Informing Science:
the International Journal of
an Emerging Transdiscipline

An Official Publication
of the Informing Science Institute
InformingScience.org

Inform.nu

Volume 20, 2017

COGNITION TO COLLABORATION: USER-CENTRIC APPROACH AND INFORMATION BEHAVIOUR THEORIES/MODELS*

***this paper was partially presented as a PHD thesis (Aydin, 2015)**

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ABSTRACT

Aim/Purpose	The objective of this paper is to review the vast literature of user-centric information science and inform about the emerging themes in information behaviour science.
Background	The paradigmatic shift from system-centric to user-centric approach facilitates research on the cognitive and individual information processing. Various information behaviour theories/models emerged.
Methodology	Recent information behaviour theories and models are presented. Features, strengths and weaknesses of the models are discussed through the analysis of the information behaviour literature.
Contribution	This paper sheds light onto the weaknesses in earlier information behaviour models and stresses (and advocates) the need for research on social information behaviour.
Findings	Prominent information behaviour models deal with individual information behaviour. People live in a social world and sort out most of their daily or work problems in groups. However, only seven papers discuss social information behaviour (Scopus search).
Recommendations for Practitioners	ICT tools used for inter-organisational sharing should be redesigned for effective information-sharing during disaster/emergency times.
Recommendation for Researchers	There are scarce sources on social side of the information behaviour, however, most of the work tasks are carried out in groups/teams.
Impact on Society	In dynamic work contexts like disaster management and health care settings, collaborative information-sharing may result in decreasing the losses.
Future Research	A fieldwork will be conducted in disaster management context investigating the inter-organisational information-sharing.
Keywords	user-centric information processing, information behaviour, collaborative information behaviour

Accepting Editor: Raafat Saadé. | Received: February 4, 2016 | Revised: June 7, 2016; November 27, 2016 | Accepted: November 28, 2016.
Cite as: Aydin, A. M. (2017). Cognition to collaboration: User-centric approach and information behaviour theories/models. *Informing Science: the International Journal of an Emerging Transdiscipline, 20,* 1-17. Retrieved from http://www.informingscience.org/Publications/3615

INTRODUCTION

User-centric studies focus on the behaviour of the information users. This research became popular by the second half of the 70's and the beginning of the 80's. The seminal paper of the Dervin and Nilan (1986) discussed the paradigmatic change in information science. They elaborated on three innovations in the field, those are based on the User-Value Approach of Taylor (1968), Sense-Making Approach of Dervin (1983), and Anomalous-State of Knowledge (ASK) Approach of Belkin, Oddy, and Brooks (1982) (see Appendix A and B). These three models focus on the cognitive side of the information needs and uses. Each of the models conceives that the human beings are the actors while processing information.

The User-Value Approach of Taylor articulates that information systems are constructed to satisfy the users' needs. Whole algorithms, systems and processes are designed to fulfil the information needs of the users. Therefore, this approach activated the user friendly design of information products and services. The Sense-Making Approach of Dervin articulates that people seek information to construct a meaning between a context and a desired situation. The bridge is constructed via using the information sought. In the Anomalous-State of Knowledge (ASK) situation, the user seeks and retrieves information to realise his/her needs. During this period texts or any other information sources are cognitively transformed according to the user's belief, intent, and knowledge. By doing so, information is restructured regarding the user's needs.

To make the case clear for user-centric studies, we elaborate information behaviour, information-seeking behaviour models, information-sharing behaviour, and collaborative information behaviour in the following sections.

INFORMATION BEHAVIOUR

In the literature of information behaviour field, there is large number of papers on information seeking behaviour. Wilson (2000, p. 49) defines information behaviour as "the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use. Thus, it includes face-to-face communication with others, as well as the passive reception of information as in, for example, watching TV advertisements, without any intention to act on the information given." Similar to this definition, Savolainen (2007) states that information behaviour is not a solely passive phenomena, it consists of face-to-face contact and interaction among people to act on information received or given. And Wilson (2000, p. 49) defines information-seeking behaviour as "the purposive seeking for information as a consequence of the needs to satisfy some goal. In the course of seeking, the individual may interact with manual information systems (such as a newspaper or a library), or with computer-based systems (such as the World Wide Web)."

Kulthau (1991, 2004, 2006) explains that information-seeking is the process of searching for information to use and construct a meaning for solution of a particular problem. Basically, information behaviour contains all aspects of information searching, seeking, sharing, and usage (Case, 2012; Wilson, 2000). A key point for the user behaviour is the *information need* that is the gap between the ideal state of knowledge and the actual state of knowledge. Belkin and colleagues (Belkin, 1978, 1984; Belkin et al., 1982) called this situation as the Anomalous-State of Knowledge (ASK). Basically, ASK is the basic motivator of the information-seeking behaviour.

INFORMATION-SEEKING BEHAVIOUR MODELS

The paradigmatic change in the field from system-centric to user-centric led a change in the research methods from quantitative to qualitative. The researchers focused on the behaviour of information users (humans). Wilson (1981, 1997, 1999b) introduced several information-seeking behaviour models. The mostly cited models with Wilson's models are Dervin's (1983) *Sense-Making* theory; Krikelas

(1983) *information-seeking behaviour* model; Kulthau's (1991) *information-search process (ISP)* model; Ellis, Cox, and Hall's (1993) *information-seeking strategies of the scientists model*; and Leckie, Pettigrew, and Sylvain's (1996) *information-seeking behaviour of the professionals* model. Table 1 summarises the features of the aforementioned models and the figures of the models can be found in the Appendices part.

Table 1. Prominent information behaviour models

Model	Features
Wilson's Models **(Wilson, 1981, 1999b)** (see Appendix C, D, and G)	Information need as a trigger for the overall information seeking behaviour Information need is not a basic need, but part of process to satisfy three basic needs, namely physiological, cognitive, and affective
Sense-making model **(Dervin, 1999)**	Information seeking is a sense-making process used by an individual actor to construct a bridge between a context and a desired situation
Information-seeking behaviour of professionals **(Leckie et al., 1996)** (see Appendix I)	Specific to a particular professional practice Roles and related tasks carried out by professionals lead to information needs, leading to information seeking Importance given to intervening factors
Process-oriented information process model **(Ellis, 1989)**	Multistage model Starting, differentiating, monitoring, extracting, verifying, and ending
Information search process **(Kulthau, 1991)** (see Appendix F)	Process of construction that involves the experience of the person, feelings as well as thoughts and actions Activities include: initiation, selection, exploration, formulation, collection, and presentation
Information gathering habits **(Krikelas, 1983)** (see Appendix H)	Information gathering and giving habits of the scientists. One-way arrow flow information behaviour activity Immediate and deferred information needs exist and to reduce the uncertainty information needs are satisfied
Task oriented information seeking **(Bystrom & Jarvelin, 1995)** (see Appendix E) **(Hansen & Jarvelin, 2005)**	Work tasks are the triggers for the information seeking Information seeking tasks are embedded in the work tasks Uncertainty and other situational factors has influence on the information seeking and search

(adapted from Aydin, 2015; Karanukaran, Reddy, & Spence, 2013; Wilson, 1999a)

Wilson discusses two main propositions in his 1981 model. In his first proposition, he distinguishes the information need of the users from the primary needs. He deduces that it is a second order need unlike the first order needs such as shelter, or the other human needs necessary for their survival.

Information needs are cognitive and affective needs of the people. The second proposition entails the barriers that the seeker encounters in the search process. These barriers are the personal, interpersonal, and environmental barriers. In the model, the information exchange or transfer occurs between people. In the failure situation (when the relevant information is not found), the feedback mechanism enables one to restart new search.

Wilson (1981, p. 5) points out the weaknesses of his early model in that "... the model is that all of the hypotheses are only implicit and are not made explicit. Nor is there any indication of the processes whereby context has its effect upon the person, nor of the factors that result in the perception of barriers, nor of whether the various assumed barriers have similar or different affects upon the motivation of individuals to seek information."

Wilson's (1997) model is more comprehensive than his earlier model (Wilson 1981) (see Figure 1). The aim of the model is to expose a more effective framework of the information behaviour in general. He identifies the factors in his new model by searching the other fields such as *psychology, decision making, health communication and consumer research* (Wilson, 1999b). The model has two constructs: *information-seeking,* and *information processing* (as feedback loop). The model is in an iterative system. The model emerges from recognising the need to involve a stage (activating mechanism) between the *person in context* and *information-seeking action*. He proposed the model by filling the gap via *activating mechanism* using *stress/coping* theory and *risk/reward theory*. These *activating mechanisms* can be considered as the motivators for the information-seekers to keep them from exiting the system when they encounter a stress in the search process (Wilson, 1997).

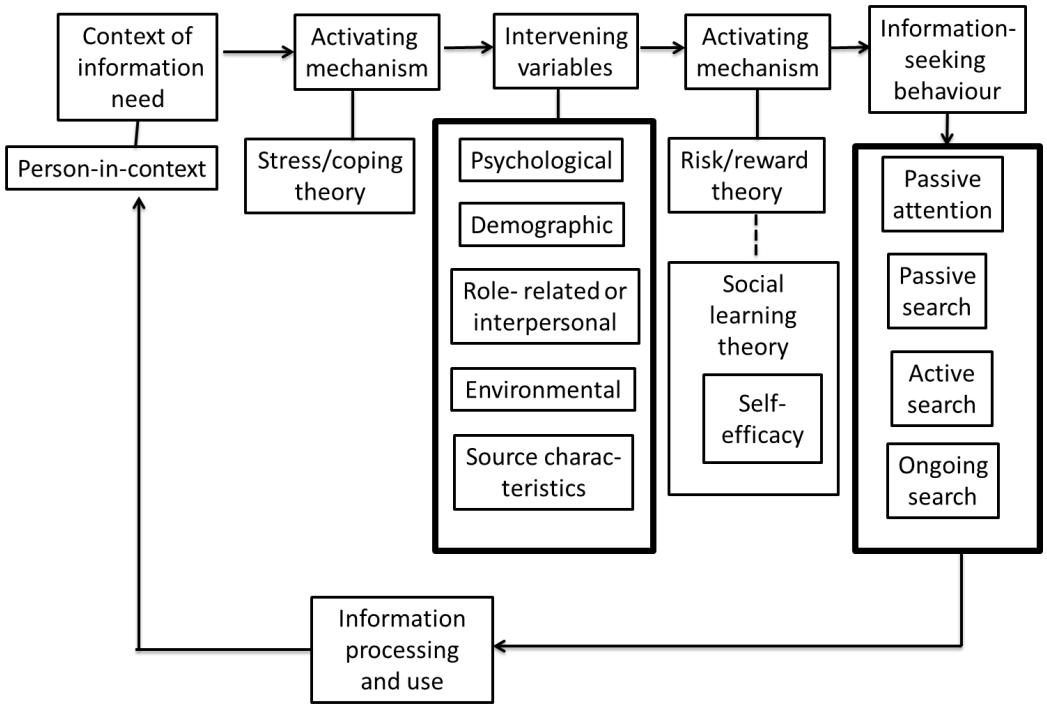

Figure 1. Wilson's model of 1997

In the model shown in Figure 1, an important factor, *intervening variables,* has an impact on the motivators (activating mechanism). These can be barriers either for information-seeking or for information processing. The barriers are the psychological, demographic, role-related or interpersonal, environmental properties, and they influence the process of seeking. The key results for his revised model are the new types of search behaviours: *passive attention, passive search, active search, on-going search*. Contrary to this situation, the attention is on the active seeking in the former model. Moreover, in the

former model, intervening variables have a preventive role rather than supportive. One key point worth noting is that information processing and use is a necessary component for the feedback loop.

Dervin's (1983) *Sense-Making* theory was developed as an approach to study information-seeking, needs, and use. *Sense-Making* theory relies on four basic constituent elements: *situation, gap, outcome,* and *bridge* (Dervin, 1983). In the model, *situation* engaged with the time and space that reveals the context in which the problem occurs; *gap* reveals the variance between expected and contextual situation; *outcome* is the results of the sense-making process; *bridge* is the tool for closing the gap between situation and outcome.

In the *Sense-Making* theory, one of the main assumptions is the construction of the information. The other information behaviour models or theories treat information as an external entity; however, Dervin (1992) regards information as constructed internally by the human mind through cognitive functioning. Dervin's (1992) model was applied in the work of Savolainen (1995) that encompasses the *everyday life information seeking (ELIS)*. As a summary, sense-making serves detailed knowledge and research methods about the gap-defining and gap-bridging in the problem faced situations. Sense-making approach builds some conceptual and meta-theoretical approaches to comprehend how people make sense of their surroundings to utilise required information.

Another information behaviour model is that of Krikelas (1983). The emerging point of his model is the information gathering habits of scientists and others. In the model, information-seeking behaviour is defined as activity of the individuals to satisfy a need. Also, information is perceived as the stimulus that reduces the uncertainty. Accordingly, need is defined as the recognition of uncertainty in the personal, work related settings. This uncertainty is produced by the discrepancy between the individuals' current certainty level and the expected level to achieve the goal (Krikelas, 1983). Krikelas (1983) points out that information-seeking starts with the recognition of the knowledge gap. The initial behaviour is information giving and information gathering activities. Information giving in the model seems like a communication activity that enables a person to disseminate the information. Information gathering is the acceptance of the stimuli to keep information in records to recall them for further needs. Information gathering that proposes the recall model is not only related to remembering, it is also associated with the personal recorded files and deferred needs.

Apart from most of the information-seeking models, needs are categorised into two types: deferred and immediate. However, most of information-seeking models deal with immediate needs. In the model there are two kinds of source preferences: internal and external. The internal sources involve memory or personal files or structural observations. External sources involve interpersonal contact or recorded materials. People select these sources if they are pertinent to their problem or if they are easy to access.

Ellis's (1989) *information-seeking strategies* model is based on the different types of information-seeking activities. The model represents the relation between these components. These activities are *starting, chaining, browsing, differentiating, monitoring, extracting.* All these six activities have interaction among one another during the process. Ellis (2004) asserts that his model does not indicate the set of stages or phases. The model represents the strategies that can be applied during information-seeking period.

His model was applied to different work groups to investigate their seeking behaviour (Ellis et al., 1993). This point is the strength of the model. He pointed out that there were common similarities between the behaviour of the researchers, though they were coming from different backgrounds and different disciplines. With its stages, the model shows resemblance to Kulthau's (1991) *information-search process (ISP)* model.

Kulthau's (1991) *information-search process* model is based on the gap between the users' *natural process of information use* and the *information system and intermediaries' traditional patterns* of information provision. Kulthau's (1991) model investigates the feelings of the researcher in each stage of the information

search. *ISP* comprises construction of the meaning referring to the experience, feelings, thoughts, and actions of the person (Kulthau, 1991). The process is initiated via the perception of uncertainty.

Kulthau's (2004) *ISP* model involves three realms common to each stage: the affective (feelings), the cognitive (thoughts), and the physical (actions). These realms are presented in six stages: *initiation, selection, exploration, formulation, collection,* and *presentation*. These stages resemble Ellis' (1989) phases. She states that individuals experience the information-search process with an interplay of thoughts, feelings, and actions (Kulthau, 2006). Her work is based on the Kelly's Personal Construct Theory (cf. Kulthau, 2004), which discusses the influence of feelings on information-seeking and the process of meaning construction. When individuals encounter with new information or ideas, their feeling of confusion increases; however, in the following period they accept or refuse the new information or idea (Kulthau, 2004).

In Kulthau's model, the information-seekers are constrained by the task, time, interest, and availability. During the search process, individuals encounter uncertainty depending on the characteristics of the task. Hence, this uncertainty stimulates the affective symptoms of confusion, frustration, anxiety (Kulthau, 2006). Subsequently, Kulthau's *ISP* model is the pioneer scrutinizing the cognitive, affective and action aspects of information-seeking behaviour of the user's (Kulthau, 1991).

Wilson's (1999b) nested model emerged from the combination of the Ellis's (1989) and Kulthau's (1991) model. Wilson (1999b) deduced that all information behaviour models attempt to describe the same set of phenomena or activities. Thus, Ellis' (1989) model is involved with the behavioural patterns in search activity, while Kulthau's (1991) model is involved with the stages of the process. Wilson (1999b) compared the stages and the components of these two most cited models in the literature and constructed a nested model by incorporating these two models. Consequently, he pointed out that information-search behaviour is subset of information-seeking behaviour. Both of information-seeking behaviour and information-search behaviour are the subsets of information behaviour.

In the model of Leckie et al. (1996), the information-seeking behaviour of the professionals is investigated. They separate the professionals' information habits from the scientists and library users. They point out that the scientists seek for information to produce new information while professionals seek for information to produce physical entities or services. Basically, professional information-seeking is task oriented and this orientation requires a distinguishing information-seeking model apart from the scholar's information-seeking model.

Leckie et al. (1996) points out that the main discourse of the model is that it serves information needs of the professionals related to work roles and tasks in the course of daily life. Like most of the other aforementioned information-seeking models, stimuli are sent to initiate the action one more time to the feedback mechanism when the task relevant information is not found or the information does not satisfy the information needs.

The model emphasises that professionals' information-seeking habit cannot be elicited only by the analysis of the sources alone. It can be recognized by the roles and the tasks that the professionals employ. Thus, these variables can be mentioned referring to the context in which the professionals operate. This model can be generalisable to different kinds of professions, since it was developed after the comprehensive review of the earlier models and it was applied to various kinds of professions via conducting case studies (such as engineers, health care professionals, and lawyers).

As a summary for the information behaviour models, the models represent the stages of the information-seeking and -search behaviour of the users. The models are shaped by the affects, cognitions, and attitudes of the users. One aspect and aim of the information behaviour models is to reduce the uncertainty for problem solving (Wilson, 1999a). The criticism of us for recent information-behaviour models is the models are not linked to context; most of them are isolated; they discuss the individual activities (cognitive, affective or individual behaviour) instead of group activities. The

models mostly investigate the information behaviour via cognitive base; however, societal information behaviour exists in organisations during carrying out the work tasks.

INFORMATION-SHARING BEHAVIOUR

Human activities are social and they are initiated by the interactions between people in the community (Talja, Tuominen, & Savolainen, 2005). As all human activities are social, human information behaviour (sharing, seeking and using of the information) is a social phenomenon (Wilson, 1981) too. People mostly do not think about any information behaviour they employ while they are performing it in different contexts such as in their daily lives or in the work place. People use different information strategies in work, however, they do not differentiate any of the information behaviours (seeking, search, using, sharing). During the recent years, researchers' interest has shifted into communicative actions in information science. This situation is a key challenge for the field (Widén-Wulff, 2007; Widén & Hansen, 2012).

Information-sharing behaviour originates from information behaviour and a bridge between individual and social information behaviour. There are various academic studies focusing on information-sharing in different contexts. In a consensus, it is a component of information behaviour and it is a communicative action. Davenport and Hall (2002) approach information-sharing activity as a type of information behaviour, and it is essential in all collaborative activities to tie the group members and communities together. Information providers and information-seekers are the actors of the information-sharing behaviour. These two actors collaborate with each other to transfer the information from one party to the other. It is hard to distinguish seeker and provider from each other in collaborative work settings. In a similar vein, "information-sharing behaviour can be defined as collaboration between two groups of actors in order to exchange information with the purpose to achieve their individual or common interests." (Bao & Bouthillier, 2007, p. 4). In this regard, both of them may be in an interaction with each other, the activity may be two-way-process as Talja (2002) conceptualized. She suggested that social aspects of information behaviour couldn't be considered in an independent context. These social aspects are tied to social and cultural norms. Hence, in the social networks information is not only sought, it also is interpreted, used, and created (Talja, 2002).

One other experimental study about information-sharing – based on the Social Exchange Theory – was conducted by Constant, Kiesler, and Sproull (1994). They concentrated on understanding the attitudes and norms that facilitate or constrain the information-sharing in the technology based organizations. They used the Social Exchange Theory of Kelly and Thibaut as a research framework to investigate the organisational members' attitudes from the view of cost-benefit analysis in the information-sharing process. They attested that individuals mostly tend to share their knowledge (including expertise) when they expect good outcomes for their interests and the whole organization (Constant et al., 1994). This study is one of the pioneer studies that addressed the organisational members' attitudes and norms role on the information-sharing behaviour.

Hall & Widén-Wulff (2008) proposed three main types of exchange structure while they were discussing the information-sharing context. First is the *direct or restricted* that enables two agents to share reciprocally; second is the *generalized* that the reciprocation is less easily defined since the agents share in the group; third is the *productive* that the agents employ to achieve for a joint output.

COLLABORATIVE INFORMATION BEHAVIOUR

Most of the information behaviour studies have investigated information behaviour as an individual set of activities. In real life settings, most of the tasks are carried out via collaborative actions. However, there is a limited number of studies that investigate collaborative information behaviour. We found only 7 articles that mention collaborative information behaviour in different contexts (in Scopus database, between 2005-2016). These articles discuss information processing in group-based activities.

Talja and Hansen (2006, p. 114) perceive that collaborative information behaviour is "an activity two or more actors communicate to identify information for accomplishing a task or solving a problem." Another more detailed definition of collaborative information behaviour is "the totality of behaviour exhibited when people work together to understand and formulate an information need through the help of shared representations; seek the needed information through a cyclical process of searching, retrieving, and sharing; and put the found information to use." (Karunakaran et al., 2013, p. 2438).

Collaborative information-sharing is one mode of systematic information processing in the group or team based settings. It is not a serendipitous activity. It involves collaborative query formulation, database searching, information filtering, interpretation, and synthesis (Talja & Hansen, 2006)). Therefore, it enables the group or the team to work on a specific task with a planned division of labour.

Sonnenwald (2006) investigated the dynamic group information behaviour and the effective information sharing in the group that is influenced by the organisational, inter-cultural, and interdisciplinary differences. In this study face-to-face and remote communication of the organisational members in command and control were investigated in battle simulation context.

Other collaborative information behaviour studies were conducted by Hyldegård (2006, 2009) and Hyldegård and Ingwersen (2007), who investigated the collaborative information (seeking) behaviour of the students in educational settings. These studies applied Kulthau's (1991, 2004) *ISP* model in the group settings. They scrutinised how the attitudes of the individuals alter in group-based works. In contrast to this situation, previous researchers were investigating cognitive functions and individual behaviour. So, they were isolated from social factors. In the light of this critique, Hyldegård (2006, 2009) found out that every group member had different emotions in the search process; also intra-group divergence had impact on the motivation and feelings (uncertainty, frustration, disappointment). In addition, group members influenced each other during the group work. According to the results of the case studies, Hyldegård and Ingwersen (2007) pointed out that so many differences occur according to contextual and social factors while working in the groups. They asserted that group based work was dynamic process, and Kulthaus' *ISP* model did not fully indicate the group members' information behaviour while they were working collaboratively. Therefore, there is still need to mine the collaborative side of the information behaviour.

Table 2. Differences between individual information behaviour (IIB) and collaborative information behaviour (CIB)

	IIB	CIB
Motives	Lack of relevant information to complete a task Gap between the current situation and the expected outcome	Complex information needs Fragmented information resources Lack of domain expertise or distributed domain expertise Lack of immediately accessible information
Mediators	Querying, seeking, searching	Interaction between information users Communicative action among the information users
Objective	To fulfil the affective, physiological, cognitive information needs To carry out the individual work tasks	Ensuring collaboration between information users. To accomplish the shared objective

(adapted from Aydin, 2015; Karunakaran et al., 2013; Reddy & Jansen, 2008)

Collaborative information behaviour can be differentiated from individual information behaviour by three points as summarised in Table 2. Interaction between individuals, integration of the fragmented information sources, and communication differentiate collaborative information behaviour from individual information behaviour (Aydin, 2015; Hertzum, 2008; Karunakaran et al., 2013; Reddy & Jansen, 2008; Veinot, 2009).

Triggers for the collaborative information behaviour can be categorised under three main domains: (1) fragmented information needs require the team members to communicate to each other to be aware of the situation, (2) lack of domain expertise, and (3) immediate accessible information (Reddy & Jansen, 2008).

First trigger: Fragmented information needs require the team members to communicate to each other to be aware of the situation

Team members seek information from each other and a *seeking-sharing-seeking* circle in the teamwork occurs. In this case team members collect information from different agents and combine the different information to solve the problem. Information-sharing (communication) is *sine qua non* for collaborative group actions, otherwise the group work will fail (Sonnenwald, 2006)

Second trigger: Lack of domain expertise

The complexity of the task constrains individuals to reach a decision individually. In this regard, each individual focuses on different parts of the problem according to their expertise (Aydin, 2015).

Third trigger: Immediate accessible information

This trigger represents the information retrieval technologies. Individuals are in interaction with the technological tools to seek or share information. In the collaborative settings information technologies have substantial role in supporting the collaborative information work (Aydin, 2015; Reddy & Jansen, 2008).

SYNTHESIS OF ANALYSIS

A paradigmatic shift in information science led the studies from system-centric to user-centric basis. System-centric studies were approaching the information users as passive processors; however, users seek, share, and use information consciously in work settings and daily life. People need information to solve problems, carry out work tasks, etc. People's information needs vary according to the context in which they engage. Initially, a user makes sense of the information needed consciously and then seeks relevant information from various sources. The user interacts with the information systems, database, etc. When the user is satisfied with the information found, he/she ends the seeking process and uses the information.

One other point is the social information behaviour. Recent models and theories (aforementioned in this paper) deal with the individual information behaviour. However, people live in a social world and carry out work tasks mostly in groups/teams. People, departments, project groups, and institutions establish common ground to accomplish common goals. By doing so, coordination of these groups/teams is established by seeking and sharing information among themselves. For example, health care staff share expertise to respond to emergent situations and save lives in a timely manner. By doing so, fragmented information and distributed expertise are integrated to solve the patients' problems. One another example is disaster management context. Various governmental and non-governmental bodies come together for response. The ICT systems of the disaster response organisations should be in compatible mode and the staff should be willing to share relevant information among each other to decrease the potential losses, and the organisational staff should use common vocational language.

Subsequently, information science research focused on the qualitative side within the shift to user-centric research. Cognitive/individual based researches facilitated the generation of information-

seeking and information-search behaviour theories/models. These studies were represented in many researches up to date, however, these theories/models have weaknesses in describing information behaviour during carrying out common tasks of groups/teams. By doing so, taking the information behaviour research one step further, the emerging theme is the investigation of the social side which is collaborative information behaviour in organisations/groups/teams. This review contributes with its vast literature; indication of the recent cognitive/individual theories/models; and shed lights onto the way how the social side of the information behaviour can be analysed through the findings of seminal papers discussing collaborative information behaviour.

CONCLUSION

There is still gap in the understanding of the CIB comprehensively. Most of the work investigates information-seeking behaviour and information retrieval (Hansen & Järvelin, 2005; Karunakaran et al., 2013; Reddy & Jansen, 2008). There is a scarce number of papers investigating the collaborative information actions dynamic contexts. The societal part of information behaviour is still an underdeveloped area in information behaviour research.

Recent collaborative information behaviour research was conducted in the health care context (Hertzum, 2010; Reddy & Jansen, 2008; Reddy & Spence, 2008) and in school settings (Hyldegård, 2006, 2009). However, in most of the work settings organisational members collaborate with each other while sorting out problems and carrying out work tasks, and time-critical work exists in the stock exchange and finance sector, breaking news contexts, fire brigade, first aid and rescue teams' settings, etc. In these contexts, there is a need to investigate collaborative information behaviour.

In the aforementioned contexts, people come together to carry out work tasks. They establish teams and, moreover, different teams come together. The coordination of these people/teams is enabled through information sharing. Teams/people collaborate to carry out work tasks in a timely manner, for instance, timely response to the disasters to decrease the losses.

As practical implications, in the time critical settings, like fire departments, ambulance services, police departments, and disaster response centres, collaborative work is facilitated by collaborative information sharing. Investigating collaborative information behaviour leads to redesign of information and communication tools. By doing so, the response pace and quality of information increase to find solutions for the complex work/task issues in time critical contexts.

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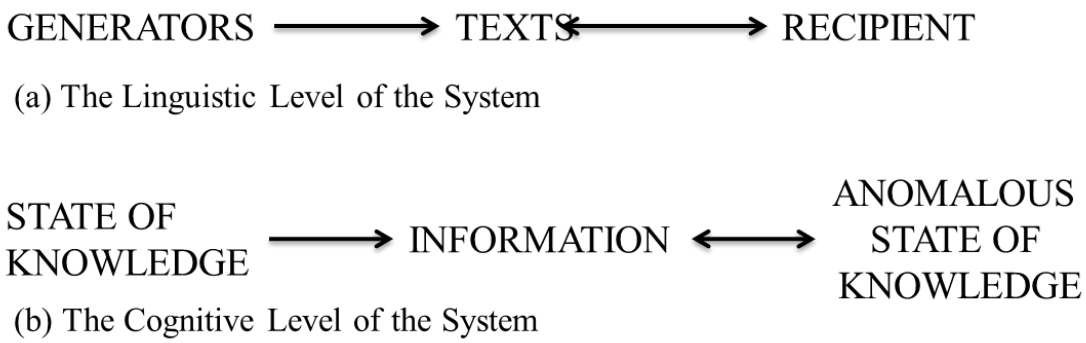
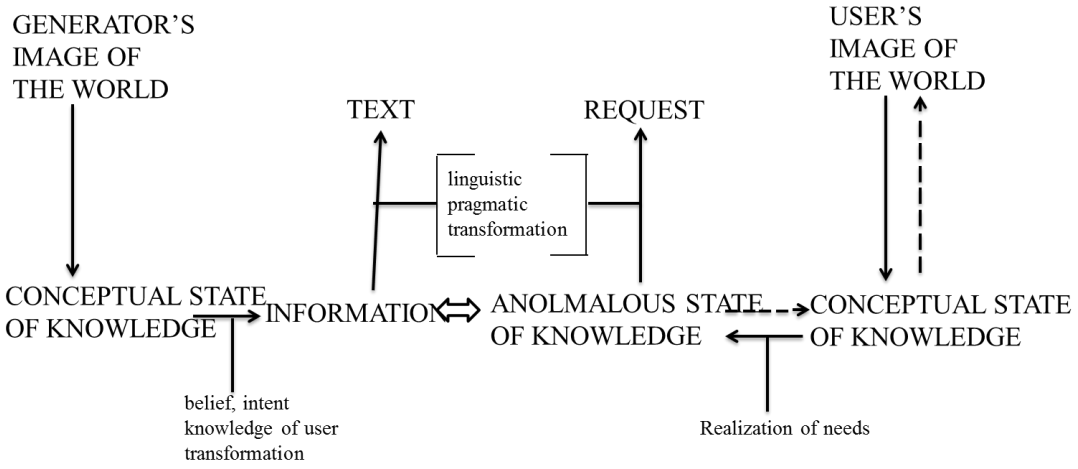
APPENDICES

APPENDIX A: THE COMMUNICATION SYSTEM OF INFORMATION SCIENCE



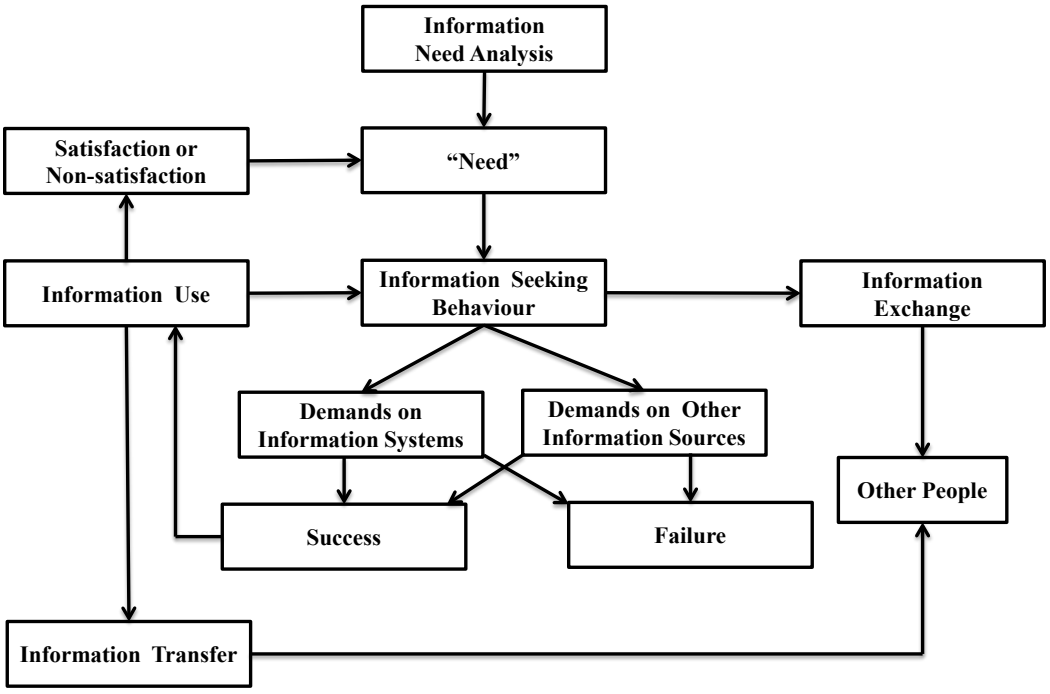
(Belkin, 1978)

APPENDIX B: THE COGNITIVE COMMUNICATION SYSTEM FOR INFORMATION RETRIEVAL



(Belkin et al., 1982)

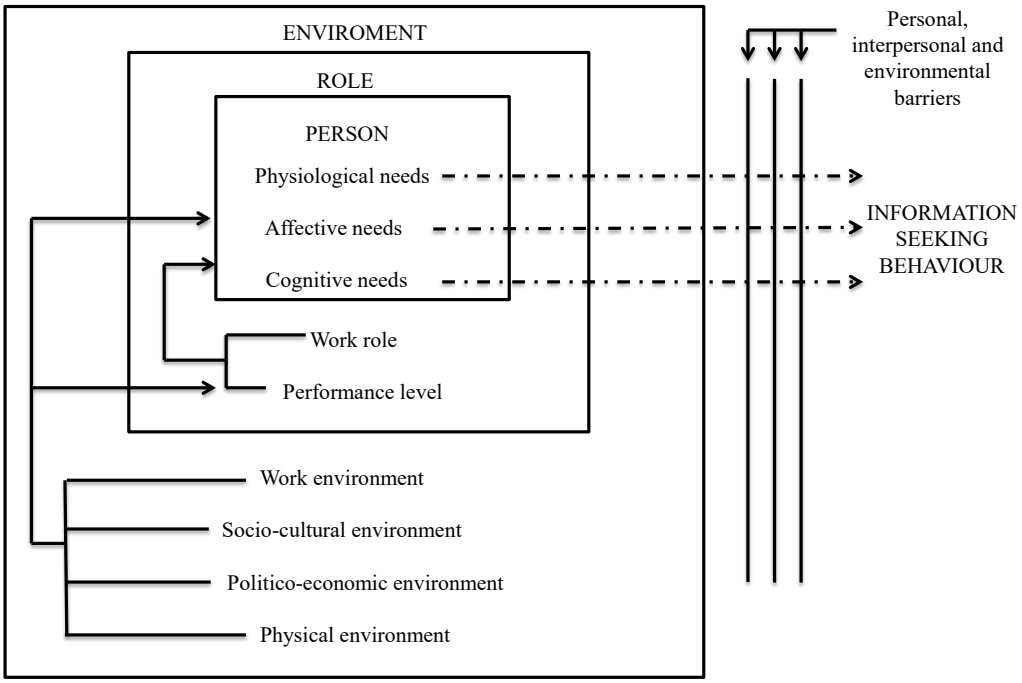
Appendix C: A Model of Information Behaviour



A Model of Information Behaviour

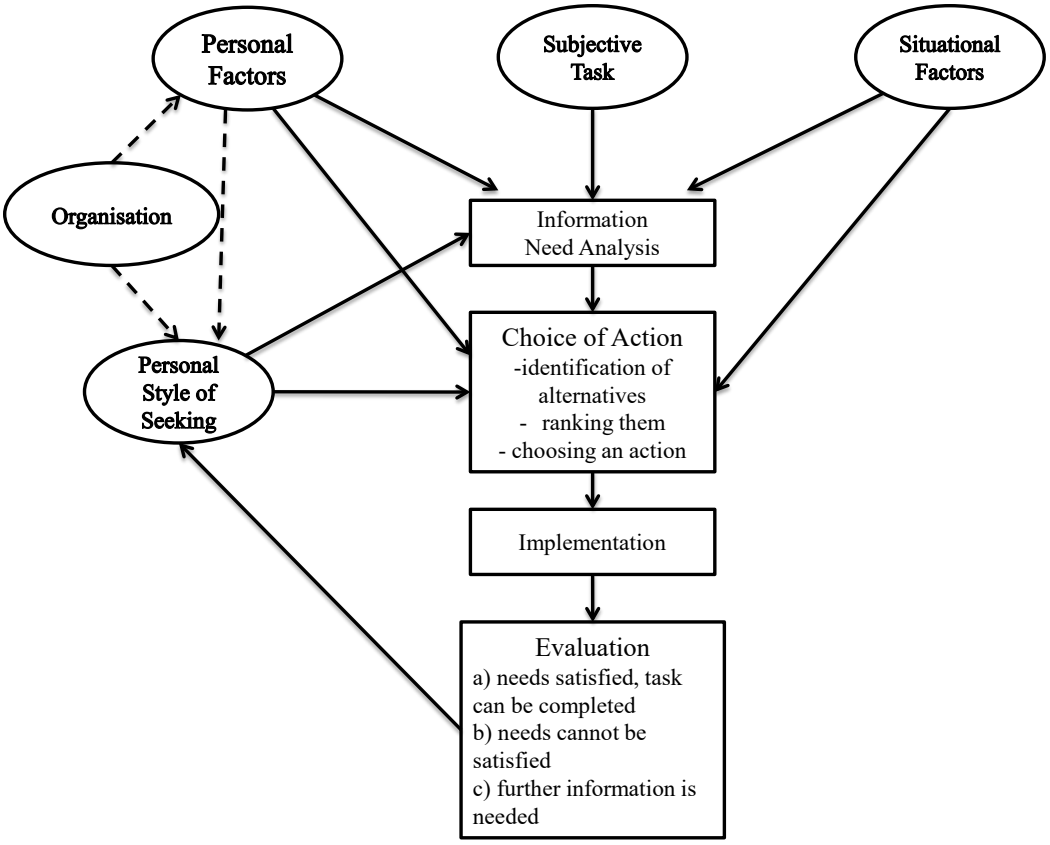
(Wilson, 1981)

Appendix D: Information Needs and Seeking



(Wilson, 1981)

APPENDIX E: THE INFORMATION SEEKING MODEL



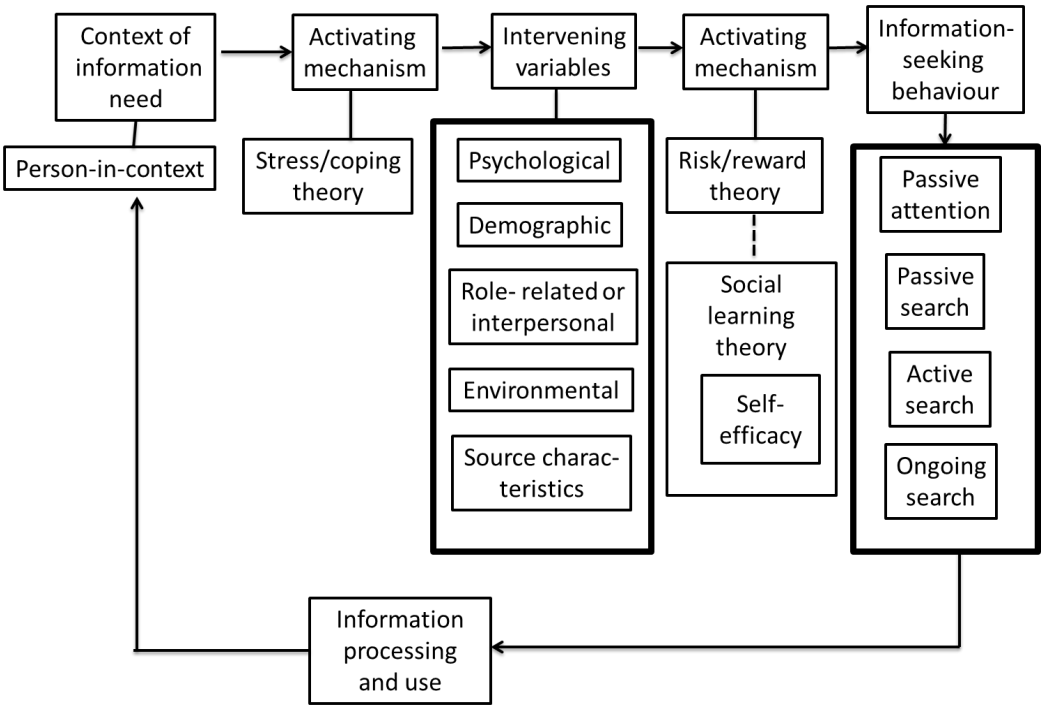
(Byström & Jarvelin, 1995)

APPENDIX F: KULTHAU'S MODEL OF INFORMATION SEARCH PROCESS

Stages	**Initiation**	**Selection**	**Exploration**	**Formulation**	**Collection**	**Presentation**
Feelings (Affective)	Uncertainty	Optimism	Confusion/ frustration/ doubt	Clarity	Sense of direction/ confidence	Relief/ satisfaction or disappointment
Thoughts (Cognitive)	General/ Vague ---------->			Narrowed/clearer	Increased interest	Clearer/focused
Actions (physical)	Seeking background information		Seeking relevant information		Seeking relevant or focused information	

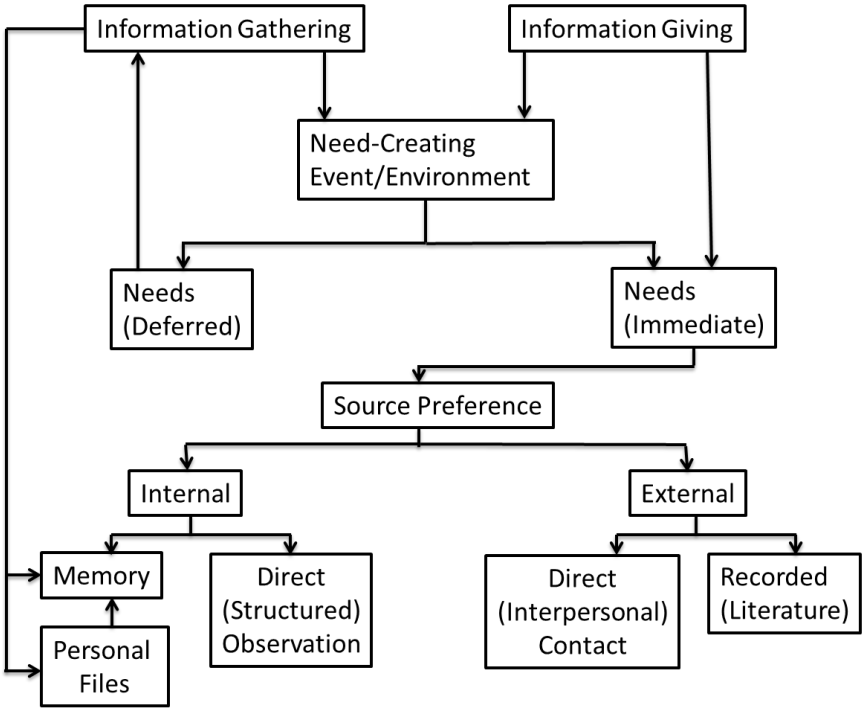
(Kulthau, 1991)

Appendix G: Wilson's Information Behaviour Model



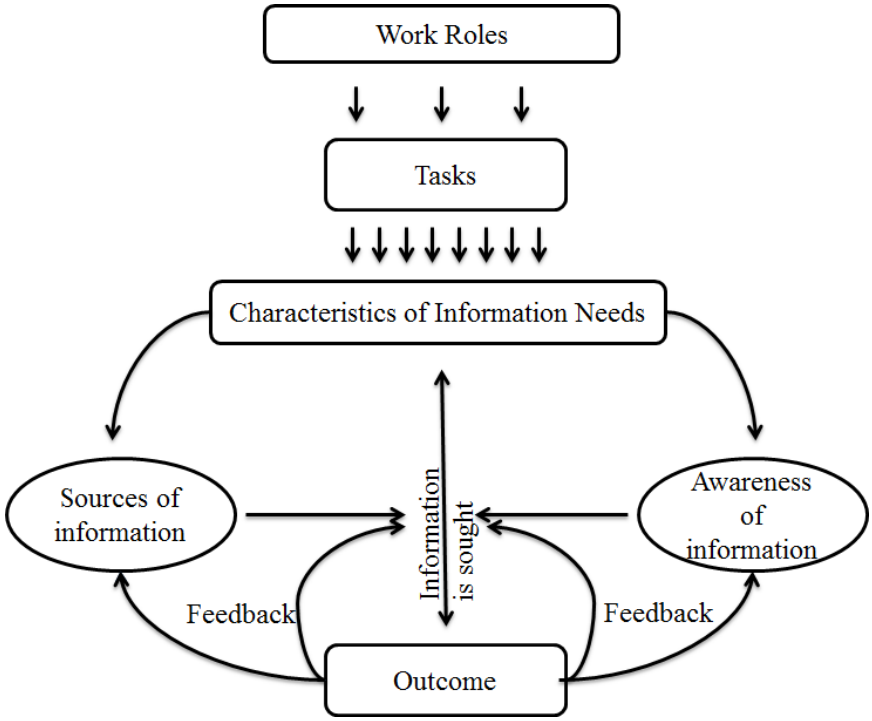
(Wilson, 1997)

Appendix H: Information Gathering Habits of Scientists



(Krikelas, 1983)

APPENDIX I: INFORMATION SEEKING BEHAVIOUR OF PROFESSIONALS



(Leckie et al., 1996)

BIOGRAPHY

Alperen Mehmet Aydin obtained his Bachelors and Masters degrees from Fatih University, Istanbul. He joined AIMTech Research Group in 2009 to do a PhD. Mehmet's research, supervised by Prof. David Allen and Prof. Tom Wilson, is on "The influence of task and time on information behaviour in organizations". Mehmet completed his PhD in 2015. Mehmet previously worked as undergraduate students' mentor, researcher, manager, and consultant in different education and business institutions in Turkey and the UK.

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