception of the object in focus.

In *group B* the title of the project as well the group members' perception of focus tended to stay the same throughout the process. In contrast, *group C* demonstrated more divergences both in titles and in perceptions of focus across group members. One explanation may be that group C changed subject and focus several times during the project assignment period. In addition to this, work task motivation was found to differ between group members, which may have affected their engagement in focus formulation accordingly.

5.1.3. Affective experiences

When looking at the affective experiences associated with the work task dimension the increase in degree of focus did not seem to be reflected in the groups' perceptions of *clarity* as stated in the diary at start, midpoint and end. As shown in Table 2, the average group values for 'clarity' only increased from 'low' to 'high' for group B, whereas a slight decrease in clarity was identified by group A and C towards the end. The low degree of clarity at the beginning as perceived by group B was partly associated with a doubt by B2 in the selected topic according to her notes in the diary.

The lower values at the end may be associated with the fact that the groups were in the middle of finishing the assignment while the third diary was kept.

The perception of *motivation* did not seem to be associated with focus formulation either. If looking at the average group values for 'motivation' in Table 3, motivation was generally high at start but decreased at midpoint and towards the end, especially with respect to group A and group C.

[15] The same procedure was applied to the group member's descriptions of the assignment problem in each of the three interviews.

Table 3
Group perception of 'motivation' during time

Group	1. Diary	2. Diary	3. Diary
A	29	22	23
B	23	16	24
C	24	20	18

Average values on a scale from 0 to 5 for each diary period (7 days) and for each group (max = 7 × 5 = 35).

Table 4
Group perception of 'stress' during time

Group	1. Diary	2. Diary	3. Diary
A	7	5	9
B	13	15	3
C	8	14	13

Average values on a scale from 0 to 5 for each diary period (7 days) and for each group (max = 7 × 5 = 35).

The general high values at start were explained by the group members as relating to curiosity regarding the topic and positive expectations regarding the group work. The fall at midpoint was primarily due to a falling-off after the *other* assignment (A3, B1, B2, C1, C2 and C3) and a decrease in subject interest concerning the delegated part (A2, A3 and C3). In addition, a loss in motivation derived from interpersonal problems in group C (C1, C2). The higher values at end was often associated with the intensive spirit up to deadline and the expectations of the impending ending of the assignment.

Another emotional experience related to the work task process was *stress*. In this case no general pattern could be identified *across* groups when looking at the average group values on 'stress' for each diary period in Table 4.

Whereas stress increased for group A towards deadline, group B seemed to experience a sudden decline in stress. The average values of stress for group C nearly stayed the same between midpoint and end. Besides deadline, a pause or stagnation in work task activities was mentioned by many as a stress provoking factor. Hence, the slight increase in stress at midpoint for all groups could be seen as an reaction to the other assignment implying no activity on the present assignment. The mere act of writing helped reduce stress as mentioned by many group members. In turn, it could also easily provoke stress if *no* writing activity had taken place for a while, both at the individual and at the group level. Except for group B, no high perception of 'relief' was identified in group A and C towards the end. This seemed to be related to individual factors such as dissatisfaction with the end product. In addition, all groups were at the completion stage when data on relief were collected, hence they had not finished the assignment yet, which generally implies experiences of relief (Kuhlthau, 2004).

5.2. Information seeking

This section presents results associated with the information seeking dimension.

5.2.1. Activities

In line with the work task dimension group members' information seeking activities *differed* according to the point in the work task process. Moreover, some activities were performed collaboratively while others were performed on an individual basis. This was partly due to the shifts in subtask and information needs at the focus formulation stage, e.g. shifting from a collective information need to an individual information need. When looking across groups the information seeking activities at the pre-focus-stage were primarily concerned with the 'initial subject formulation', 'identification of information needs', 'searching for background information' and 'skimming of information sources'. At the focus formulation stage the groups were generally in the middle of 'exploring the subject'. Group A, however, was also engaged in 'goal oriented searching' implying a search for specific information. At the end groups were still in the middle of 'exploring the subject' as part of the focus formulation stage, but were also engaged in activities typically related to the post-focus-stage, such as 're-checking information sources for new information'. Not surprisingly, most information seeking activities were performed in common at the beginning of the process in order to find a shared focus of the assignment and before dividing the assignment into specific parts for further work on an individual basis. At the focus formulation stage information activities were more spread across group members due to the delegation of specific parts and the pause in group work caused by the other assignment. At the end, group A and group C were still engaged in information seeking activities, which regarding group C derived from a sudden shift in focus.

If looking at the *intra-group* level various collaborative information seeking strategies were employed. At the pre-focus stage, in particular, information was communicated, discussed, exchanged and shared, primarily to help formulate a collective goal and obtain a shared understanding of the problem in focus. At the focus formulation and post-focus stage information was primarily communicated and discussed according to specific elements of the assignment, e.g. based on the reading of other group members' writings. Depending on subtask and point in the work task process various information sources

were used. In Table 5 the use of personal, physical and electronic information sources during time is shown. The data originate from the process surveys, due to which each group member should mark a source and its importance 'at the moment' with a number from 1 (low) to 3 (high). Only sources assigned values 2 or 3 are shown.

Looking across groups and group members more identical information sources were generally employed at start and end than at midpoint, where a more differentiated picture can be seen. This can again be explained by the start of writing according to which group members concentrated on *different* parts of the assignment. Despite differences in use among group members the 'book' was, however, preferred to all, independently of point in the process. This may also be related to the nature of the assignment topics, which derived from two courses on cultural studies.

5.2.2. Cognitive experiences

With regard to the cognitive aspects of information seeking a slight *increase* in the easiness of judging relevance was identified in the three process surveys for each group member, which seems to correspond with the increase in perceived focus. Differences in perceived complexity of relevance judgement were, however, identified. This turned out to be related to the character of the delegated part of the assignment, meaning that simple subtasks entailed less complexity in relevance judgements than complex subtasks. Moreover, group members did not reach at a common set of relevance criteria, but employed different relevance criteria according to the specific situation at hand. Though information seeking tended to result in more pertinent information along the focus formulation stage end of searching (search closure) was not only determined by cognitive criteria due to knowledge construction. Also work task criteria such as time and formal assignment requirements and psychological criteria such as stress avoidance tended to affect group members' ending of the information searching process.

5.2.3. Affective experiences

Table 6 below shows the group members' affective experiences associated with information seeking during time, that is, in the first, second and third process survey. Each group member was asked to assign a value to each of four affective dichotomies on a scale from 1 (positive) to 5 (negative), that is: easy (1)–difficult (5); relaxing (1)–stressing (5); simple (1)–complex (5); satisfying (1)–frustrating (5). A value assigned to 'Other' was also allowed.

Table 5
Use of information sources

	E-journals	Other internet sources	Printed journals	Books	Newspapers	Teachers	Supervisor	Group members	Teaching
Oct. 04									
A1		X	X	X	X			X	X
A2		X		X				X	
A3				X	X			X	
B1	X		X	X					
B2	X		X	X				X	
B3	X		X	X					
C1				X	X		X	X	
C2		X		X					
C3				X	X		X	X	
C4				X	X		X	X	
19. Nov. 04									
A1		X	X	X	X	X	X	X	
A2									
A3		X		X	X				
B1			X	X					
B2				X			X		X
B3				X					
C1				X			X	X	
C2				X	X			X	
C3				X	X		X	X	
C4		X							
17. Dec. 04									
A1				X		X	X	X	
A2		X		X					
A3	X	X		X	X		X	X	
B1			X	X					
B2	X		X	X		X		X	
B3			X	X					
C1		X	X	X	X		X	X	
C2		X		X	X		X	X	
C3				X	X				
C4				X			X	X	

The table shows the sources that were used by group members 'at the moment' according to the three process surveys and their perceived importance to the project (1 = low; 3 = high). Only x's with the values 2 and 3 are shown.

Table 6
Group members' affective experiences in association with 'information seeking'

Feelings	Difficult			Stress			Complex			Frustrating		
Time	Start	Midpoint	End	Start	Midpoint	End	Start	Midpoint	End	Start	Midpoint	End
A1	3	2	4	3	2	3	4	3	4	2	2	3
A2	2	4	3	3	4	2	4	2	3	3	2	3
A3	1	4	1	1	3	1	1	4	1	3	3	1
Average	2	3	3	2	3	2	3	3	3	3	2	2
B1	3	2	3	4	2	3	4	3	3	3	4	3
B2	4	3	2	3	4	2	4	3	2	4	3	2
B3	1	2	3	2	1	3	3	3	3	1	3	3
Average	3	2	3	3	2	3	4	3	3	3	3	3
C1	2	2	2	2	3	3	3	3	3	2	3	3
C2	2	0	4	1	0	3	2	0	4	1	0	3
C3	3	3	2	3	2	3	5	3	1	4	4	1
C4	3	3	3	3	3	3	4	3	3	3	3	2
Average	3	3	3	2	3	3	4	3	3	3	3	2

The table is based on group member values assigned to affective dichotomies on a scale from 1 (positive) to 5 (negative) in each of the three process surveys at start, midpoint and end. C2 was not seeking information at midpoint, hence the '0'-values.

As can be seen many of the group members perceived information searching as complex at the beginning. This was related to the pre-focus-stage when no focus had been found yet, hence difficult to perform a search and judge relevance. But also at midpoint and towards the end 'some' complexity was found in addition to 'some' difficulty, stress and frustration. This indicate, in turn, that information seeking only *rarely* was considered 'easy', 'relaxing', 'simple' and 'satisfying' by groups. The affective experiences associated with information seeking were also found to be associated with the *perceived* level of search task knowledge and skills. Further, it was found that group members' perception of own search task performance could change negatively (and positively) when compared to the performance of *other* group members (e.g. in association with group based problem solving).

5.3. Group work-dimension

This section presents result associated with the group work-dimension.

5.3.1. Activities

The first group activity was group formation. Besides the fact that group formation was welcomed as part of a pedagogical strategy at that term, familiarity with other group members was often mentioned in the interviews as an explanation for group formation. Hence, the subject of the project assignment or congruent interests seemed to play a minor role to the individual's choice of group and group members. Familiarity with other group members was often associated positively with various work task factors, e.g. that no time had to be spend on getting to know the other group members. You know already from the outset what role to take in the group. Further, you know that you share the same ambitions, working principles and working style.

Various *forms* of communication were employed during the assignment period which differed in frequence across time according to point in the process and goal of communication. Physical 'group meetings' were, however, preferred by all groups to all other forms of communication, independent of point in process. Meetings concentrated on the work task, but they also served a social purpose in 'gluing' group members together into a cognitive unit and in cultivating the 'group spirit'.

5.3.2. Cognitive experiences

Looking at the cognitive aspects of group work different strategies were used during group work to stimulate the cognitive processes at the group level as well as at the individual level.

In the initial process of obtaining a shared understanding of the focus (the problem) and goal of the assignment, 'mind-mapping' was used by all groups as a meta-cognitive strategy to plan and facilitate problem solving and to disseminate ideas, knowledge, etc. In addition to the social construction of knowledge information was communicated, discussed, exchanged and shared at group meetings from the beginning to the middle of the formal assignment period to help formulate a collective goal and obtain a shared understanding of the problem in focus. From midpoint to the end, information was primarily communicated and discussed in relation to specific elements of the assignment, e.g. during reading of other group members' writings. Group members were generally regarded as reliable information sources for problem solving, hence held a cognitive authority, which implied that suggestions and recommendations from other group members were trusted.

5.3.3. Affective experiences

Affective aspects associated with group work were also identified, which further demonstrated the *social* impact on group members' perceived emotional experiences.

Table 7
Group perception of 'confidence' during time

Group	1 (22 October)	2 (19 November)	3 (17 December)
A	4	4	4
B	3	4	4
C	4	4	3

Average values on a scale from 0 to 5 (max = 5) for each process survey (1–3) and for each group.

Table 8
Group perception of 'uncertainty' during time

Group	1 (22 October)	2 (19 November)	3 (17 December)
A	0	1	1
B	1	2	0
C	2	1	1

Average values on a scale from 0 to 5 (max = 5) for each process survey (1–3) and for each group.

As can be noticed in Table 7 a general 'high' perception of 'confidence' was experienced across group members during the process, if we add up the average group values on a scale from 0 to 5 for each period.

This should also be seen in connection with the general 'low' average group values of 'uncertainty' across time in Table 8.

One explanation for this may be the security derived from group member familiarity. Many of the participants mentioned in the interviews that it made them feel more safe, relaxed and confident. Feeling safe, respected and accepted in the group provides the basis for giving constructive feedback, asking 'silly' questions or come up with new ideas and suggestions. Furthermore, when you feel safe in a group, uncertainty and lack of confidence tend to decrease as some group members mentioned.

Being satisfied with the process and the product also seemed to affect the individual's perception of confidence and certainty. However, social factors may also affect negatively. This was, for example, seen in group C due to a personal conflict between group member C1 and C2. For these group members the conflict resulted in a slight decrease in motivation, interest and clarification during time.

In the next section, the results are discussed according to the four research questions of the case study.

6. Discussion

This section discusses the results in accordance with the four underlying research questions, that is, the similarity in behavior between group members and the ISP-model, the similarity between intra-group members' behavior during time as well as the influence from contextual and social factors.

The aim is to compare the results from this study with the ISP-model and to further validate the hypothesis that Kuhlthau's ISP-model does not represent a complete model of the information seeking process of group members.

6.1. Similarities between group member behavior and the ISP-model

When comparing group members' behavior with the individual in Kuhlthau's ISP-model similarities were primarily found in three areas. Group members followed the (1) general stages of information seeking behavior in the ISP-model. This means that they generally explored relevant information in the beginning, searched more pertinent information as focus increased and were checking information sources for documentation towards the end. In addition, group members followed the (2) cognitive pattern in the model by moving from vague thoughts at start to more focused thoughts towards the end of the process. However, participants' descriptions of focus over time (in the process survey and interviews) varied according to point in time. At start, for example, the group members' descriptions concerned their motivations for topic selection, at midpoint the structure of the assignment and at the end the specific problem in focus. Finally, (3) the group members' search activity was found to decrease towards midpoint of the process as writing activities started to increase – in line with the ISP-model.

The finding that no significant difference was seen between individuals' and group members' information search behavior at the *general* level while constructing knowledge has also been found in studies of the ISP-model, both in academic and in professional settings (e.g. Byron & Young, 2000; Kracker, 2002; Kracker & Wang, 2002; Limberg, 1998; Vakkari, 2001). This may indicate that the *general* goals of searching during time are *common* to knowledge construction in relation to complex work tasks independent of context (professional, private or academic), individual or group.

Many deviations from the ISP-model were, however, also identified – deviations that turned out to be associated with aspects of the work task and the group process. These are further discussed below.

6.2. Similarities between intra-group members

Looking for similarities in intra-group members' behavior across time it was found that all participants employed many cognitive as well as social strategies to produce a *professional* (task motivation) and *satisfying* collective product (social motivation). They applied mind-mapping-techniques at start to identify aspects of the topic as well as searched, exchanged, shared and distributed information and information seeking strategies. Towards the end, they generally searched in order to check specific references for the reference list of the assignment. However, group members' information behavior also *differed* according to the specific stage of the work task process (pre-focus, focus formulation and post-focus) and *between* intra-group members according to group member orientation (group/individual) and personal characteristics. Hence, group members did not assimilate during time demonstrating similar behavior. This further implies that groups cannot *a priori* be stated to constitute *one* cognitive unit; rather, groups consist of *different* cognitive units (members) that dynamically interact between an individual and a group level.

6.3. Influence on behavior from the work task dimension

With regard to the work task dimension the *work task process* turned out to alternate between a group perspective (we-mode) and an individual perspective (I-mode) depending on the specific point in the process. The 'we-modes' and 'I-modes' were both found in relation to focus formulation, information searching, relevance judgement as well as reading and writing. Hence, the work task process turned out to shift between collaborative and individual activities reflecting *different* intra-group subtasks and activities. In general, these shifts and differences in activities constrained the process of finding a shared focus and of producing a *collective* product.

These findings ties in with the findings by Bjørn and Hertzum (2006), who investigated the negotiation process of finding a shared focus within three virtual groups of students preparing a project report. Two risks were identified: (1) the risk of an individualistic proactive behavior constraining consensus building and preventing progress and (2) the risk of dominating students leaving the other students with subordinate roles that may affect the learning outcome as well. The shifts between individualistic and collaborative behavior may also be seen as an inherent characteristic of the work task context itself. Recently, Reddy and Jansen (2008) have explored the characteristics of CIB compared to individual information behavior. They found, for example, that the very complexity of information needs triggers a collaborative information behavior and the use of a variety of information sources. They present a model showing trigger occurrences on a continuum from individual information behavior (IIB) to collaborative information behavior (CIB) and how shifts in behavior may take place due to characteristics of the environment. Hence, we may not conceptualize information behavior as *either* performed individually *or* collaboratively but rather as integrated and dynamically interacting processes, which should be carefully addressed in information services and system development.

Another influence associated with the work task dimension was found in the environmental factor of *other* work tasks. Due to the other assignment in case study 2, among others, none of the groups had formulated a focus at midpoint though searching had started to decrease and writing started to increase, which generally implies a 'turning point'. This finding may therefore indicate that the group members entered Kuhlthau's 'presentation'-stage *without* a clear focus of the assignment. Another finding associated with the work task dimension was that search closure often was determined by work task factors such as time *rather* than cognitive factors such as clarity due to knowledge construction. Hence, search closure may not necessarily imply a 'turning point' due to focus formulation and result in positive feelings. Similar results were also found in Kuhlthau's studies, but they are not reflected in the ISP-model.

6.4. Influence on behavior from the group work-dimension

Addressing the influence from social factors on the group members' behavior all groups generally formulated a *shared* focus and experienced positive feelings such as confidence as well as low levels of uncertainty and frustration – even at start in contrast to the ISP-model. This may indicate that these groups passed through *all* the ISP-stages (as perceived by *them*). At the pre-focus-stage, in particular, they were actively engaged in generating a shared focus and understanding of the problem at hand, e.g. shown in various forms of collaborative information activities and strategies. Information was communicated, discussed, exchanged and shared, primarily to help formulate a collective goal and obtain a shared understanding of the problem in focus. At the focus and post-focus stage information was primarily communicated and discussed according to specific elements of the assignment, e.g. based on the reading of other group members' writings. This behavior has many elements in common with the collaborative information behavior identified in studies of *complex* problem solving in teams (e.g. Bruce et al., 2003; Hertzum, 2000, 2002; Talja, 2002). With reference to Limberg (1998) study the groups' behavior also correspond in many ways to the characteristics of the 'holistic' approach to group work. Group members acknowledged, for example, the value of group work and considered group work as a *collective* task towards a shared goal, implying various group activities to succeed ('we-mode'-orientation). In addition, they considered the establishment of a shared knowledge base as very important, though they did not succeed in developing shared relevance criteria. The difference in behavior between these groups and the ISP-model seemed to be related to whether the group members were familiar with each other, either from previous group work or from work in class. 'Familiarity' in this context was, for example, connected positively with ones knowledge of other group members' ambitions, working style, ethics and attitude, hence the cognitive and social

motivations influencing group based problem solving. With reference to the group development process (Tuckman, 1965) these groups almost 'jumped' into the norming stage from the right beginning. The same was seen in group B of case study 1, due to which group members also knew each other in advance. In turn, group A in case study 1 did not know each other very well from the outset. This group had difficulties in finding a shared focus and did not seem to reach the last and performing stage of the group process, hence entered the presentation-stage of the ISP-model without a clear focus. In addition, the group members often experienced negative feelings such as uncertainty, frustration, stress and disappointment – even at the end in contrast to Kuhlthau's ISP-model. Further, information was generally searched on an individual basis and without any negotiated information seeking strategy. Moreover, information was strategically exchanged and shared, primarily at the pre-focus-stage, and effective discussions and sharing of information were only limited, constraining the goal of finding a shared focus. This group had many elements in common with Limberg (1998) 'atomistic' approach to group work, e.g. demonstrated by a strong 'I-mode'-orientation among group members and a lack in perception of the 'whole'. With reference to the group development process it may be argued that though group A in the first case study started the group work process at the forming/storming stage, but the group did not at any point reach the performing stage, which would have implied a spirit of cooperation, coordination and commonly understood procedures and mores. Following from this, the idea of familiarity seems to play a role, hence should not be ignored in studies of collaborative information behavior in academic settings. The importance of familiarity in groups may, however, not only apply to an academic context, but may apply to teams in a professional context as well.

To follow up on the results from this study in combination with the results from case study 1 the information search process has been found to be *sensitive* to the work task process as well as to the group work process and group characteristics. The affective experiences identified in both case studies were, for example, not solely related to various information seeking activities across time, but were associated with factors deriving from the work task process and the group development process as well. The complexity and importance of the affective dimension of information behavior is further supported by the growing research interest and work within this area in order to understand information behavior from a more holistic point of view (Nahl & Bilal, 2007).

To sum up, the results from case study 2 (and case study 1) have indicated that some similarities in behavior exist between the individual in Kuhlthau's ISP-model and group members, but also differences which seemed to relate to contextual (work task) and social (group work) factors *beyond* the mere search process.

6.5. Limitations

Due to the case study approach based on 10 subjects and within only one discipline (library and information science) in an academic context one cannot generalize from this study to other forms of group work or teamwork. One may, in turn, find patterns of behavior that correspond to or differ from previous findings. The fact that participants came from the LIS field may have influenced their information seeking behavior as LIS students generally will be more acquainted with the information seeking process, thus more information literate, than students from other disciplines. Moreover, as participants voluntarily chose to participate in the study they might have been more motivated from the outset. Besides the many positive elements regarding motivated participants, e.g. in relation to diary keeping, it may further have affected the representativity of the groups.

As another effect of the small sample with only 1 male represented among group members no influence on behavior was identified that could be associated with differences in sex.

We may say then that the findings presented here demonstrate *indications* of group based information behavior in an academic setting or context.

As a result of the research design, no direct observations of subjects were made. Hence, results and findings have been based on *indirect* observations, that is, each group member's perceptions and experiences in either written or oral form. Some researchers may argue that this study rely too much on subjective data, that makes it difficult to state anything in general. However, from a phenomenological point of view (Zahavi, 2005), these personal perceptions and experiences have served to gain insight into human thoughts and behavior during personal, social and contextual interaction. Finally, the holistic approach to explore information (seeking) behavior implying a number of factors and dimensions to be taken into account has increased the complexity of the research design. In addition, the separation and distinction between, for example, feelings associated with group work process, the work task process and the information seeking process may be difficult to make as these feelings intermingle in natural settings.

7. Conclusion

This paper has addressed group members' behavior in relation to the process of writing an assignment. The focus has been on group members' activities as well as cognitive and affective experiences in comparison with Kuhlthau's ISP-model. Besides the information seeking process the work task process and group process have been taken into account. Hence, the information seeking process has not been studied in isolation, but as an integrated part of its context. The exploration of group members' information behavior during a case study of three groups of LIS students in addition to the two groups of LIS students in case study 1 (Hyldegård, 2006a, 2006b, 2006c) has contributed with a new conceptual understanding of

students' behavior in small groups. In addition, the study has led to some conclusions concerning the four underlying research questions, which can be summarized in this way:

- Similarities between group members and the individual in Kuhlthau's ISP-model were found with regard to the *general* stages of information seeking, the cognitive pattern associated with focus formulation and the tendency towards an increase in writing activities while searching activities decreased.
- Group based problem solving seems to be a dynamic process that shifts between a group perspective and an individual perspective.
- This activity is further influenced by contextual (the work task and other work tasks) and social (group work) factors *beyond* the mere search process.

Based on these statements and with reference to the hypothesis derived from case study 1 it is concluded that the ISP-model does not fully comply with group members' problem solving process and the involved information (seeking) behavior. Further, complex academic problem solving seems to be *even* more complex when it is performed in a group based setting.

In future it should be further explored to what extent and how perceived work task complexity is associated with the group work process, the underlying cognitive and social motivations present in the group and the group members' approach to group work (individual/group). Further, it would be relevant to investigate if and how shifts between we-modes and I-modes in task performance are present within other academic disciplines or within professional teams in the public or private sector. Finally, it would be relevant to explore whether or to what extent the behavior of academic group members identified in the two case studies comply with the behavior of professional team members in the private and public sector.

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