

©2020

Eun Youp Rha

ALL RIGHTS RESERVED

AN EXPLORATORY STUDY OF SOCIAL ASPECTS OF
TASK-BASED INFORMATION SEEKING BEHAVIOR

By

EUN YOUP RHA

A dissertation submitted to the

School of Graduate Studies

Rutgers, The State University of New Jersey

In partial fulfillment of the requirements

For the degree of

Doctor of Philosophy

Graduate Program in Communication, Information and Media

Written under the direction of

Nicholas J. Belkin

And approved by

New Brunswick, New Jersey

May, 2020

ABSTRACT OF THE DISSERTATION

An Exploratory Study of Social Aspects of Task-Based Information Seeking Behavior

by EUN YOUP RHA

Dissertation Director:

Nicholas J. Belkin

This dissertation aims to explore social aspects of task-based information seeking behavior. It examines how individuals are influenced by their social context when they engage in a task and information seeking for the task. The main theoretical framework of the study is cognitive sociology that recognizes individuals' mental acts as socially shaped. The study is designed as a qualitative case study using a cross-context comparative approach, which compares cognition and behavior of individuals in different social contexts. Data were collected from twelve individual scholars in two academic disciplines as the type of social contexts: natural sciences and humanities, using either one-on-one interviews or a diary study. A specific task type commonly performed in the two groups was chosen for the inquiry of their task-related cognition and behavior: writing a research proposal to gain external funding for one's scholarship. The qualitative data were analyzed through the open coding process and compared between the two groups.

The findings reveal that the process of individuals' task-based information seeking is influenced by their disciplines. Specifically, social norms and social practices of the disciplines affected how the individuals perceive a task, attend to information problems of the task, and seek and use information for the task. These findings suggest individuals' socio-cognitive activities that occur in the process of task-based information seeking: socially constructed understanding of a task and relevance to a task. Based on the findings, a novel model of task-based information seeking behavior was developed, which highlights social factors (social norms, social practices) and socio-cognitive factors (social understanding, social relevance).

This exploratory study generates a new idea of cognitive sociological aspects of information seeking behavior by showing the existence of influences of the social context on individuals' cognitive activities while interacting with a task and information. This new approach to information seeking behavior helps advance understanding of the relationships between information seeking behavior and social contexts. It further contributes to developing information systems for specific sociocultural communities with particular focus on their collective cognitive structures related to information seeking and use.

ACKNOWLEDGEMENTS

First and foremost, I thank God who has been, and continues to be, my help and source of strength throughout my life. It is through Him that I have made it this far.

I would like to thank my advisor, Dr. Nicholas Belkin, for his encouragement, guidance, and mentorship. I especially appreciate his thoughtful comments and weekly meetings along my path, which made me grow as a scholar. I cannot thank him enough for everything that he has done for me. I am also grateful to my dissertation committee, Dr. Marie Radford, Dr. Chirag Shah, and Dr. Katriina Byström, for providing their time and insightful feedback for my project. I would also like to thank Dr. Daniel O'Connor, for his support and care in many ways, socially and intellectually, from the first day of my life in New Jersey.

I would like to express my genuine gratitude to Dr. Sam Oh at Sungkyunkwan University, not only for encouraging me to pursue PhD, but also for helping me begin and complete this journey. I am indebted to him for his support and prayer.

This dissertation is dedicated to my family. I owe my deepest gratitude to my incredible family who always supports and prays for me. I am extremely grateful to my mother, father and sister for their unconditional love and tremendous support. I am very appreciative of Daehoon Han, who is my best friend, my colleague, and my husband, for giving me emotional and intellectual support and constant encouragement throughout the PhD program. I am truly blessed to have my family.

I would like to thank my good friends from Rutgers who have walked through this journey together over the years: Minji Bak, Wei Shi, Songhee Park, Eun Jung Baik,

Yiwei Wang, Minkyung Kim, Inyoung Shin, Katie Kang, Goun Kim, and Seoyoon Sung.

Thank you all for listening to my concerns and giving me warm support and encouragement.

Finally, I would like to thank all the professors who participated in this study for their time and openness in sharing their experience and thoughts with me.

TABLE OF CONTENTS

ABSTRACT OF THE DISSERTATION.....	ii
ACKNOWLEDGEMENTS.....	iv
TABLE OF CONTENTS.....	vi
LIST OF TABLES.....	xii
LIST OF FIGURES.....	xiv
CHAPTER 1 INTRODUCTION.....	1
1.1 Problem Statement.....	1
1.2 Purpose of the Study.....	4
CHAPTER 2 LITERATURE REVIEW.....	6
2.1 Task and Information Seeking Behavior.....	6
2.1.1 Conceptualization of Task.....	7
2.1.2 Key factors in task-based information seeking/Searching behavior.....	8
2.1.2.1 Task Factors.....	8
2.1.2.2 Personal Factors.....	9
2.1.2.3 Context of Task.....	10
2.2 Social Approaches to Human Information Behavior.....	13
2.2.1 The Socio-Cognitive Approach to Human Information Behavior.....	14
2.2.2 The Social Approach to Human Information Behavior.....	15
2.2.3 Information Practices.....	17
2.3 Conclusion.....	18
CHAPTER 3 THEORETICAL FRAMEWORK.....	19
3.1 Thought Communities.....	21
3.2 Sociology of Thinking.....	23
3.2.1 The Sociology of Perception.....	23

3.2.2 The Sociology of Attention.....	24
3.3 The Preliminary Model.....	25
3.3.1 Social Understanding.....	27
3.3.2 Social Relevance.....	27
3.3.3 Other Social Elements.....	28
3.4 Research Questions.....	30
CHAPTER 4. METHODOLOGY.....	34
4.1 Methods Used in Previous Work.....	34
4.1.1 Survey.....	34
4.1.2 Interview.....	35
4.1.3 Observation.....	36
4.1.4 Diary Study.....	38
4.1.5 Summary.....	39
4.2 Sources of Data.....	40
4.2.1 One-on-One Interview.....	41
4.2.2 Diary Study.....	42
4.3 Participants.....	42
4.3.1 Recruiting Criteria.....	44
4.3.1.1 Thought Communities.....	45
4.3.1.2 Task Type.....	46
4.3.1.3 Professional Age.....	48
4.3.2 Process of Recruitment.....	48
4.4 Data Collection.....	49
4.4.1 Instrument protocol.....	51
4.4.2 Interview Process.....	52

4.4.3 Diary Study Process.....	53
4.5 Pilot study.....	54
4.5.1 Methods.....	54
4.5.2 Results.....	55
4.5.3 Implications for the Main Study.....	56
4.6 Data Analysis.....	57
4.6.1 Process of Coding.....	58
4.6.2 Validity of Coding.....	61
4.6.3 Comparative Analysis.....	62
4.6.3.1 Similar.....	63
4.6.3.2 Different.....	63
4.6.3.3 Not Different.....	64
4.6.3.4 Exclusion.....	64
CHAPTER 5. FINDINGS.....	65
5.1 Characteristics of Participants.....	65
5.1.1 Academic Background.....	65
5.1.2 Task-Related Background.....	66
5.2 Comparison of Task-Based Information Seeking Behavior in Different Thought Communities.....	69
5.2.1 Understanding of a Task in Different Thought Communities.....	69
5.2.1.1 Task Characterization.....	72
5.2.1.2 Relevant Funding Types.....	76
5.2.1.3 Task Complexity.....	81
5.2.1.4 Task Importance.....	82
5.2.1.5 Feelings.....	84

5.2.1.6 Challenges.....	85
5.2.1.7 Priorities.....	86
5.2.2 Information Problems of a Task in Different Thought Communities.....	88
5.2.2.1 Subtasks.....	88
5.2.2.2 Information Types Needed.....	95
5.2.3 Choice of Action to Resolve Information Problems of a Task in Different Thought Communities.....	101
5.2.3.1 Information Source Selection.....	102
5.2.3.2 Information Searching.....	109
5.2.3.3 Information Evaluation.....	111
5.2.3.4 Information Management.....	111
5.2.3.5 Information Communication.....	114
5.2.4 Summary of Findings.....	115
CHAPTER 6. DISCUSSION.....	118
6.1 Effects of Thought Communities on Understanding of Task (RQ1)	118
6.1.1 Effects of Social Norms of Thought Communities on Understanding of a Task.....	118
6.1.2 Effects of Social Practices of Thought Communities on Understanding of a Task.....	121
6.2 Effects of Thought Communities on Information Problems of a Task (RQ2)...	124
6.2.1 Effects of Social Norms of Thought Communities on Information Problems of a Task.....	124
6.2.2 Effects of Social Practices of Thought Communities on Information Problems of a Task.....	127
6.2.3 Effects of Social Understanding of Thought Communities on Information Problems of a Task.....	129
6.3 Effects of Thought Communities on Choice of Action (RQ3).....	131

6.3.1 Effects of Social Norms of Thought Communities on Information Seeking and Use.....	132
6.3.2 Effects of Social Practices of Thought Communities on Information Seeking and Use.....	134
6.3.3 Effects of Social Understanding and Social Relevance of Thought Communities on Information Seeking and Use.....	135
6.4 Revised Model of Task-Based Information Seeking Behavior.....	138
6.4.1 Sociomental Factors in Task-Based Information Seeking Behavior.....	139
6.4.2 Other Factors in Task-Based Information Seeking Behavior.....	141
6.4.2.1 Characteristics of Communities.....	141
6.4.2.2 Characteristics of Individuals.....	142
6.4.2.3 Characteristics of Institutions.....	144
6.4.2.4 Characteristics of Task.....	146
6.5 Summary.....	147
CHAPTER 7. CONCLUSION.....	149
7.1 Summary.....	149
7.2 Implications.....	154
7.2.1 Theoretical Implications.....	154
7.2.2 Methodological Implications.....	156
7.2.3 Pragmatic Implications.....	157
7.3 Limitations.....	158
7.4 Future Research.....	160
APPENDICES.....	163
Appendix 1.....	163
Appendix 2.....	165
Appendix 3.....	168

Appendix 4.....	171
Appendix 5.....	173
Appendix 6.....	175
Appendix 7.....	176
Appendix 8.....	178
Appendix 9.....	179
Appendix 10.....	181
Appendix 11.....	183
Appendix 12.....	184
Appendix 13.....	185
BIBLIOGRAPHY.....	204

LIST OF TABLES

Table 1. The Scope and Agenda of Cognitive Sociology.....	22
Table 2. Sample Interview Protocol Questions for Data Types.....	52
Table 3. Codebook Excerpt from Major Theme “Understanding of Task”	60
Table 4. Examples of Codes Evaluated as Similar.....	63
Table 5. Examples of Codes Evaluated as Different.....	63
Table 6. Examples of Codes Evaluated as Not Different.....	64
Table 7. Examples of Codes Excluded for Comparative Analysis.....	64
Table 8. Participants’ Academic Background and Data Collection Methods Used.....	66
Table 9. Frequency of Codes of the Participants’ Proposal Writing Age.....	68
Table 10. Codes of the Major Theme “Understanding of Task” and Comparative Analysis of Code Occurrence.....	71
Table 11. Codes of “Subtasks” and Comparative Analysis of Code Occurrence.....	89
Table 12. Codes of “Information Needed” and Comparative Analysis of Code Occurrence.....	96
Table 13. Codes of “Information Source Selection” and Comparative Analysis of Code Occurrence.....	102
Table 14. Summary of Differences and Reasons for the Differences in the Two Disciplines.....	115
Table 15. Cognitive Activity in Understanding of a Task Influenced by Social Norms in Two Disciplines.....	120
Table 16. Cognitive Activity in Understanding of a Task Influenced by Social Practices in Two Disciplines.....	123

Table 17. Information Problems of a Task Influenced by Social Norms in Two Disciplines.....	126
Table 18. Information Problems of a Task Influenced by Social Practices in Two Disciplines.....	128
Table 19. Information Problems of a Task Influenced by Social Understanding in Natural Sciences.....	130
Table 20. Information Seeking and Use Behavior Influenced by Social Norms in Two Disciplines.....	133
Table 21. Information Seeking and Use Behavior Influenced by Social Practices in Two Disciplines.....	135

LIST OF FIGURES

Figure 1. The Preliminary Model of Task-Based Information Seeking Behavior.....	25
Figure 2. Information Seeking and Use Behavior Influenced by Social Understanding in the Humanities.....	136
Figure 3. Information Seeking and Use Behavior Influenced by Social Relevance in the Natural Sciences.....	137
Figure 4. Information Seeking and Use Behavior Influenced by Both Social Understanding and Social Relevance in Natural Sciences.....	138
Figure 5. The Revised Model of Task-Based Information Seeking Behavior.....	139

CHAPTER 1 INTRODUCTION

1.1 Problem Statement

Task, an activity to be performed in order to accomplish a goal (Hackos & Redish, 1998), has emerged as a key contextual factor that influences information seeking behavior (Byström, 2007; Gwizdka and Spence, 2006; Vakkari, 2003), in that it motivates the start of people's information seeking by providing goals to be satisfied through information seeking processes. The concept of task has been important in understanding why people seek information, the type of information they seek, the methods they choose to acquire it, and the use they make of it (Byström & Hansen, 2005).

Given the role of tasks in information seeking, factors related to specific information seeking tasks and topics, such as task types, characteristics/facets of tasks, and qualities of actors, and so on, have received extensive consideration and discussion in the literature (Kelly, 2006). These are known to be key variables influencing how individuals perform a task and seek or search for information. For instance, different task types lead to different information seeking and searching behaviors (Jiang, He, & Allan, 2014; Liu et al., 2010), and information seeking or searching patterns are also dependent on certain characteristics of a task, such as complexity and difficulty (Byström, 2002; Byström & Järvelin, 1995; Gwizdka & Spence, 2006). An actor's prior knowledge of a topic (Allen, 1991; Brand-Gruwel et al., 2017; Hembrooke et al., 2005; Kelly & Cool, 2002) or knowledge of a domain (Hsieh-Yee, 1993; White, Dumais & Teevan, 2009; Wildemuth, 2004) also affect his/her specific activity of information searching. As such, the close relationships between task and information seeking and searching behavior have

been discussed in the prior literature by focusing on diverse aspects of tasks and performers of tasks in relation to information seeking and searching behavior.

Despite comprehensive and continuous discussion on task-based information seeking behavior, little attention has been made to one particular aspect of task to date, which is the social context of task. Typically, the performances of tasks, which include physical and cognitive actions of individuals (Vakkari, 2003), take place in a certain context (Taylor, 1991). For instance, a work task is generated in the particular workplace and performed by people in that context. Such work tasks are known to be key factors affecting how people engage in information seeking according to previous studies that surveyed individuals' information seeking behavior within various professional contexts (Leckie, Pettigrew, & Sylvain, 1996; Rasmussen, Pejtersen, & Goodstein, 1994). However, there is still a lack of sociological attempts to understand the context of task in relation to information seeking behavior. Current work task studies tend to focus on how work task types are related to qualities of task performers and characteristics of work tasks with little consideration for social features of the work context.

In fact, a sociological approach to information behavior, which associates social contexts of people with their information behavior, rather than their cognitive or affective states, has been a consistent research approach in information science. A number of scholars have suggested useful theoretical frameworks and analysis to discuss social aspects of human information behavior; for instance, individuals' memberships to multiple social systems (Paisley, 1968) information use environments (Taylor, 1991), small worlds (Chatman, 1999), Everyday Life Information Seeking (Savolainen, 1995), information worlds (Jaeger & Burnett, 2010), etc. Such theories or models demonstrate

that people's information behavior is shaped by a particular social environment, not simply by own cognitive structures. From the social perspective, social products, such as culture, discourse, norms, etc., play a vital role in determining how people seek and use information within their social boundary.

The growing scholarly interest in the sociological viewpoint to information behavior motivates the exploration of the wider contextuality of task-based information seeking by paying attention to sociocultural aspects of the context. In line with an emerging social lens on information behavior, the sociocultural and practice-oriented viewpoints of task-based information seeking have also arisen (Byström, 2007; Byström & Lloyd, 2012; Talja & Nyce, 2015), which primarily point out that social culture and practice in the context are intertwined with human behavior related to task. From this point of view, task is an inherent property of the context in which it takes place and individuals conduct the task by conforming to the context they interact within (Byström, 2007). It highlights the understanding of information behavior as a set of activities derived from their community's conventional and cultural practices.

Despite the growing scholarly attention to the sociocultural context of tasks, the majority of research in task-based information seeking has been still analyzed from the cognitive viewpoint, with focus on information seeking and searching behavior of people with different cognitive states or on different task types or properties. Since a task is typically performed by individuals in a certain social context, such as familial, occupational, religious, and ethnic contexts, it seems necessary to look into the influences of the social contexts of information seeking in task. It is possible that the same task type can be differently understood and conducted by people in different social contexts as a

result of socialization to each context, by learning different norms and conventions with regard to the task. Hence, it is important to understand how the social context of task is associated with people's information seeking behavior in task in order to advance knowledge in task-based information seeking and searching behavior. It will also help design and develop information systems for certain social and cultural communities by articulating members' needs or preferences in seeking and using information for their tasks, which are influenced by their communities.

1.2 Purpose of the Study

This dissertation explores the social aspects of task-based information seeking behavior by focusing on how the social context of tasks influences individuals' perception and performance of a task and information seeking behavior while working on a task.

To achieve this goal, the study adopts the theory of cognitive sociology as a primary conceptual foundation. Cognitive sociology is the subfield of sociology that emphasizes that human cognition is socially constructed, which influences human actions. Applying the cognitive sociological framework to research of information seeking behavior could make it possible to identify what actually leads individuals to act in a certain manner in social contexts, since it allows for the analysis of individuals' cognition as socially affected. Previously, a number of researches have demonstrated particular patterns or characteristics of information behavior in various groups, such as professions (Cobbledick, 1996; Gorman, 1995; Lea French & Williamson, 2016; Leckie, Pettigrew, & Sylvain, 1996; Mackenzie, 2003; Olsson, 2016; Pinelli, 1991), ethnicities

(Agada, 1999; Kazmer, Glueckauf, & Burnett, 2013; Liu, 1995; Quirke, 2011), nations (Bronstein, 2017; Gao, Larsson, & Luo, 2013; Huang & Kelly, 2013; Jeong, 2004), etc. However, reasons for such varieties of information seeking and uses across the groups seem still vague. Cognitive sociology may help understand underlying reasons behind different information seeking behavior in different social and cultural communities through the analysis of individuals' cognitive processes influenced by their social context. Therefore, in this study, the cognitive sociological framework is used to analyze whether and how the social context affects individuals' cognition, which further leads to, or motivates their behaviors, when they perform a particular task and interact with information for the task.

In brief, using the cognitive sociological viewpoint, this dissertation focuses on investigating how individuals' information seeking behavior is influenced by the social context of task. It will contribute to not only expanding understanding of social aspects of task-based information seeking behavior, but also suggesting a new theoretical approach that can be used to account for individuals' information seeking behavior or other types of information behavior in sociocultural contexts.

CHAPTER 2 LITERATURE REVIEW

For the literature analysis, theoretical bases and empirical evidence were reviewed in terms of two areas: task and information seeking/searching behavior, and social approaches to human information behavior.

2.1 Task and Information Seeking/Searching Behavior

The dominant perspective on analyzing information seeking is a cognitive viewpoint that focuses mainly on mental structures of individuals (Ingwersen & Järvelin, 2006). This approach led to context-sensitive interpretations of cognition by expanding the scope of the interest to situational and task-related factors. Particularly, a task became a key exemplar that represents information problems in certain situations or contexts. For instance, Belkin (1990) suggested the ASK model that described situational and task-related factors for the development of anomalous states of knowledge. Also, Ingwersen (1999) emphasized an interactive information seeking perspective with particular attention to work task and organizational environments. He integrated diverse contextual factors including cultural, social and organizational contexts to understanding processes of human interactions with information. Thus, task-based information seeking emerged as a new sub-group of information seeking which emphasizes the relationships between task and information seeking processes. In order to understand the effects of tasks on information seeking behavior, various features of tasks have been examined as variables to information seeking and searching behavior, such as task types or facets, task performers' cognition and task contexts.

2.1.1 Conceptualization of Task

A task has multiple levels of granularity (Byström & Hansen, 2005) and is inherently hierarchical and multidimensional, consisting of more than one subtask (Toms, 2011). Accordingly, task has been systematically conceptualized by scholars to accomplish more advanced and lucid understanding of task itself, which ultimately enhances knowledge of information seeking behavior. Vakkari (2003) comprehensively provided conceptions and characteristics of task with explanations of the relations between task and information searching. Byström and Hansen (2005) summarized different ways of viewing tasks in research settings and illustrated three types of task levels: work tasks, information seeking tasks, and information search tasks. They confirmed the interconnectedness between information seeking, information retrieval and work task performance in real-life. Toms (2011) also explicated definitions and characteristics of task and summarized the literature of conceptual discussion of task as well as empirical studies that used a task to examine information seeking or search behavior.

Li and Belkin (2008) carried out holistic analysis of the multidimensional characteristics of a task, encompassing work tasks, information seeking tasks and information search tasks. They developed a faceted classification scheme for conceptualizing a task from multiple aspects. The scheme consists of two primary dimensions: general facets of task and common attributes of task. It is worth noting that it incorporates a wide variety of task-related dimensions, such as task process, outcomes, objective complexity and process, and user-related dimensions, such as task doer and user's perception of task (e.g., urgency of task, difficulty of task, and subjectivity

complexity). The classification framework demonstrates the necessity for a multi-faceted outlook on task and task-based information seeking.

2.1.2. Key Factors in Task-Based Information Seeking/Searching Behavior

Since task is recognized as an influential factor in information seeking behavior (Gwizdka & Spence, 2006), a number of researchers have identified key variables in relation to task-based information seeking and searching behavior, especially task factors, personal factors, and context of tasks.

2.1.2.1 Task Factors

Since task type is a fairly predictable influence on people's information behaviors (Talja & Nyce, 2015), various empirical research has been conducted on analyzing information seeking and searching behavior in different task types based on a conceptualization of task types. Kim (2006) analyzed how information search behavior is different among three different task types including factual, interpretive, and exploratory tasks. Toms et al. (2007) focused on four different task types including fact-finding, information gathering, browsing and transactions, in order to articulate the effects of the task type on search behavior. Liu et al. (2010) studied search behaviors associated with four different task types varied on four dimensions of task including complexity, task product, task goal and level. Similarly, Jiang et al. (2014) compared multiple tasks having different goals and products to information search activities in those tasks.

Moreover, task stage has been considered a factor determining information seeking of users in that their needs or strategies can change as they progress through task

stages or phases. Basically, Kuhlthau's (1991) information search model (ISP) played a crucial role in developing the understanding of how task stage is related to information behavior. She identified six stages of task performance (initiation, selection, exploration, formulation, collection and presentation) that differentiate information searched for, ways of searching, and relevance assessments (Vakkari, 2003). Vakkari and Hakala (2000) and Vakkari et al. (2003) demonstrated that specific stages of a problem influence users' search tactics and term selection when they search for information. Taylor et al. (2007) also found a statistically significant relationship between multi-dimensional user relevance assignments and stage in the process of completing a task.

2.1.2.2 Personal Factors

Since task is viewed as a personal activity triggered by individuals' motivations and goals (Byström, 2007), the relations between cognitive states of task doers and information seeking and searching behavior have been continuously studied. First, individuals' perception of task difficulty or complexity has been of key interest in analyzing the effects of task on individuals' behavior. Byström and Järvelin (1995) conducted research on how task complexity affects information needs, information types, and information channel and sources of users, and Byström (2002) explained the effects of perceived task complexity on information activities in a real-life work setting. Bell and Ruthven (2004) examined whether web searchers could recognize task complexity and how this impacted issues such as search success and searcher satisfaction. Gwizdka and Spence (2006) studied the relationships between searchers' behaviors on the web and both objective and subjective complexity. Zhang and Gwizdka (2014) also examined

information searching behavior in tasks of different levels of complexity. Such examples attest that how a person perceives complexity or difficulty of tasks can influence his/her information seeking processes and activities.

Furthermore, a task doer's prior knowledge, including domain knowledge and topical knowledge, is a key cognitive element related to information seeking or searching behavior. Hsieh-Yee (1993) examined how domain knowledge that individuals already have affects information seeking in task, and Wildemuth (2004) identified effects of domain knowledge on how a task performer formulates search tactics in the process of information search. White, Dumais and Teevan (2009) also found different web search behaviors in the same task depending on performers' levels of prior domain knowledge.

Topical knowledge, or topic familiarity, could influence information seeking behavior in task, too. Allen (1991) identified the associations between topic knowledge and search behavior, specifically online catalog search formulation. Kelly and Cool (2002) also proposed topic familiarity as a fundamental factor influencing information search behavior. Hembrooke et al. (2005) showed how expertise on a topic leads to behavior of search term selection and Brand-Gruwel et al. (2017) discussed differences of domain experts and novices in evaluating sources during the web search process. In essence, it is clear that an individuals' cognition plays a critical role in determining information seeking behavior when he/she engages in a task.

2.1.2.3 Context of Task

Work context. In this sense, context is the institutional, organizational or work task settings (Cool & Spink, 2002). In the task-based approach, work settings have been

particularly focused on since work duties or roles in the real-life context produce a variety of tasks and subtasks to be completed, either regularly or irregularly. For instance, Byström and Hansen (2005) addressed the interconnectedness between information seeking, information retrieval and work task performance in real-life.

An early effort on work task research was achieved by Leckie et al. (1996), who developed an information seeking model of professionals. They associated work roles with work tasks and suggested key factors influencing professionals' information seeking behavior, such as information needs, sources, and awareness of information. This model emphasizes the relationships between the work tasks on information seeking behavior of professionals. Also, the relationships between different work task types and information seeking and search activities in different domains have been studied (Hansen, 2009). Freund, Toms, and Clarke (2005) connected work task with document genres, concluding that different work tasks generate variation of information tasks and information genres. Li and Belkin (2010) described that work tasks play an important role in users' interaction with information systems in that they not only exert different efforts, but also need different quantities of information to address depending on different work task types. More recently, Saastamoinen and Järvelin (2016) demonstrated the strong relationships between work task types and search task features.

Domain. Domain of tasks was also examined as a type of context, which is an important social factor in information seeking behavior (Hjørland & Albrechtsen, 1995). Toms, Freund, Kopak and Bartlett (2003) explore the effects of task domain on users' search process. They surveyed whether users conduct a search task differently in four different domains: consumer health, general research, shopping, and travel. The results

confirm different patterns and activities of information seeking in four domains and reveal the importance of domain-specific design elements for the development of information search systems.

Sociocultural Context. A sociological viewpoint on the context of tasks has emerged, which mainly focuses on the social and cultural context of tasks. It is a socially constructed context that defines knowledge as an inherently social product and considers discourse as the most important means for understanding the context (Courtright, 2007). The context in which tasks arise and performances of tasks takes place is interpreted as a social and cultural environment that contains socially constructed knowledge, values, meanings, artefacts, or language. From this point of view, task-based information behavior is more related to practices of communities than to individualistic actions.

The social and cultural perspective on the context of task is presented in some literature. Byström and Lloyd (2012) highlighted the need for applying the sociological lens to understand work task-related behavior. They explained that individuals' perceived complexity of a task may be seen from the contextual point of view, where their perception mirrors the agreed upon view on the complexity of a work task at the particular workplace, rather than from a purely personal point of view based on cognitive judgment. Similarly, Kallehauge (2010) pointed out that the work task from which the information problem is derived is dependent on the present state of the socio-economic development in the location wherein the people solving their work tasks takes place. Talja and Nyce (2015) also emphasized that the background of tasks consists of a practice, a domain, or a sociocultural activity setting which are all crucial to construct a person's task-related behavior. Since people utilize their worldview and knowledge

obtained from a certain community in the course of completing a task, task-based information seeking should be also understood as the embodied process of the resolution of a problematic situation within a particular context (Talja & Nyce, 2015). As seen, the sociological approach to information seeking behavior in task is an emerging perspective that pays attention to a new aspect of task context; the social, cultural and conventional environment in which a task arises.

2.2 Social Approaches to Human Information Behavior

A slow increase in academic interests in social factors in information retrieval and human information interaction has occurred (Fidel, 2012). Traditionally, the cognitive viewpoint was dominant to build models and theories of information behavior and to provide a profound understanding of the concept of information and other conceptions in information seeking and retrieval research (Ingwersen & Järvelin, 2006). It focuses on user's ability to create mental and knowledge structures for information processing (Talja, Tuominen, & Savolainen, 2005). Later, the socio-cognitive viewpoint was developed as an alternative to individualistic and behaviorist approach, which emphasizes that information processes should be seen as embedded in social, organizational, and professional contexts (Talja et al., 2005). A more sociological lens that analyzes social norms and culture, linguistic and conversational constructs, and practices of communities to understand human information behavior has been also growing, particularly under the name of *information practices*.

2.2.1 The Socio-Cognitive Approach to Human Information Behavior

The socio-cognitive approach to information behavior generates theories or models that conceptualize how individuals' cognition and their social context are interacting in the course of information seeking.

Paisley (1968) discussed individuals' socio-cognitive factors of information behavior based on the comprehensive review on literature on scientists' information needs and uses. He addressed various types of systems where information behavior take place, including cognitive, social, political, and economic systems. Specifically, he summarized that scientists' information needs and uses are influenced by their memberships to multiple systems: culture, a political system, a membership group, a reference group, invisible college, a formal organization, a work team, a legal/economic system, one's own head, and a formal information system.

Another example is cognitive work analysis (Rasmussen et al., 1994; Fidel, 2012) that illustrates multiple types of social dimensions of workplace influencing cognitive acts, such as work environment, work domain, social organization, resources and values, which may constrain individuals' information behavior simultaneously and interdependently.

Domain analysis (Hjørland & Albrechtsen, 1995) is a theoretical framework that highlights the role of social contexts (i.e. domain) in shaping human cognition leading to information behavior. According to this theory, information seeking behavior is an outcome of individuals' socialization and internalization to a certain domain. Information needs are generated from social and cultural factors since the information demanded by users is defined as an expression of their subjective information needs after being

socialized to the context, which may be different from their real or objective needs (Hjørland, 2002).

Taylor (1986, 1991) also proposed a model from the socio-cognitive perspective, known as information use environments (IUE). In this model, the work organization plays a crucial role in not only providing individuals with the context of information uses, but also establishing tasks and responsibilities from which information problem are triggered. The model stresses the effects of information user's environment or situation upon the nature of the information needed (Palmquist, 2009).

2.2.2 The Social Approach to Human Information Behavior

The social approach to information behavior pays attention to information behavior of people from socio-cultural perspectives, focusing on effects of cultural and sociological aspects of community on human information behavior. The social lens to information seeking chiefly emphasizes the roles of social norms and culture, worldviews, values, and beliefs that form an individual's mental structures and behaviors with regard to information seeking.

Savolainen (1995) developed a sociologically and contextually oriented model of information activity, the Everyday Life Information Seeking (ELIS) model. The thrust of the model is expressed by *way of life* and *mastery of life*, a socially and culturally determined system of thinking, perception, and evaluation. The model illustrates that an information seeker's behavior tends to be shaped not only by their psychological factors, but also the social conditions in which they are situated.

Chatman's (1999) theory of life in the round is another example developed based on sociological roots to understand everyday information behavior. It suggests that human information interactions are shaped by people's social conditions within a community, named as a *small world* in which people share physical and/or conceptual space within a common landscape of cultural meaning. The small world holds specific social conditions and forces for people's thinking and acting when they seek and use information. The theory's four key concepts (small world, social norms, social types, and worldview) certainly manifest the shift of the emphasis from individuals' information needs and motivations to their social contexts. Both Chatman and Savolainen commonly attended to socioeconomic groups as a type of social communities holding a legitimized set of behavior within the group.

Also, information worlds (Jaeger & Burnett, 2010), primarily derived from Chatman's small world, also depicts a social place where information needs and behaviors take place. It expands a scope of social communities from a socioeconomic group to various types of groups sharing the common interests, expectations and behaviors. Jaeger and Burnett (2010) identified five elements constituting such communities: social norms, social types, information value, and information behaviors. Information worlds highlight the need for understanding sociological elements of information contexts in research of information behavior.

As such, the social perspective on information behavior studies reveals that information seeking behavior is influenced by various sociocultural elements, particularly social norms, which is a collective sense of standards and appropriateness in direction and order of behaviors within a social context (Chatman, 1999; Jaeger & Burnett, 2010).

2.2.3 Information Practices

Recently, there has been an increasing interest in information practices which essentially discuss information activities that are woven through social practices in everyday life, as an alternative to the dominant concept of information behavior (Savolainen, 2007). The information practice approach focuses on a domain or a community as a unit of analysis and gives a central role to the social and cultural factors in qualifying information seeking and capturing the richness of information as constructed through the interaction of the individual and the sociocultural context (Savolainen, 1995). In contrast to the general view that information behavior is caused by needs and motives of individual actors, the information practice approach accentuates continuity and habitualization of activities affected and shaped by social and cultural factors; all information activities originate from interactions between the members of community (Tuominen, Savolainen, & Talja, 2005). Due to the different approaches to how people deal with information between information behavior and information practices, information practice is conceived of as a major alternative to the dominant discourse of information behavior (Savolainen, 2007).

The information practice view is mainly rooted in a social constructionist paradigm that puts emphasis on language which is constitutive for the construction of selves and formation of meanings (Talja, Tuominen, & Savolainen, 2005). It stresses that the boundaries of social knowledge are set by discourses that categorize the world and bring phenomena into view and people's belief, thoughts, and emotions are shaped by linguistic representations (Tuominen, Talja, & Savolainen, 2002). From this point of view, the processes of information seeking and use are constituted dialogically

(Savolainen, 2007; Tuominen, Talja, & Savolainen, 2002). Although information practice lacks a fixed meaning in information science, there seems a shared view on understanding information practices: social constructions that reflect the role of information in the discourses of communities and that are manifested in the saying and doings taking place in their activities (Lloyd, 2010). Accordingly, researches using the conceptual framework of information practices have examined how information seeking and use are constituted socially and dialogically by paying attention to discourse communities in which particular linguistic and symbolic structures are shared (e.g. Foster, 2009; Isah & Byström, 2016; Lloyd & Olsson, 2019; McKenzie, 2003; Olsson, 2016; Radford & Radford, 2001).

2.3 Conclusion

Social approaches to information behavior demonstrate that individuals' information seeking behavior is constructed not only by their own goals and motivations, but also their social and cultural backgrounds. Although task-based information seeking has been known to be goal-driven, individualistic activity, it cannot be free from social influences since a task is created and performed in a certain context having a set of socio-cultural elements. In contrast to a large number of studies on cognitive and task-related factors in information seeking behavior, there seems little scholarly attention made to social factors that might also affect behavior. Therefore, it is worth focusing on social effects on the process of performing a task and of interacting with information in order to advance knowledge of relationships between the context and information seeking behavior and deepen the sociological understanding of information behavior studies.

CHAPTER 3 THEORETICAL FRAMEWORK

In this study, cognitive sociology is selected as the primary theoretical basis for analyzing individuals' task-based information seeking in a social context. Sociologists have agreed upon the argument that society plays a crucial role in constructing knowledge and identity of individuals. From this viewpoint, individuals employ specific social standpoints to interpret the world based on the societies they live in, the communities they inhabit, and the social networks they belong to (Brekhus, 2015). In order to identify the effects of such social worlds on human beings, sociology has examined how social power shapes people's mind and behavior based on the assumption of humans as socially and culturally located humans, not as universal humans. One path for understanding the relationships between societies and human beings is concerned with how a society shapes human minds and motivates actions, which is a focal point of cognitive sociology.

Cognitive sociology highlights that an individual's mind is heavily dependent on the social community to which he or she belongs. In early research, Mannheim (1949) described the sociology of thinking: a group develops a particular style of thoughts and individuals within the group, thinking in the manner in which their group thinks. Also, Durkheim (2005) emphasized the social and cultural human, over the universal human or the autonomous individual. He viewed cognition as a product of a particular social environment and rejected the idea of a universal, single, rational way of thinking. His approach became the basis for the theory of cognitive sociology since it highlights that the self and mind are socially constructed in a dynamic relationship with the social world,

rather than constituted only in an individual human-object relationship with the natural environment (Brekhus, 2015).

Later, Zerubavel (2009) holistically conceptualized the sociology of cognition as the discipline of cognitive sociology. It mainly conceives individuals as social beings, who think not only individually and universally, but also socially, being affected as well as constrained in the way to interact with the world by a particular social environment (Zerubavel, 2009).

The theory of cognitive sociology can provide an insightful framework for analyzing the relationships between the social context and individuals by examining social aspects of individuals' cognition and behavior during the process of task-based information seeking. As the performances of tasks include various types of physical and cognitive actions of individuals (Vakkari, 2003), this framework is chosen to conduct the holistic analysis of how the social context is associated with individuals' task-based information seeking, focusing not only on individuals' task-related physical actions, but also on their cognitive actions. Thus, in this study, social aspects of task-based information seeking behavior are examined through the analysis of social effects on individuals' cognition and behavior using cognitive sociology. This approach is novel and distinctive in the field of human information behavior, in that it primarily emphasizes the social and conventional characteristics of human cognition leading to behavior. It differs from existing social approaches to human information behavior in information science, such as information practices and domain analysis, which view a domain or a community as a unit of analysis. Cognitive sociology examines both individual and social levels of individuals' behavior by looking into their socially shaped cognition.

In particular, the study adopts the conceptual stance of cognitive sociology from Zerubavel (2009, 2015). It highlights the fundamental concepts for understanding a society, *thought communities*, and individuals' mental acts shaped within such communities, *sociomental acts*, which are discussed in detail below.

3.1 Thought Communities

In cognitive sociology, it is vital to understand the concept of thought communities which play a major role in constructing one's mind. Mannheim (1949) stated that "it is not men in general who think, or even isolated individuals who think, but men in certain groups who have developed a particular style of thought in response to certain situations (p.3)". It suggests that a person of the community participates in thinking further what other men have thought before him. Thus, a community is developed upon a common style of thoughts or thinking in cognitive sociology. The members of a community share a range of ideas and concepts with one another and continuously maintain, expand or revise them together; such a group is known as a thought community. A thought community is a community of persons mutually exchanging ideas or maintaining intellectual interaction, and offers a special carrier for the historical development and for the given stock of knowledge and level of culture (Fleck, 1981). Fundamentally, the thought collective requires the establishment of a *thought style*, a particular style of thought in the group that governs the members' cognitive processes. It makes possible the perception and establishment of facts in the community, whereas renders recognition of other forms and other facts impossible (Fleck, 1981).

Thought communities were further elaborated by Zerubavel (2009), who offered a logical conceptualization of the realm of cognitive sociology as a subfield in sociology. He focused on the thought community, where people experience cognitive traditions and socialization. A thought community is an intersubjective world, larger than the individual but smaller than the entire human race, for instance professions, generations, social classes, and status groups (Brekhus, 2015). Table 1 summarizes the scope of cognitive sociology compared to cognitive individualism and cognitive universalism.

Table 1. The Scope and Agenda of Cognitive Sociology (Zerubavel, 2009)

Cognitive Individualism	Cognitive Sociology	Cognitive Universalism
<ul style="list-style-type: none"> • Thinking as individuals 	<ul style="list-style-type: none"> • Thinking as members of thought communities 	<ul style="list-style-type: none"> • Thinking as human beings
<ul style="list-style-type: none"> • Subjectivity • Personal experience 	<ul style="list-style-type: none"> • Intersubjectivity • Conventional cognitive traditions 	<ul style="list-style-type: none"> • Objectivity • Natural/logical inevitability
<ul style="list-style-type: none"> • Personal cognitive idiosyncrasies 	<ul style="list-style-type: none"> • Cultural, historical, subcultural cognitive differences 	<ul style="list-style-type: none"> • Universal cognitive commonalities

Intersubjectivity, which is neither objective nor subjective as a consequence of objectifications of subjective processes, is an important concept that helps define the scope of sociology of the mind (Zerubavel, 2009). Thought communities are considered to be an intersubjective world, the context in which people share the stock of knowledge, the facts a group recognizes, the beliefs it espouses, and the routine performances, logics, and symbols by which these facts and beliefs are created and sustained (Schutz & Luckmann, 1973). Within thought communities, members learn how to think and act in a socially appropriate manner in accordance with standard and conventional structures of their communities, through cognitive socialization. They become socialized and learn to see

the world through the mental lenses of particular thought communities (Zerubavel, 2009) In the following sections, how cognitive sociology explains social dimensions of human cognition is addressed.

3.2 Sociology of Thinking

Zerubavel (2009) provides a comprehensive analysis of the sociology of thinking, explaining individuals' *sociomental* acts, socially situated cognitive acts of human beings. The term *sociomental* denotes the elementary forms of our mental life found at the intermediate level, between the two extremes, the individual on the one extreme and the entire human race on the other (Zerubavel, 1993). Sociomental control within thought communities enables members to learn how to think socially, not just sensorially or generally, which result in their sociomental acts. Examples of sociomental acts: interpreting, focusing, categorizing, associating, and remembering (Zerubavel, 2009). In this dissertation, perceiving/interpreting, and attending/focusing are particularly focused on, because these two types of cognitive acts seem closely relevant to cognitive processes in information seeking. They are also considered to be central elements in the social construction of reality (Brekhus, 2015).

3.2.1 The Sociology of Perception

Perception is one of the broadest, most fundamental processes of cognition, and one that relates to the processes that follow (Brekhus, 2015). From the standpoint of cognitive sociology, how individuals perceive the world is neither purely personal nor universal; rather, it is social. Individuals are socialized to a particular *optical community*;

the social unit from within which the world looks the same, by learning to look at things in unmistakably social ways (Zerubavel, 2009). Consequently, the same object is often perceived somewhat differently by people in different groups since there is always more than just a single mental stance from which something can be seen. For instance, cooking is viewed simply as one of the domestic chores routinely done by a housewife, whereas it is understood as a crucial task for improving professional skills and capabilities by a prospective chef. This example shows that distinct sociomental lenses are applied by people in different thought communities in interpreting the task. Likewise, individuals in the same optical community perceive things somewhat similarly: they see the world through the same mental lens, whereas they tend to be different from those who come from different social backgrounds and therefore use altogether different ones (Zerubavel, 2009). In brief, cognitive sociology underlines that people optically socialize to their community, which leads to perceiving and understanding things in a social way.

3.2.2 The Sociology of Attention

A thought community helps us determine what actually enters our minds in the first place (Zerubavel, 2009). Members of the community have an ability to notice things that nonmembers tend to ignore as well as to ignore some of the things they attend to (Zerubavel, 2015). Consequently, when a person excludes certain parts of reality from their attention as irrelevant, he or she does so not merely as a human being, but also as a social being, as a member of a particular thought community that tends to ignore certain things conventionally. For instance, scholars selectively publish their research papers in certain journals which never gain attention from other scholars in a different domain,

since they have become socialized to overlook journals irrelevant or less relevant in their academic community as a result of cognitive habituation (Zerubavel, 2015). Each field of study, as a subculture of academia, creates specific cognitive biases that determine what individuals in the community focus on and ignore as a member. Scholars' behavior of selecting certain journals can be understood as "a product of the particular way they focus their attention as a result of their professional socialization" (Zerubavel, 2015, p. 68). The sociology of attention concludes that the ways we draw a line between relevance and irrelevance is social as a consequence of learning restricted norms of focusing in our social world.

3.3 The Preliminary Model

A preliminary model (Figure 1) for the research was built based on the review of related literature from information behavior and cognitive sociology, with particular focus on the sociology of perception and attention.

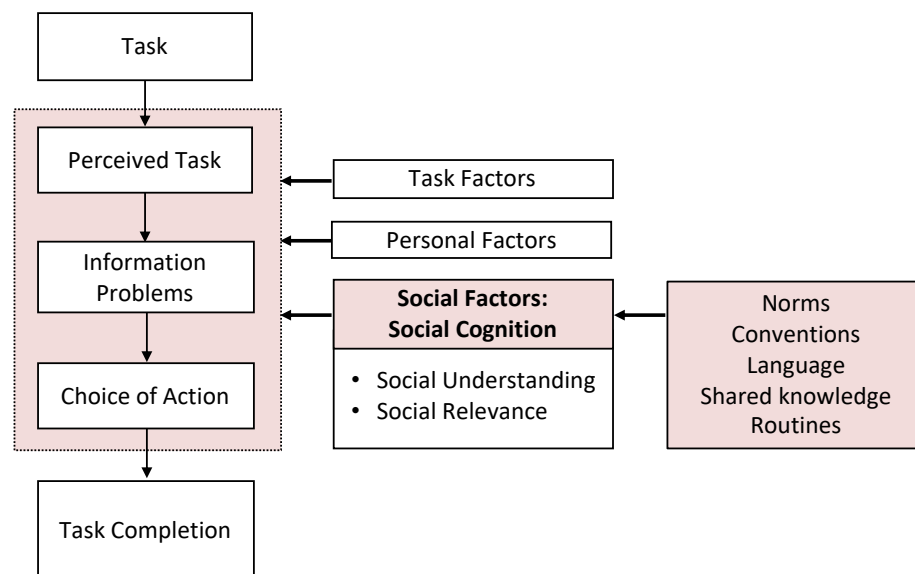


Figure 1. The Preliminary Model of Task-Based Information Seeking Behavior

This preliminary model describes the process of how a task leads to information seeking behavior. This model is based upon the model of information seeking in task by Byström and Järvelin (1995). It mainly adds possible effects of socio-cognitive interventions to the process of task-based information seeking, which may reveal why people engage in particular information-related actions while conducting a task.

An individual perceives and interprets a given task (Perceived Task) and identifies specific problems including subtasks and information needs (Information Problems) from the task, leading to taking actions (Choice of Action) to resolve the problems, including various kinds of information seeking activities that enable a task performer to complete the whole task. During the process, the person can be influenced by task-related factors, such as task types or task stage, and personal factors, such as a task doer's knowledge and familiarity with a task. Besides, the model newly suggests the social factors, known as social cognition. The social cognition includes two specific sociomental elements: social understanding and social relevance, derived from Zerubavel's (2009) concepts of the sociology of perception and the sociology of attention, respectively. These are attained by individuals through their participation and socialization in a particular thought community, in which common norms, conventions, language, knowledge, and routines are shared among members. Details of the suggested social factors in this model are provided below.

3.3.1 Social Understanding

Social understanding is concerned with a person's perception, as socially shaped. When a person perceives and interpret a given task, he/she understands it as a member of certain thought communities according to cognitive sociology; for instance, as a student, as a Christian, as a mother, as an information scientist, etc., depending on contexts of the task. Such social identity tends to direct individuals' cognitive acts based on social understanding learned from their thought communities when they recognize and interpret the reality. Consequently, the very same task can be understood in a different way by two individuals who are socialized to different communities having distinctive social understanding which is applied to view the task and to define the problems. Therefore, social understanding may influence when a person perceives and interprets a task to perform a task.

3.3.2 Social Relevance

Social relevance indicates that relevance is constructed on the shared agreement on what is relevant and what is irrelevant among members of a social group. Thus, decision making based on relevance is a social behavior that varies depending on social groups. How to perceive a task and identify specific information problems and goals from a task can be socially accomplished since individuals may apply social relevance learned from his/her thought community for such cognitive acts. It is related to social framing of attention that draws a line between the relevant and the irrelevant (Zerubavel, 2015). When a person perceives a task, only relevant things or aspects of the task are focused on as information problems, whereas irrelevant ones are neglected. Since each thought

community may have different criteria on distinction between the relevant and the irrelevant and different norms of focusing, relevance is socially constructed. Therefore, social relevance may result in different styles or patterns of understanding and attention in relation to a task and information behavior across different thought communities.

3.3.3 Other Social Elements

Importantly, it is not necessary that a thought community be an official community that holds any formal structure (Fleck, 1981). Instead, social elements are essential in constituting and maintaining it as well as in developing socio-cognitive acts including social understanding and social relevance.

First, the social construction of knowledge is an important basis for elucidating a thought community. As Berger and Luckmann (1966) discussed, knowledge and reality are concepts socially and relatively constructed in a specific social context based on the taken-for-grantedness for what is real. The stock of knowledge in the community plays a key role in providing the context of cognitive acts and the limits for any judgment about objective reality by the members (Schutz & Luckmann, 1973). Hence, the shared knowledge of a community lets individuals cultivate how to think socially based on the social facts used to understand and define the reality.

Also, culture is considered a major locus of cognition in cognitive sociology (Zerubavel, 2009), in that it constrains people's capacity to imagine alternatives to existing arrangements (DiMaggio, 1997). Through their participation in a culture, people are able to obtain shared meanings and concepts that allow them to interpret and negotiate within the public world (Bruner, 1990). Specifically, the social norm, a product

of cultural processes in the social context based on the community's conventions and traditions, creates rules and standards of behavior within a community (DiMaggio, 1997). It plays a significant role in constructing sociomental structures of individuals; normative dimensions can tell people what to focus on and what to ignore according to relevance and irrelevance as socially established (Zerubavel, 2015). Thus, members in a thought community distinguish relevant things from irrelevant ones based on social norms which provide stability and appropriateness to their thoughts and behaviors within their community.

Language, in which culture is embedded, is a basis for socialization (DiMaggio, 1997). Language is viewed as a social product passed through in history from an individual's contemporaries and predecessors (Mannheim, 1949). Zerubavel (2009) emphasized the impersonal nature of language: most symbolic associations involve shared meanings within the group, which are conventional rather than personal or natural, based on an artificial association between signifier and signified. Also, Brekhus (2015) maintained that social action is deeply embedded in and informed by narrative and speech acts, since discourse and symbols determine how to frame of things and events. Therefore, language and symbols are developed through cultural interactions among people within the group and discourse tools and people become socialized to their thought community by conforming to a social system of typifying schema of experience.

Finally, routines or habits socially established through socialization to a thought community can help members of the community develop sociomental structures. Such socially shaped routinized and habitual activities may include ways of moving bodies, handling objects, treating subjects, describing things, and understanding the world

(Reckwitz, 2002). These kinds of actions can be performed in a social manner as a member of a thought community being influenced by routines and practices of communities, not as a particular human being based solely on individualistic patterns or preferences.

In conclusion, the preliminary model presented here can be used for framing individuals' task-based information seeking behavior with special attention to the socio-cognitive variables on behavior. It helps identify the process of task-based information seeking, effects of socially constructed cognition on such process, and fundamental social elements leading to the socio-cognitive acts. The model is mainly used to develop research questions of the study, which are described in the following section.

3.4 Research Questions

The objective of this study is to explore the social influences on individuals' information seeking behavior in the process of performing a task, with particular attention to sociomental aspects of individuals learned and obtained from their thought community. Based on the theoretical framework of cognitive sociology and the preliminary model (Figure 1), three research questions are developed and guide the entire study as follows:

RQ1. Are there differences of individuals' understanding of a task in different thought communities?

- If there are differences, what are they, and what are the reasons for the differences?

The preliminary model (Figure 1) describes two possible socio-cognitive factors that may be related to the process of performing a task and of interacting with information: social understanding and social relevance, derived from the cognitive sociological stance. The first question is concerned with one of these socio-cognitive elements, social understanding of individuals. Since the sociology of perception in cognitive sociology emphasizes that members of a thought community use their sociomental lens to perceive and understand a reality, an individual may use it while conducting a task, especially when they recognize or interpret a task in order to begin the task. Therefore, this question focuses on how a task performer understands and interprets a given task, being influenced by his/her thought community.

A comparative approach analyzing differences of individuals' interpretation of a task in different thought communities is useful to examine the existence of social understanding. For comparison, individuals' perceptions of a task and information in different thought communities should be collected. When differences of individuals' understanding of a task between the different communities are confirmed, reasons for the differences need to be analyzed to see if the differences are associated with any social factors, such as norms, conventions, language, and routines, as suggested from the preliminary model (Figure 1).

RQ2. Are there differences of individuals' information problems of a task in different thought communities?

- If there are differences, what are they, and what are the reasons for the differences?

Similar to RQ1, RQ2 aims to identify a socio-cognitive variable from the model that may influence task-based information seeking of individuals, which is social relevance. According to cognitive sociology, relevance results from a person's social framing of attention that distinguishes relevant things from irrelevant ones. In order to identify social relevance, it is necessary to see if there is any difference in individuals' mental acts of attending to certain things while conducting a task, between different thought communities, particularly when individuals identify information problems of a task. For this question, specific kinds of subtasks and of information needs by individuals should be examined. Subtasks are considered to be the representation of information problems of a task. Information needed to perform a task is also important in understanding how individuals frame relevant or important information in doing the task. Once the data about cognition and behavior with respect to subtasks and information needs for a task are collected from different communities, the groups should be compared to find the differences between them and reasons for the differences. This process is performed in a similar way to RQ1.

RQ3. Are there differences of individuals' choice of action to resolve the information problems in different thought communities?

- If there are differences, what are they, and what are the reasons for the differences?

After identifying information problems, a task doer needs to decide how to resolve the problems by choosing certain actions, such as actions related to information seeking and use for resolving the problems. This act may be also influenced by social

understanding or social relevance. For example, a task doer may evaluate information items as a member of a particular thought community, applying the judgment criteria learned from the community to information assessment. Also, he/she may access certain information sources relevant to their community to obtain information needed according to the social relevance gained from the thought community. That is, the same task can be conducted through different kinds of actions by members in different thought communities, if they become socialized to selectively attend to certain things in their community.

This question necessitates data concerning detailed actions to complete subtasks and information-related actions that occur while performing a task, for instance, selecting and accessing information sources, using, communicating, and evaluating information found, etc. Once such data are collected, similar to RQ1 and RQ2, data from different thought communities need to be compared. Analysis of reasons to choose certain actions is required if there is any difference between the communities caused by social factors of the communities.

Overall, the three research questions mainly aim to identify whether individuals are influenced by their sociomental acts when they perceive and perform a task, and interact with information. Comparative analysis between different thought communities is required to confirm the differences of behavior and thoughts in such communities and to discover sociological backgrounds or reasons leading to such distinctive behavioral and cognitive aspects of the communities. Detailed methods to collect data are discussed in depth in the following chapter.

CHAPTER 4. METHODOLOGY

4.1 Methods Used in Previous Work

This section reviews research methods used in the previous empirical studies that analyzed task-based information seeking behavior and socially constructed cognition and behavior in order to find proper methods for this study.

4.1.1 Survey

A survey is a common method for analyzing the relationships between cultural constructs and social actions, especially when the sample is large. For instance, Miles (2015) analyzed whether individuals' values in mind as a type of cultural construct can predict their actions. The researcher utilized the European Social Survey, a cross-national, representative survey participated by 47,537 people. Vaisey and Lizardo (2010) also used a large survey to examine cultural worldview's effects on network composition with 3,290 teenagers. The data were obtained from National Study of Youth and Religion that contains information on several measures of network composition and measures of moral-cultural worldview, including expressive individualist, utilitarian individualist, community-centered and theistic. Beyerlein and Vaisey (2013) analyzed the data from Religion and Public Activism Survey (RAPAS) answered by 2,898 adults in the U.S., to assess whether moral worldviews can help explain why certain people engage in different types of civic actions. Casey, Riseborough, and Krauss (2015), who conducted a research into the relationships between national culture and safety perception and performance, exploited the survey instrument with 562 employees in multinational organizations. The

survey method is useful to discover or confirm general patterns of human behavior in context and when a large number of participants can be recruited for a study. However, it stills requires a need for qualitative data in understanding individuals' cognitive activities more in depth.

4.1.2 Interview

Qualitative interviews have been constantly used as a primary means for identifying socially- or contextually- influenced information behavior. Cobbledick (1996) analyzed information seeking behavior of artists by conducting in-depth interviews. Agada (1999) interviewed a community of a particular race and of an occupation (i.e., African-American gatekeepers) to understand their information use environment (IUE) and information behavior. Also, Landry (2006) studied the effects of work roles and associated tasks on the choice of information sources by using interviews. Specifically, she conducted vignette-based in-depth interviews with 12 dentists by creating five different scenarios, representative of work role-associated tasks that they may encounter. Käsäkoski and Huotari (2015) chose semi-structured interviews for research on relationships between health professionals' information behavior and their organizational context. Also, Jarrahi and Thomson (2017) conducted in-depth semi-structured interviews to analyze information practices of 31 mobile knowledge workers.

Additionally, an interview is suggested as a method for studying practice-based behavior in sociology. Nicolini (2009) introduced a specific interview technique for practice-based research; “interview to the double”, which is a methodology for

articulating and representing practice by asking interviewees to imagine they have a double who will have to replace them at their job the next day.

In sum, interviews are useful to elicit specific information behaviors of individuals in certain contexts and factors or reasons relevant to their behaviors, as they allow a researcher to focus on the interplay between individuals and information context. Although this method is limited in applying its findings to a more general context or beyond a selective group, it still plays a vital role in generating vivid and rich information about each individual of participants, which help to analyze individuals' cognitive activities in a social context in detail for this study.

4.1.3 Observation

Observation is performed as an ethnographical method in social behavior studies. Raudenbush (2012) worked on specifying racial differences in interactions on public transportation to assess social cohesion. Three train lines were selected as a fieldwork place to be observed based on the routes' characteristics. In the observation process, verbal exchanges and gaze were particularly focused on by the researcher.

The combination of ethnographical observation and interviewing is also common in sociology and information science to capture interactions between individuals and a social context, since observations are limited to reveal individuals' cognitive activities. Vaughan (2002) conducted observations and interviews in three different contexts as case studies based on analogical theorizing, a method that compares similar events or activities across different social settings using qualitative data. Daipha (2010) also conducted a field study by interviewing weather forecasters and observing their behavior

in their workplace to analyze their visual perceptions trained and obtained within their occupational context.

In the area of information seeking, Isah and Byström (2016) examined information access of physicians in their work using both direct and participatory observations at their workplace, and interviews with 15 individuals after the observation. Similarly, Lea French and Williamson (2016) examined information practices of welfare workers. They recruited 14 workers and observed them for about 10 months, along with interviews as well as some limited document analysis with annual reports, mission statements, strategic plans. In the naturalistic task setting, Saastamoinen, Kumpulainen and Järvelin (2012) looked at the differences of searching behavior and information source uses across tasks with different complexity. They mainly employed shadowing, a qualitative data collection method that provides real time information about the subjects' actions, as an interactive observation that enables a researcher to ask questions to the participants whenever needed but not to perform a task (Saastamoinen et al., 2012). Kumpulainen et al. (2020) also collected data about historians' information interactions in task settings using interviews and observations.

Observations are an effective method to collect data about “how” by enabling a researcher to view participants' behaviors in naturalistic settings. In particular, it seems useful to obtain data about task-related actions when participants engage in an actual task. However, it is hard to understand cognitive aspects of participants in relation to their actions, such as reasons or motivations for the actions, with mere observations; thus, interviews are still required to complement this method. Also, in the case of task-related studies, observation can be complicated or impossible when a task is highly sensitive or

long-term based. Therefore, various factors of task may constraint application of observations.

4.1.4 Diary Study

A diary study is well known as an unobtrusive method which enables researchers to increase reliability and completeness of the data (Byström & Järvelin, 1995). Thus, it has been often used for analyses of information seeking behavior in naturalistic settings of information seeking. For instance, Byström (2002) used self-recorded journals and subsequent interviews for research on how individuals' perceived task complexity affects their information seeking behavior. Thirty-nine municipal administrators participated in the study, while conducting their 78 kinds of naturalistic tasks. Rieh (2004) studied 12 individuals' information searching behavior at home by collecting data from the participants' search activity diaries along with search activity logs in naturalistic tasks. Self-recorded diaries were also selected to understand the information journeys of professionals (Du, 2013) and the code-switching behavior in searching in everyday life (Wang & Komlodi, 2018).

The diary study method is useful to collect in-depth qualitative data in a natural setting. In particular, it allows for generating both real-time cognitive and behavioral data in a naturalistic task setting. However, compared to other methods, participants are expected to perform more work themselves for the study, which results in high dependency on the level of participants' dedication and contribution.

4.1.5 Summary

Overall, the review of research methods used in previous studies reveals that qualitative methods including interviews, observations and diary studies have been frequently selected to investigate socially constructed cognition and information behavior of certain communities. Qualitative data seem useful to identify social aspects of human cognition and behavior, since they allow for analyzing reasons and factors of actions in certain social contexts. In particular, task-based studies in information science have been often conducted employing a diary study method accompanied with an interview or observation. This suggests that the diary method can be proper to conduct task-based information behavior research, especially in a natural setting. Since this study explores social dimensions of task-based information seeking behavior using a novel conceptual approach, qualitative methods are more appropriate than quantitative methods that focus on generality of results. Specifically, in-depth interviews that generate “why” data of behaviors appear to be a good choice, in that the three research questions of this study require understanding of detailed reasons for different behaviors in different communities. The interview can be also accompanied by an observation to gain rich behavioral data. A diary method is another method in consideration of comparing task-related cognition and behavior. Thus, the analysis of the previous methods used in other studies suggest that qualitative methods, such as interviews, observations and diary studies, which can be used for the study of social aspects of information seeking behavior in a task setting, are likely to be most appropriate for this research. Final choice of methods is discussed more in detail in the next section.

4.2 Sources of Data

Before describing the methodology of the study, it is important to specify that this study is exploratory. Exploratory study is a type of research program in social sciences. It is often used to explore a specific topic of interest to the researcher or a relatively new subject (Babbie, 2001) and to find an alternative way to make sense the world (Reiter, 2017). It aims at applying new words, concepts, explanations, theories, and hypotheses to reality with the expectation of offering new ways of seeing and perceiving how this segment of reality works, how it is organized, or how and in what way different factors relate to each other causally (Reiter, 2017). Since social aspects, especially cognitive sociological dimensions, of information seeking behavior have gained little attention to date and cognitive sociology is a relatively new perspective on information behavior studies, the exploratory approach seems proper in finding new explanations regarding information seeking behavior in social contexts. This particular research stance is helpful for researchers to observe and analyze reality from a new and different angle, which leads them to unveil previously hidden facets of reality (Reiter, 2017). Therefore, the study adopted the exploratory approach to determine specific methods for data collection.

Based on the comprehensive review of methods in the previous work in the similar areas and the exploratory approach, a qualitative approach was chosen as methodology for this study. Qualitative methodology has strengths in generating rich data to uncover complexity, collecting data concerning ‘how’ and ‘why’ of behavior, and understanding people’s meaning in a social world (Connaway & Radford, 2017), which may not be gathered from using quantitative data. It is also good for exploring and understanding the meaning individuals or groups ascribe to a social or human problem

(Cresswell, 2014). Since this study aims to identify social aspects of mind and action and specific reasons leading to such mind and action, qualitative methodology is more suitable than quantitative methodology, which can help identify how and why individuals' mind and action are related to their social world. The qualitative approach can also meet the important goal of the study, exploring and capturing social factors related to task-based information seeking behavior which has been little studied to date. Hence, the qualitative approach is selected as the type of methodology.

Specifically, one-on-one interviews and diary were chosen for data collection. The primary method is semi-structured in-depth individual interviews. The diary study plays a supplemental role in collecting data of individuals' task-based information seeking behavior. The aim of the supplementary method is to add real-time data of individuals' cognition and behavior while working on a task to the retrospective data gained from individual interviews. Data collected from the two methods were expected to be similar as they were designed with the same questionnaire.

4.2.1 One-on-One Interview

Semi-structured one-on-one interviews are the primary method for gathering qualitative data of participants' thoughts and actions with respect to task-based information seeking in this study. Individual in-depth interviews are helpful in discovering participants' experiences and perspectives via stories, accounts, and explanations and things or processes that occurred in the past which are unobservable (Connaway & Radford, 2017). It is also known to be useful to identify relationships between information uses and the problem-solving process (Martyn & Lancaster, 1981).

The interview technique has been constantly used in the information seeking and use studies, specifically the time-line interview, the neutral questioning technique, the critical incident method (Ingwersen & Järvelin, 2006). Hence, this method mainly aims to obtain rich data of individuals' perceptions and past experiences with regard to performances of a task and relevant information seeking activity.

4.2.2 Diary Study

A diary study is chosen as a supplementary method for data collection, which has been often used to analyze task-based information seeking behavior, especially when collecting authentic behavioral data is the goal of study. The main reason for choosing a diary study as a supplementary tool was to gain additional real time data about cognitive and physical acts when performing a task and seeking information. Two short interviews are included in the diary study: initial and exit interviews. A structured diary was prepared based on the questionnaire for the interview method as a supplementary tool of data collection. Also, it is known that a structured diary can simplify diary keeping and thus encourage participants to fill them (Byström & Järvelin, 1995; Martyn & Lancaster, 1981). The diary study was used for a person currently conducting a task in their naturalistic environment.

4.3 Participants

For recruitment of participants, two methodological approaches were particularly considered: case and comparative approaches. First, a case approach was chosen for data collection. The case method often samples a single one of a person, an event, a program,

an organization, a time period, a community, a nation, or several individual cases for comparison, as a unit of analysis (Case & Given, 2016; Patton, 1990). Importantly, a case should be thoroughly examined within a bounded context (Miles, Huberman, & Saldaña, 2014), such as a social world or competitive environment (Case & Given, 2016). A case study is viewed as valuable because of the rich context in which it places the subjects of the inquiry (Zach, 2006). Primarily exploratory and explanatory in nature, a case study is used to gain an understanding of the issue in real life settings and recommended to answer how and why (Yin, 2017). Task is conceived as a particular context of information behavior that triggers an individual's information seeking activities (Courtright, 2007). Hence, the case approach can allow the researcher to gain the detail of interaction between individuals and task (Patton, 1990), which is the main focus of the study.

In the field of LIS, case studies have been shown valuable as a tool for achieving a deep understanding of a specific phenomenon, especially information seeking behavior of a particular group (Zach, 2006). For instance, Kuhlthau (1999) examined a single securities analyst in her longitudinal case study of information seeking behavior by interviewing the subject in depth twice, using eight interview questions. Although she admitted that the findings of the study cannot be considered as describing the group's process of information seeking in general, they still contribute a critical dimension that reveals the underlying rationale of the quantitative findings (Kuhlthau, 1999). She showed how to learn from details of one person and to explore a basic aspect of human information behavior (Case, 2016). Her study demonstrates that a case study is capable of addressing "why" questions of human information behavior and gaining new insight into

prior knowledge or studies even with a single entity. Despite being used less frequently compared to other methods, it seems that the case study still plays a fruitful role in providing validity of findings for the expansion of knowledge in information behavior studies.

In addition, this study adopts a cross-context comparative method to collect and analyze data. Cognitive sociologists collect evidence across multiple contexts and use a comparative method to generate analysis across the disparate social contexts (Brekhus, 2007). A comparative approach to cognition contrasts cognitive habits of different groups; for instance, Austrians and Indonesians, Mormons and Muslims, and surgeons and sculptors (Zerubavel, 2009). Accordingly, this study recruited individual cases from different thought communities to compare the communities' characteristics of the cognitive conventions used to construct community members' actions related to a task.

On the basis of the two approaches, individuals in two different thought communities were recruited, and the two groups were compared in terms of their task-related cognition and behavior. This section discusses details of participant recruitment and task type selected in this study for analyzing task-based information seeking behavior.

4.3.1 Recruiting Criteria

Desired characteristics of participants were determined in advance: a type of thought community, experience of performing a task, and professional age. First, discipline in academia was identified as exemplary of a thought community. For comparison, participants were recruited from two different disciplines, humanities and

natural sciences. Also, all participants must have at least one-time experience of performing a particular task chosen in this study: preparing and submitting a research proposal. To balance the degree of participants' socialization to their discipline between the two fields, professional age was also considered, by limiting participants to tenured professors only.

4.3.1.1 Thought Communities

Academic communities are one of the key types of thought communities according to cognitive sociology, since scholars have cultivated a professional vision and perspective by learning specialized knowledge and socially and intellectually interacting with their colleagues. Specifically, Zerubavel (1995) addressed effects of academic identity on mental structures: “the way we institutionally carve up universities into schools and departments generally reflects the way we mentally carve up the world in our minds, as well as the way we experientially construct our professional identities as scholars (p. 1093)”. Consequently, disciplines, fields, and areas of scholarship are envisioned as being surrounded by mental walls that help their members to be cognitively supported and promoted by a particular mindset (Zerubavel, 1995). Cognitive diversity in different disciplines has been also empirically confirmed by some previous research. Cetina (1999) showed different attentional styles of two science fields, high energy physics and molecular biology, which led to their different ways of dealing with problematic factors in experiments. Also, Lamont (2009) found out that decision making with respect to peer review or academic evaluation can be different depending on disciplines due to distinct criteria and values appreciated in each academic community.

Thus, this study chose two different disciplines in academia as types of thought communities that may reveal different mental structures.

Furthermore, disciplinary structures have been a common analytical framework in studies of information seeking and of information practices of scholars working within or across disciplines to provide a foundation for the development of information systems, services, and tools to support scholarship and science (Palmer & Cragin, 2008). In particular, the fields of humanities and natural sciences have continuously shown their different information behavior in other literature, such as in terms of information source selection (Allen, 1966; Rosenbloom & Wolek, 1967; Talja & Maula, 2003; Talja, Savolainen & Maula, 2004; Walsh, Kucker, Maloney & Gabbay, 2000) and information management and sharing behavior (Akers & Doty, 2013; Borgman, 2012; Weller & Monroe-Gulick, 2014). Therefore, this study builds upon existing knowledge in information behavior of scholarly communities in different disciplines, by choosing humanities and natural sciences for comparative analysis of information seeking behavior in task.

4.3.1.2 Task Type

In order to compare task-based information seeking behavior in two different communities, a certain task type should be applied to both groups. The task chosen for the analysis of task-based information seeking behavior in this study is preparing and submitting a research proposal. A research proposal can be any kind of proposal that primarily aims to obtain external funding to support one's scholarship, such as a research grant proposal or a fellowship proposal.

Basically, research task is a widely discussed task type in the literature on the academic profession, along with teaching and service tasks (Dill, 1986). In particular, writing a research proposal is an essential and critical task continuously performed by scholars in academia across fields in order for them to perform a variety of research tasks. It encompasses a broad range of subtasks entailing multiple layers of communication with various people and information seeking activities throughout the whole process. Therefore, preparing/submitting a research proposal is appropriate as a type of task in analyzing scholars' information seeking behavior in a naturalistic task setting.

From the empirical perspective, a proposal writing task was useful in the study of task-based information seeking behavior; for instance, Vakkari and Hakala (2000) chose the task of research proposal writing to analyze relationships between task stage and relevance criteria during task performance.

Also, from the sociocultural view, it is known that research culture and styles in academia are discipline-specific (Becher, 1994; Donald, 1995). This implies that cognitive and behavioral acts for writing a proposal for research may be influenced by a discipline's specific culture and norms of how to design and conduct research. Therefore, the task of proposal writing was selected as a task type triggering individuals' information seeking activity to examine how a thought community of individuals is related to their task-based information seeking behavior. All participants must have previous experience of proposal writing for supporting their scholarship at minimum of once.

4.3.1.3 Professional Age

Professional age refers to the length of a person's engagement in a particular discipline as a faculty member. This criterion is important since the length of the time that he or she has spent in a particular discipline represents the degree of socialization to the community. In order to compare individuals in the two groups as equally as possible, the professional age needs to be controlled. Accordingly, only tenured professors were invited for participation, in that receiving tenure can verify sufficient amount of time for scholars' socialization to their discipline, both intellectually and socio-culturally. However, the specific length of appointment of each individual was not considered as long as tenure was already obtained.

4.3.2 Process of Recruitment

A purposive sampling approach was used to recruit participants according to the pre-determined criteria: a thought community, task experience, and professional age. It is most often used in qualitative research to select individuals that will better inform the researcher regarding the current focus of the study (Krathwohl, 2009). It also has the advantage of matching for characteristics useful to the study, which helps reinforce validity (Case & Given, 2016). Participants were primarily recruited by email. The researcher first identified eligible tenured professors in the departments in humanities and natural sciences at a single institution of higher education in the United States from its website, and then individually contacted them by email with a recruitment letter (Appendix 1). The mode of participation (either an individual interview or a diary study) and time and place for meeting were determined through correspondence with those who

agreed to participate. Additionally, snowball sampling was used in the recruitment process: some participants recommended the researcher sending a recruitment email to their colleagues as potential participants who were qualified for this study. In such cases, the recruitment email was sent out to these professors by the researcher. Details of the study participants recruited by this process are summarized in Table 8 in Chapter 5 (See **5.1 Characteristics of Participants**).

4.4 Data Collection

In general, a case study focuses on a relatively small numbers of individuals, problems or situations to obtain an in-depth understanding (Patton, 1990). As the main goal of the study is to explore new aspects of information seeking behavior that have received little systematic empirical scrutiny, not to generalize findings of information seeking behavior in thought communities, rich qualitative data were collected from twelve participants, as a multi-case study. Multiple cases, arrayed on a continuum with few exemplars of each, or contrasted, offer the researcher a deeper understanding of the processes and outcomes of cases compared to a single case study (Miles, Huberman, & Saldaña, 2014). Using multiple cases means that we try to generalize from one case to the next on the basis of a match to the underlying theory, not to a larger universe (Miles, Huberman, & Saldaña, 2014). Thus, the researcher used single scholars, each as a case, from either natural sciences or humanities, comparing and contrasting them to one another, to understand the cognitive sociological aspects of individuals' behavior. Patton (1990) suggested five rich cases as a minimum for multiple-case sampling adequacy; Yin (2017) recommended six to ten cases, if the results turn out as predicted.

One example of the rich case study in information science is found in Kuhlthau (1999). She successfully explored human perceptions and information seeking behavior with one interview respondent from a certain professional context. Also, there are exploratory case studies that investigated information seeking of certain groups with a small-sized sample, using qualitative methods. For instance, Zach (2006) used twelve individuals to examine information seeking behavior of arts administrators using a multiple-case studies design; Lambert (2010) also conducted a multiple-case study by interviewing ten ministers, in order to identify what causes them to seek and stop seeking information.

Accordingly, twelve individual cases, including six natural scientists and six humanities scholars, were carefully chosen for this exploratory comparative study, based on the purpose and criteria of the recruitment of the study. Patton (1990) described an example of comparative case study which investigated the meaning of a specific literacy program to individuals. It was conducted using qualitative methods, data from in-depth interviews with two different individuals (Patton & Stockdill, 1987). The two cases were contrasted to illuminate the value of detailed, descriptive data in deepening their understanding of individual variation (Patton, 1990). Given the experience of prior researches, six individual cases from each thought community should be sufficient to generate data rich enough for analyzing similarities and differences between two communities, in terms of how individuals think and behave.

Among the twelve participants, eleven individuals were interviewed and one individual from the natural sciences participated in the diary study. More details are discussed below.

4.4.1 Instrument Protocol

First, questions that guide the overall process in interviews and a diary study were developed. The questionnaire for the interview protocol was created first, and then modified and reorganized to be proper to the diary setting, which involves an initial interview, a diary keeping stage and an exit interview.

The questionnaire mainly consists of four topics for inquiry: background, perception of a task, subtasks of a task, and information-related activity of a task. The first set of questions is related to participants' academic background information and proposal writing experience in their thought community. Then, their perception of task is addressed in the next set of questions. Next, they are asked to recollect a memory of writing a research proposal in the past and answer questions regarding what it was, and how they perceived and conducted this task. Based on the subtasks described by participants, information seeking activity related to such subtasks is investigated, to understand their information needs and other information-related actions. A "why" question is added to some questions related to a participant's perception and behavior if necessary. Table 2 shows selected questions from the initial interview protocol and data types relevant to the questions. A full list of initial interview questions is included as Appendix 4.

Table 2. Sample Interview Protocol Questions for Data Types

Data Type	Interview Questions
Background	<ul style="list-style-type: none"> • What discipline have you been involved in? • Please describe your education history, from first college degree to the highest degree.

	<ul style="list-style-type: none"> • How long have you been a faculty in higher education, including the time when you worked at other institutions in the past? • How long have you been writing a research proposal? • How often do you write a research proposal?
Perception of a task	<ul style="list-style-type: none"> • How do you perceive the proposal writing work as a scholar in your field? How do you think it is important for you to get support in your scholarship? • Could you freely talk about your proposal in detail so that I could understand the nature of your proposal? • What were the most important tasks or priorities among the whole set of tasks you performed from thinking of the project to submit it, and why?
Subtasks	<ul style="list-style-type: none"> • Could you please describe how you developed the proposal, particularly in terms of some phases, for instance, early, mid, and last phases?
Information-related activity	<ul style="list-style-type: none"> • Could you tell me about your information seeking activity from [Subtask 1], such as kinds of information that you needed, sources or channels you accessed to get the information needed? What made you choose such sources? • How did you evaluate and select the information items among what you found from information seeking activities? • How did you use, manage, or communicate the information that you selected? Please also tell me why you did so.

4.4.2 Interview Process

Individual in-depth interviews were conducted either face-to-face (n=10) at a participant's office or Skype (n=1) depending on the preference of the participant. The interview began with providing the participant with an informed consent form and audio-recording consent form (Appendix 2). The participant read and signed before starting a conversation with the researcher. Each interview was recorded and transcribed. The length of the interviews ranged from 40 minutes to 2 hours. The interview was guided by

the interview protocol (Appendix 9). Specific questions and the order of the questions within a topic were subject to change depending on participant's answers.

4.4.3 Diary Study Process

The diary study method also used the same questionnaire as the interview method; only the order and structure of the questions were reformulated, specific to the diary setting. The diary template was developed using *Qualtrics*, an online survey design tool. Some questions were added in the diary study, particularly for the exit interview which aimed for further investigation and clarification of participant-generated data from diaries.

As the first step, the initial interview (Appendix 10) was conducted to inquire of the participant's academic background, the nature of a task, and perceptions of a task, and to explain how to keep the diary. The participant was given the informed consent form for the diary study and audio-recording consent form (Appendix 3) at the beginning of the meeting. The interview took approximately a half hour. After the first interview, the participant began to record the diary on the online form over a month whenever he/she completed a subtask entailing information seeking activities while writing a proposal. Appendix 11 shows the instructions and questions included in the diary template. After the participant completed the task, a final exit interview was scheduled on a week after submission of the last diary entry. For a week, the exit interview questions were finalized based on the review of the participant's diary entries and the questionnaire developed in advance (Appendix 12).

4.5 Pilot Study

Before starting final data collection, a pilot study was conducted with three individual interviews and one diary study. The goal of the pilot study was to test whether data collection instruments were appropriate to produce data in answering the research questions using the protocols developed. The pilot participants were recruited from outside the targeted disciplines: the three interviewees were from social sciences and the one diary participant was from engineering. They were all tenured, having experiences of proposal writing.

4.5.1 Methods

For testing the interview method, three individual interviews, two face-to-face meetings and one online meeting, were conducted. They lasted from 45 minutes to 100 minutes and were audio-recorded. Appendices 1-8 are the forms and data collection instruments approved by the Rutgers Institutional Review Board and used for the pilot study. The consent form (Appendix 2) and the questionnaire for interviews (Appendix 4) were used.

The pilot diary study consisted of three steps: an initial interview, diary keeping, and a final interview. The first interview, lasting around a half hour, was done to introduce the overall study and how to keep a diary, provide a consent form (Appendix 3), and ask a few questions about how the participant perceives proposal writing. This interview protocol can be found in Appendix 5. The diary keeping stage was limited to two weeks due to time constraints. The participant generated 7 diary entries based on one particular proposal writing task for a new research project. After finishing the diary stage,

an exit interview was performed for less than a half hour, asking additional questions concerning the participant's task-related thoughts and behaviors and clarification of some of the data from the diary entries and obtaining general feedback regarding participation in the diary study.

4.5.2 Results

Pilot interviews confirmed that two hours were sufficient for an in-depth interview using the protocol, and that the interview questions generated usable and effective data for answering the three research questions. Similarly, the pilot diary study revealed a reasonable process of study participation with the online diary tool using the diary template designed by the researcher.

The results of the pilot study did not address whether the data collected could answer the research questions, which require comparison between different thought communities, due to limited recruitment for the pilot study. However, overall, the pilot study results indicated that expected data, including a person's perception and performance of task and related information seeking activities, would be collected using the existing instruments and their protocols.

The results also suggested a need for revising protocol to collect more relevant and accurate data about participants' task-related background and information seeking activity. Details of such revisions are addressed in the following section.

Finally, the results of the pilot studies allowed the researcher to develop the preliminary codebook, which was used as the basis for creating coding in the main study.

4.5.3 Implications for the Main Study

There are some implications of the pilot study that are relevant for the conduct of the main study, including revision of the protocols. First, it is worth noting that reasons for some of the task-related actions were closely related to their identity as a scholar in the academic community (e.g., focusing on peer-reviewed papers, accessing academic databases), rather than just as an individual. For instance, the participants looked for information from peer-reviewed papers, which are commonly known to be highly acceptable source of information in academia. Such knowledge was gained as a member of the academic community by becoming socialized to academia. Also, the participants utilized information sources, academic databases, which have been considered reliable and trustworthy as a source of information in academia, which non-scholars may disattend. Based on the effect of an academic community on scholars' cognition, it can be speculated that a discipline, as a subculture of academics, may also impact their reasons for actions in performing a task; for instance, focusing on particular subtasks conventionally done within a discipline, or accessing particular information sources greatly valued within a certain domain. Thus, the analysis of pilot study suggested that differences between disciplines could be discovered in the actual study when participants are recruited from two different thought communities where discipline-specific research culture and shared knowledge of valuable sources/channels exist. Such differences could be explained with cognitive sociology's conceptions of socialized perception and attention, as suggested in the theoretical model of this study.

The results of the pilot study also suggested a need for revision in the questionnaires for both interviews and the diary study, by modifying, adding and

removing some of the questions. First, a question concerning a participant's understanding of a task in terms of its importance was changed to an open-ended question from a scale-based question, which helps obtain richer data of how a scholar perceives and interprets a task from his/her own words. Also, questions regarding participants' overall background related to proposal writing, such as frequency of proposal writing and years of proposal writing, were newly added to understand their experience of the task better. Furthermore, a question concerning a participant's learning experiences in understanding how to write a good proposal was added in order to acquire more data about how and why their understanding of a proposal task has been constructed within their discipline. Finally, questions about evaluation of information sources were eliminated, in that it was complicated and time-consuming to ask participants the questions about how they evaluated sources used individually, and more importantly, because the focus of this study is concerned with types of sources chosen by participants and reasons for such choice, rather than assessments of specific sources. Demographic questions were also removed since they are unnecessary in analyzing the research questions of this study. Hence, after the processes of the pilot study, some changes were made and applied to the data collection instruments, including both interview and diary study. The final versions of instrument protocols are presented in Appendices 9-12.

4.6 Data Analysis

Data collected through individual interviews and the diary study were interpreted by a coding process, a process of denoting concepts to stand for qualitative data (Corbin & Strauss, 2015). In total, 13 interview transcripts (including 11 individual interviews

and 2 short interviews from the diary study) and 2 spreadsheets of diary entries were analyzed. As the first step of data analysis, verbatim responses to each question from audio recordings of interviews were transcribed. Diary entries submitted online were transferred to the Microsoft Excel spreadsheets in order to collect and line up all answers according to each of the diary questions.

4.6.1 Process of Coding

All of the transcripts and spreadsheets of diary entries were imported to NVivo, software for qualitative data analysis. It is useful for the entire process of qualitative research since it enables researchers to assign and change codes for transcripts, calculate inter-coder reliability (ICR), and generate coding queries (Connaway & Radford, 2017). Using the software, open coding was conducted in two phases, initial coding and focused coding (Charmaz, 2014). First, the researcher read through a transcript and tentatively assigned a code in a word or short phrase that summarized the content of the texts, ranging from a phrase to a paragraph, as the first cycle of coding. Codes are labels that assign symbolic meaning to the descriptive or inferential information compiled during a study (Miles, Huberman, & Saldaña, 2014). In the initial stage, the researcher remained open to all possible meanings and constructs indicated by the data collected (Charmaz, 2014). After the labels were assigned in the initial coding, a focused selective phase was followed by sorting, synthesizing, integrating, and organizing the initial codes. In this stage, axial coding was performed, grouping the initial codes into a smaller number of themes and subthemes (Miles, Huberman, & Saldaña, 2014).

Throughout the coding process, the technique of constant comparison, an analytic strategy for qualitative data (Glaser & Strauss, 1976), was employed. Making constant comparisons refers to the act of taking one piece of datum and examining it against another piece of datum both within and between documents in order to determine if the two data are conceptually the same or different (Corbin & Strauss, 2015). Such comparison allows researchers to reduce data to concepts and to clarify relationships between concepts (Corbin & Strauss, 2015). It is also known as a strategy for increasing the validity of findings (Silverman, 2005). Since this study is exploratory, generating a large amount of narrative data and a diversity of concepts, this technique was important in identifying mutually-exclusive codes as well as in grouping or separating data appropriately.

The final codes were grouped into major themes, derived from the three research questions and the preliminary theoretical model of the study (See Figure 1), and each major theme incorporates specific subthemes that group the codes. Some codes were further redefined as subcodes or sub-subcodes, more detailed identifiable parts of codes, if needed. After this process, the first version of a full coding scheme was developed. Table 3 depicts an excerpt of the codebook. The full codebook is presented in Appendix 13.

Table 3. Codebook Excerpt from Major Theme “Understanding of Task”

Code	Definition	Example
Characteristics	Traits or attributes of proposal writing task that are perceptually present by participants	
Collaboration	Whether a task requires collaboration	

Collaborative work	Proposal writing is collaborative	
Interdisciplinary project	A research project conducted by scholars across disciplines	“I did the microbiology direction. Somebody else did chemistry, somebody else did engineering, somebody else did toxicology and then we all worked together. Even the sociology part did a proposal” (P5)
Multi-institutional project	A research project collaboratively conducted by scholars from multiple institutions	“There’s one PI and then I think we have eight co PIs at different institutions.” (P3)
Solitary work	Proposal writing is individual work	“There was no collaboration. It’s just for the individual scholar. So it’s not a collaborative project” (P9)
Research-oriented	Task’s characteristic related to research	
Natural extension of research	Task is a part of general scholarly research activity	“It’s just a natural extension of what we do. We are doing, everybody is doing some kind of research and then you have an idea that this topic has not been explored before.” (P12)
Synthesis of ideas	Task requires synthesis of research ideas	“The work I do has always sought to bring different things together rather than one well identified thing.” (P10)
Successfulness	Whether proposal is succeeded or failed	
High success rate	Proposals were highly accepted	“Our success rates maybe around 20, 30%, which is pretty high.” (P3)
Low success rate	Proposals were not often accepted	“I find it the hardest thing to do. It’s got the lowest success rate” (P2)

4.6.2 Validity of Coding

As a means for evaluating reliability of the coding by the researcher, inter-coder reliability (ICR) was measured. ICR evaluates the extent to which different coders make similar coding decisions in assessing the characteristics of text (Kurasaki, 2000). It is important as systematically different patterns of coding might result in substantial bias in research results (MacPhail et al., 2016). For ICR, approximately 20% of the anonymized data (three transcripts in total) were sent to two different coders, two transcripts from the natural sciences to the second coder and one transcript from the humanities to the third coder. The researcher (the first coder) trained the others in how to use the codebook (Appendix 13) to code a transcript.

ICR was calculated using Cohen's Kappa, a summary of how well coders agree when applying codes to data (Connaway & Radford, 2017). It provides a more robust measure than a percent agreement, as it considers the possibility that agreement on codes could have occurred by chance alone (Connaway & Radford, 2017). For the analysis of ICR, in particular, a negotiated agreement approach was chosen. Negotiated agreement is where two or more researchers code a transcript, compare codings, and then discuss their disagreements in an effort to reconcile them and arrive at a final version in which as many as discrepancies as possible have been resolved (Campbell et al., 2013). It is known to be advantageous in exploratory research where generating new insights is the primary concern (Campbell et al., 2013). For this reason, the process of calculating ICR included the activity of discussion and reconciliation between the researcher and the other coders. For example, once the second coder finished coding of one transcript, the researcher calculated ICR with her coding results and reviewed discrepancies with the researcher

before moving onto the next transcript. The coders initially achieved 0.21 of ICR at the first round of coding comparison, so they conducted the negotiated agreement process. Consequently, ICR was raised to 0.64. After that, the second coder continued coding of the second transcript. Finally, ICR with the second coder was calculated with the two transcripts, as 0.68. The third coder also coded one transcript from the humanities community, based on the codebook that was slightly updated in the process of reliability assessment and negotiation with the second coder. The value of ICR calculated with the third coder was 0.85, which is sufficiently high to not require the negotiated agreement process. In consequence, Kappa for all coding categories for all three coders was 0.75, which is indicative of strong agreement, with values of ICR over 0.70 being consistently used in exploratory research (Lombard, Snyder-Duch, & Bracken, 2002).

4.6.3 Comparative Analysis

In order to answer the research questions seeking differences between different thought communities, data from the two thought communities were compared. Comparative analysis was performed based on occurrence of the codes. However, the occurrences of the majority of the codes were low since it is a qualitative case study with a small number of participants, which led to numerous codes. Thus, rules of how to analyze difference and definitions of difference were defined for rational and reasonable comparison. These criteria are developed to decide if they are similar, different, or not different, based on the difference of code occurrence between the natural sciences and the humanities.

4.6.3.1 Similar

First, similarity between the two communities was found when a code occurred at the same number of times in the two groups, at the minimum of twice in each group, or only one difference between them. Table 4 presents the sample codes considered to be similar between the two groups according to their code occurrences.

Table 4. Examples of Codes Evaluated as Similar

Code	Frequency of Code Occurrence	
	Natural Sciences	Humanities
Library	3	4
Writing a resume	2	2
Literature review	4	5

4.6.3.2 Different

Difference was confirmed when a code occurred different times in the two disciplines, particularly at least two differences of the instances between them in consideration of the small maximum number (6) in each group. For instance, the code of “planning a research process” occurred twice in the natural sciences, in contrast to none in the humanities. In such a case, the “difference” was marked on this code. Table 5 presents more examples of the codes understood as different between the two communities.

Table 5. Examples of Codes Evaluated as Different

Code	Frequency of Code Occurrence	
	Natural sciences	Humanities
Planning a research process	2	0
Demonstrating research significance	1	3
Department’s administrator	4	1

4.6.3.3 Not Different

Some codes are considered to be “not different” between the two communities in two cases. First, when a code occurs once in each community, it is not different between them since one-time occurrence of codes is hardly indicative of characteristics of the communities. Second, when a code occurs once in one community and twice in another community, it is also considered “not different” between groups. Such cases should be understood as neither different nor similar, rather not different. Specific examples are present in Table 6.

Table 6. Examples of Codes Evaluated as Not Different

Code	Frequency of Code Occurrence	
	Natural sciences	Humanities
Feedback on proposal	1	1
Compiling files for submission	2	1

4.6.3.4 Exclusion

Codes that occur only one time in total are excluded for comparative analysis. For example, the code of “data repository” occurred only once in the natural sciences. It is excluded for the analysis of characteristics of the group. The similar examples are shown in Table 7.

Table 7. Examples of Codes Excluded for Comparative Analysis

Code	Frequency of Code Occurrence	
	Natural sciences	Humanities
Grant specialist	1	0
Previous grantee	0	1
Writing an annual report	1	0

CHAPTER 5. FINDINGS

In this chapter, findings of the study are reported, including a summary of participants' background information and results of data analysis according to the three research questions.

5.1 Characteristics of Participants

5.1.1 Academic Background

Participants were all tenured professors in the fields of natural sciences or humanities, working at the same institution of higher education in the United States. In total, six natural scientists and six humanities scholars were recruited and participated in the study. Eleven people participated in an individual interview, and one participant from natural sciences conducted a diary study over a month, submitting 16 diary entries based on two proposals. Professional age and gender were balanced between the two groups. The averages of professional age in the two groups are 21 and 20.8 respectively. Three males and three females from each discipline participated in the study. A participant number was assigned to each of the participants in the process of data collection and for the descriptions of data analysis when presenting and quoting their answers in this dissertation. Table 8 presents participant number, specific department, professional age, and gender of the participants and the data collection method.

Table 8. Participants' Academic Background and Data Collection Methods Used

Participant Number	Discipline	Department	Professional Age	Gender	Method
P1	Natural Sciences	Ecology	20	Male	Interview
P2	Natural Sciences	Environmental science	15	Female	Interview
P3	Natural Sciences	Oceanography	24	Male	Interview
P4	Natural Sciences	Microbiology	20	Female	Interview
P5	Natural Sciences	Microbiology	28	Male	Interview
P6	Natural Sciences	Neuroscience	19	Female	Diary
P8	Humanities	Religion	26	Female	Interview
P9	Humanities	Art History	39	Female	Interview
P10	Humanities	History	17	Male	Interview
P11	Humanities	Linguistics	12	Male	Interview
P12	Humanities	Religion	16	Male	Interview
P13	Humanities	History	15	Female	Interview

Note. P7 was excluded since the data were concerned with a different type of task.

5.1.2 Task-Related Background

Participants' overall experience of proposal writing was examined in order to understand their typical relationship with the task, in terms of three perspectives: how long they have been writing proposals in academia, how often they write a proposal, and how much time they spend on writing a proposal. There seems little difference between the participants in the two disciplines in their background with respect to proposal writing tasks.

First, the majority of the study participants, across the two disciplines, have been writing research proposals since they were graduate students. For example,

“As early as my senior year of college. So I wrote an NSF proposal for grad school when I was a senior in college.” (P6)

“Since I was a graduate student. Let's say since 1976.” (P9)

What is different in the two communities is that two of the natural scientists particularly mentioned the start of proposal writing work as a postdoctoral researcher, for example, P2 said that “the first time I wrote a proposal was as a postdoc, so that probably was 1999”. Table 9 presents specific frequencies of the codes regarding since when the participants have been writing research proposals.

Table 9. Frequency of Codes of the Participants’ Proposal Writing Age

Code	Frequency of Code Occurrence	
	Natural sciences	Humanities
Since a graduate student	4	6
Since a postdoc scholar	2	0

Also, how often participants write a proposal was asked. Half of the natural scientists said that they write a proposal very frequently, several times a year. For example:

“I would say maybe five or six proposals a year.” (P4)

“I write about 10 a year, so close to one a month.” (P6)

Others in this group reported every year or every two or three years. For example, P1 said that he “annually” writes a proposal, and P5 said “every couple of years. Maybe one every two or three years”.

Some scientists made particular mention of change in frequency of proposal writing throughout their career stage. For example:

“I’m also later in my career now, so I’m at the point where I don’t write a lot of proposals.” (P2)

“Nowadays, I am approaching my retirement, and I very rarely write a research proposal.” (P4)

On the other hand, none of the humanities scholars said that they write a proposal very frequently, unlike the natural scientists; yet some of them are likely to write a proposal irregularly, for example:

“That [frequency of proposal writing] depends on when you have a new project.

So, I just completed a very large project that took 15 years, which was my last book. That was a history of the origins of the [deleted for anonymity] which is the first free [deleted for anonymity] in the world. That took 15 years. What that means is the process of when I apply for a grant is irregular.” (P10)

“I had not written a research proposal in about maybe five years, six years, but last year I wrote two related ones.” (P9)

Other scholars in this group tend to write a proposal every year to every four years, such as:

“Probably, once every two years.” (P8)

“In terms of trying to get funding, maybe I’ve written every three or four years.” (P12)

Last, the total period of preparing and writing proposals was examined. Most of the participants, four natural scientists and three humanities scholars, stated one to two months. The examples are as follows:

“I would say it took me two months to write the proposal on the weekends.” (P5)

“A month probably? Worked on and off for a month.” (P13)

One particular difference in the two disciplines is that, only the natural scientists provided an example of long-term preparation for a proposal. For example, two of the natural scientists stated they needed a year to prepare for a proposal:

“If I had to do, if this was open, competitive, it can take upwards of a year to put all the information together.” (P1)

“We will literally spend a year writing that proposal. We will have it reviewed drafts by friends. So that’s sort of an example of one that is like a big effort.” (P3)

Therefore, there are slight differences between the two communities in terms of the participants’ task-related background: the natural scientists wrote proposals during their postdoc appointment and tend to engage in proposal writing tasks more frequently and over a longer period of time.

5.2 Comparison of Task-Based Information Seeking Behavior in Different Thought Communities

This section presents the results of differences of task-based information seeking behavior between the natural sciences and the humanities and reasons for the differences according to three aspects derived from the three research questions: understanding of task, relevant information problems, and choice of action for task completion. In each part, how the two communities are different is demonstrated first, followed by details of why they are different.

5.2.1 Understanding of a Task in Different Thought Communities

RQ1. Are there differences of individuals’ understanding of a task in different thought communities?

Participants’ understanding of a proposal writing task was analyzed from 10 different aspects as follows:

- Relevant funding types to the participants
- Characterization of a task
- Familiarity with a task
- Complexity of a task
- Difficulty of a task
- Importance of a task
- Feelings about a task
- Priorities of a task
- Challenges in doing a task
- Criteria for selecting a funding opportunity

These became the subthemes under Understanding of Task in the coding scheme, as shown in Table 5. Codes under these subthemes are specific qualities or properties of the task perceived by the participants and their feelings toward the task. After the analysis of participants' understandings of the task, the two thought communities, natural sciences and humanities, were compared to identify if, how and why they are different in perceiving the same type of task. Table 10 summarizes subthemes of understanding of task and their related codes, results of comparative analysis for each code, and which discipline had more occurrences if different. Comparison between the two groups followed the rules defined in the previous chapter (See **4.6.3 Comparative Analysis**).

Table 10. Codes of the Major Theme “Understanding of Task” and Comparative Analysis of Code Occurrence

*SI: Similar, ND: Not Different, NS: More Occurrences in Natural Sciences, HU: More Occurrences in Humanities

Subtheme	Codes	Comparative Analysis
Task characterization	Collaboration	NS
	Research-oriented	HU
	Successfulness	NS
	Time	NS
Relevant funding types	External research grant	NS
	Fellowship	HU
	Institutional grant	HU
	Subvention	HU
Familiarity	Very familiar	SI
	Somewhat familiar	SI
Complexity	High (4-5)	HU
	Low (1-3)	ND
	Variable	NS
Difficulty	High (4-5)	SI
	Medium (3)	ND
	Low (1-2)/Not difficult	ND
Importance	Very important	NS
	Somewhat important	HU
Feelings	Negative	NS
	Positive	NS
Priorities	Budgeting	ND
	Demonstrating research significance	HU
	Designing a research project	ND
	Understanding funding agency's needs	NS
	Writing a proposal clearly	SI
Challenges	Anonymous reviewers	HU
	Budgeting	SI
	Co-working	NS
	Finding a right funding opportunity	HU
	Variations of funding agencies	ND

Criteria for selecting a funding opportunity	Life issue	ND
	Perfect fit	ND
	Request by a funding agency	ND
	What I really want	ND

Different code occurrences between the two communities were found from seven types of the subthemes, including relevant funding types, task characterization, complexity, importance, feelings, priorities, and challenges. Differences were not found between the two groups with respect to criteria for selecting a funding opportunity, familiarity with the task, and difficulty of a task. Specific differences and reasons for such differences in each aspect are described below.

5.2.1.1 Task Characterization

How participants characterize a proposal writing task was analyzed and compared between the two disciplines in order to articulate what aspects or dimensions of the task are particularly recognized by members in each group. Some characteristics of the task were recognized by both of the groups, such as synthesis of ideas and time consuming. However, differences appeared more explicitly than similarities in terms of characterization of the task.

Differences. The major distinction between two communities is that, while all of the natural scientists viewed proposal writing as a task entailing collaborative processes, the humanities scholars revealed the opposite, viewing it as solitary work. For instance, the natural scientists said:

“When you write a proposal, you really have to collaborate.” (P2)

“I usually collaborate, two or three people at a time on a grant.” (P1)

They also mentioned that it involves interdisciplinary or multi-institutional collaboration:

“There is one PI and then I think we have eight co-PIs at different institutions.”

(P3)

“Everybody wrote their own proposal for their own research, but it was all the same topic. I did the microbiology direction. Somebody else did chemistry, somebody else did engineering, somebody else did toxicology, and then we all worked together. Even the sociology part did a proposal.” (P5)

In contrast, humanities scholars made different comments, saying that proposal writing is usually performed on their own:

“There was no collaboration. It’s just for the individual scholar. So, it’s not a collaborative project.” (P9)

“No collaboration, which is normal in the humanities, it’s not like the sciences.” (P10)

Another distinctive perception of the humanities scholars with respect to characteristics of a proposal writing task is that proposal writing is viewed as a natural extension of their general scholarship. P12 described that proposal writing is “just a natural extension of what we do. Everybody is doing some kind of research and then you have an idea that this topic has not been explored before and it’s very important we should feel”.

On the other hand, what is more prevalent among the natural scientists is that they are likely to focus on successfulness of the task, whether a proposal was accepted or not. They commented on the success rates of previous proposals, which was not addressed by the humanities scholars at all. For example,

“We also know what grants were likely to be successful with, our success rates maybe around 20, 30%, which is pretty high.” (P3)

“I think we were very good and we were funded a lot. I think above average rate of success.” (P4)

Furthermore, the natural scientists tend to relate long-term research projects to proposal writing, as P1 and P3 said that:

“I’ve been working on this larger grant since 2002 and I write a new narrative for a new component to the grant every four years. So, this would be a new project that was just written that should go from 2019 to 2023.” (P1)

“That [proposal] is with the National Science Foundation. So, we run a time series site and Antarctica, and this is our 27th year of the time series” (P3)

Reasons. One of the noticeable differences between the two communities is concerned with whether a proposal writing task is perceived as work collaboratively performed or not. The difference may be caused by a social norm of natural sciences that research is typically collaborative. P4 explained why collaboration is necessary in natural sciences’ research: “The natural sciences nowadays are very complex. So, people often work in teams because it’s so complex that no one person can have all the expertise. So, you need expertise from different people in order to create a full picture”.

Another reason can be explained based on funding agencies’ preferences since funding agencies are more likely to fund a research project that is collaborative:

“The big federal agencies, NSF, NIH, EPA, they want these big collaborative proposals.” (P2)

“They [funding agencies] wanted to fund everybody working together, so we had to coordinate what we were working on.” (P5)

In contrast, the humanities scholars’ opposite way of perceiving the task as solitary activity may be associated with their relevant funding type, fellowships. A fellowship is typically a merit-based scholarship given to individual scholars, reflecting that collaboration is not necessary. Thus, the humanities scholars who mostly apply for fellowships tend to have little to do with collaboration.

Also, their typicality of not collaborating with others in their scholarship may be another reason, as reported in previous research; for instance, Becher (1994) addressed the individualistic nature of humanities, and Toms and O’Brien (2008) also pointed to humanists’ analysis that occurs during reflections and in the individual’s mind, which leads to their reputation of being loners. Such evidence explains their individualistic thinking and acting for their scholarship.

The humanities scholars’ interpretation of proposal writing as a natural extension of their general scholarship may be attributed to their common consideration of teaching as a type of key research activity in their community, since teaching is naturally connected with their research projects, as P9 explained: “Since I’m teaching, it’s a way of bringing my research program into my teaching and allowing my teaching to advance my research program until I have the time to actually devote full time to the project”.

Also, the natural scientists’ distinctive attention to success rates of the task may be related to the discipline’s norm of obtaining grants. For example, P3 stressed that proposal writing is “almost a requirement that they [scholars] will do. Even if we don’t need the money, it’s more that they need the training, because it’s like grant writing is a

skill. For our field, it's expected". Due to the importance of external funding in their field, they become highly sensitive and attentive to success rates of proposals more than humanities scholars.

Finally, proposals for long-term research projects, more mentioned by natural scientists, may be influenced by the nature of their specific research area which requires a long period of time to be completed, sometimes even longer than their professional career. For example, P1 described his long-term research project because of the research subject: "I have another project that I set up 22 years ago, and I am building a small team of scientists to take it over from me because I want it to be a 35-year study. But I'm going to probably retire before the study's done. So, I have to build the team to take it from there, because trees take time. We manage trees on 75- and 100-year rotations".

Another reason is related to their purposes of funding application, including continuing research and funding people. Long-term projects are usually linked with large grants, as P6 said: "Now I have a pretty large grant, so I renew that every five or six years". Such big grants enable them to continue their research and pay researchers in their lab consistently.

5.2.1.2 Relevant Funding Types

Despite the same task type applied to both groups for this study, writing a research proposal to obtaining external funding for supporting one's scholarship, specific funding bodies or sources that the communities consider for proposal submission may vary. Accordingly, target funding types on which the participants principally focused for their proposal writing were compared as a part of analyzing their understanding of a task.

Differences. The difference for relevant funding types in two communities was striking. The most relevant funding type for the natural scientists was external research grants, particularly those from federal agencies (e.g., National Science Foundation, National Institutes of Health). Every participant in natural sciences has applied for this type of funding sources, for example:

“This [funding agency] will be a McIntire-Stennis grant, which is federal funding for forestry.” (P1)

“My preference for the grant writing side is Office of Naval Research. It’s the US Navy. They’re the oldest science agency in the country. (P3)

“I’ve also written NSF and the DOD, Department of Defense grants.” (P5)

On the other hand, very few of the humanities scholars mentioned their experience of proposal writing for research grants. Instead, a primary funding type to them was a fellowship. All of the six humanities scholars talked about fellowships when it comes to proposal writing tasks, whereas only one natural scientist mentioned experience of proposal writing to apply for a fellowship. For example, P9 and P10 explained proposal writing for fellowships as follows:

“More recently, I have applied to residential fellowships. That was a residential fellowship, I should say, a few years ago when I was a resident in Genoa, Italy. It was only a month and a half, a short-term residency. Last year, I applied for residency in North Carolina for a semester, in the national humanities center in North Carolina.” (P9)

“I was a fellow at the Institute for Advanced Study in Princeton where for one semester I could do my own work. I could review the research that I had gathered, write chapters, formulate my ideas.” (P10)

Also, subventions and institutional grants were exclusively relevant to humanities scholars:

“I applied to an internal grant for (Institution’s grant program) to publish some work and subvention grant to make it open access.” (P11)

“There are also all the smaller grants. I was talking about subvention grants, small research grants that allow you to go to a library or archive.” (P13)

Reasons. First off, differences of relevant funding sources in natural sciences and humanities seem to be related to different reasons for applying for funds in the two fields. Fundamentally, the natural scientists believed that funding is essential to continue their research in general. For example, P4 and P6 highlighted the necessity of funding in conducting research:

“You cannot do research unless you get funding to do research in the natural sciences.” (P4)

“I think funding is, especially in my field, extremely important because you can’t go forward.” (P6)

Another crucial reason that the natural scientists write a proposal was to earn money for funding people in their laboratory, such as students, researchers and administrative staffs. Five of six natural scientists explained that they essentially need extra money to pay the lab members.

“The money that I bring in funds graduate students or undergraduate students, so I don’t work by myself.” (P1)

“So that’s like the group is grown and so your technicians, you’re completely responsible for. University doesn’t give you any money for your graduate students. You might get some university support, but you’re still paying for a lot of them. I think we’ve had 19 PhD students in our group and we’ve probably paid their salaries over half of that, the tuition, the fringe, the salaries and all that stuff.” (P3)

In order to continue research and support people working at a research lab, receiving grants is vital for them, which may lead them to focus on applying for a wide range of external grants.

In addition, the nature of research in scientific disciplines may affect the natural scientists’ tendency to apply for external grants. P3 and P6 emphasized the nature of expensive research in their research area:

“Ocean science work is really expensive. So, to go out on a research vessel, like a real research vessel, the cost per day of the ship can be up to \$75,000 a day. So, when we get grants, we tend to get very large grants, you know, so if you’re doing fieldwork, you’re talking at least hundreds of thousands to millions of dollars.

And so, because we’re doing field work, you usually need to have a team to go to see with, and so oceanography has always been considered a money.” (P3)

“Biology is very expensive, so it’s not just salaries, it’s all of the supplies and the equipment that you need. It’s very expensive.” (P6)

Finally, a social norm in scientific disciplines which values high success in earning grants, as discussed in the previous section, seems to influence natural scientists' attention to external grants. P2 particularly emphasized the need for applying to an external funding agency: "one of the things to get promoted and to really move up in your career, one of the really prestigious things you want to have is grants from the National Science Foundation." (P2)

The humanities scholars revealed different reasons for getting funding than the natural scientists. A primary reason for funding application in the humanities group is to earn time to focus solely on their research and/or writing a book. According to the humanities respondents, fellowships enable them to conduct research and write a book without interruption from other duties in their institution, such as administrative services and teaching. For example, P12 demonstrated why he needs a fellowship in general scholarship: "there are so many projects we do in the humanities. They take a lot of time. And when you are teaching, even some people don't really realize it, it seems like there's time in the week to do research. But you need extended periods and it's very difficult to do research, and then stop and start every couple of days while you're teaching and doing administration. It's very important to try to get some time to work, extended time". P13 also addressed a similar reason for applying for fellowships: "that's what I'm looking to do to get a fellowship now so that instead of teaching for a year, I could concentrate on the book because it's very difficult while you're teaching to dedicate thinking time to writing."

Another type of funding source relevant particularly to the humanities scholars was subventions, which is financial support for publishing a book. This particular funding

type may be influenced by the existing norm in the humanities, that writing and publishing a book is fundamental and highly valued, as P8 said: “in the humanities, books are the big thing”. Consequently, subventions were considered helpful for the humanities scholars to obtain support for book publications, which helps to fulfill the expected role in their field.

Institutional grants, normally a small amount of money, were addressed only by some of the humanities scholars with respect to writing a proposal, since the grants are used to assist their research activity, such as traveling, going to conferences, conducting field study, etc. It may be associated with the nature of some humanities fields that demand several trips and field studies. For example, P9 in Art History mentioned that “right now, I just want time. But for many art historians, you must travel somewhere to see your objects. So, I travel for my research and I travel to see exhibitions”.

5.2.1.3 Task Complexity

Differences. How the participants perceive the complexity of a proposal writing task is different in the two disciplines. Five of the six humanities participants identified the task as highly complex work. For instance, proposal writing is “extremely complicated” to P11, and “very complex” to P13.

On the other hand, three of the natural scientists found the task to be extremely complex. Also, what is unique in this group is that perceived complexity vary by different projects to some scientists. For instance, P4 pointed out difficulty in defining the complexity of proposal writing because “it varies on a topic. When it is very complex,

you work with other people and you use a lot of resources. It's very hard for me to say [task complexity] because some projects are more complex”.

Reasons. Why the humanities scholars commonly perceive proposal writing tasks as more complicated than the natural scientists was not explicitly found from the data analysis. However, it can be assumed that the participants' frequency of engaging in the task in their general scholarship may affect such difference. According to the previous section, **5.1.2 Task-Related Background**, typically, the natural scientists more often engage in proposal writing activity than the humanities scholars. Such different experience may generate different perceived complexity between the two fields when it comes to writing a proposal, since more experience of proposal writing increases knowledge and skills related to it, which can reduce perceived complexity. Thus, the characteristics of the disciplines with respect to proposal writing frequency seem to be associated with individuals' perception of task complexity.

5.2.1.4 Task Importance

How participants assessed importance of a proposal writing task in their general scholarship was compared and it differed markedly in the two disciplines.

Differences. Five of the natural scientists placed great importance on a proposal writing task, such as:

“I think it's very important. You cannot do research unless you get funding to do research in, in the natural sciences.” (P4)

“It's very important. Without the support, I can't do my research, right?” (P5)

On the other hand, perceived importance of proposal writing varied among the humanities scholars, ranging from little importance to high importance. The following quotes are from three different humanities scholars, who revealed slightly different perceptions of how important the task is:

“The grants, they do an interesting supplemental role in the eco-system of the humanities. But I don’t think that their role is particularly critical.” (P11)

“For me, it [proposal writing] is a matter of getting the funding so that I can have the leave time to really work intensively on my research.” (P8)

“It [proposal writing] has been extremely important throughout my career. I received that grant from the SSHRC in Canada. I had \$71,000 over four or five years. That meant, that made all the difference. I could not have written my book on the [deleted for anonymity] without it.” (P10)

Reasons. One reason for the high degree of perceived importance to most natural scientists is associated with a shared belief concerning importance of getting funding within the natural sciences community. Obtaining grants can be recognized by their community as evidence of a successful career in their scholarship, as pointed out in the previous sections. In contrast, there seems no such direct relationship between funding and success of career in the humanities, but writing a book is much more recognized by the community, according to the data analysis.

Another reason for the scientists’ consensus on importance of proposal writing is concerned with their collective reasons for applying for funding: continuing research and funding members of a research lab. Due to the critical roles of external funds for natural scientists, they tend to consider proposal writing tasks highly important.

However, the most popular reason for proposal writing from humanities scholars is earning extra time for research, which is more likely to depend on their individual preference or circumstance. Thus, perceived importance in the humanities seems to vary by individuals depending on their decision to apply for funding in accordance with their circumstances or preferences.

5.2.1.5 Feelings

Differences. A disciplinary difference was found in participants' emotional remarks on a task. Emotional comments on proposal writing tasks were made exclusively by natural scientists, either positive or negative ones. Two of them disclosed positive emotions (e.g. love, fun) and the other two expressed negative feelings (e.g. hate, stress) towards proposal writing tasks. The related quotes from natural scientists are as follows:

“I hate writing proposals. I hate it. It’s the worst part of my job. So, how do I think about it? I think about it with dread, loathing. (P2)

“I love to write proposals. I’m going to tell you why I love to write them, because you feel like you learn a lot and your ideas come together.” (P6)

However, interestingly, there was no emotional comment on proposal writing tasks made by the humanities scholars.

Reasons. Little evidence for explaining why only the natural scientists showed emotions for proposal writing tasks was found from the data analysis. High importance of the task commonly agreed by the scientists may bring out their emotional engagement in the task more than the humanities scholars. Their negative feelings towards the proposal writing may result from their big pressure and responsibility for obtaining external funds

in order to fulfill the expectation of their field, as discussed earlier. However, clear association between such different emotion and disciplines cannot be confirmed with the current data.

5.2.1.6 Challenges

Challenges are cognitive barriers or difficulties in preparing for a proposal that participants recognized. One similarity was found between the natural sciences and the humanities: budgeting was commonly challenging in proposal writing processes for both groups. More evidence for different challenges between the two disciplines were found.

Differences. Scholars in the natural sciences appear to struggle for co-working in the process of writing proposals. For example, one of the natural scientists mentioned that “I’m writing and I’m collaborating with one of my former students who now works for a consulting firm. So, it’s going to be a joint proposal between (institution name) and the consulting firm. That also makes it really complex. Anytime you’re working with multiple team members, that adds to the complexity”. (P2)

Those in humanities identified a different type of challenge, which is finding the proper funding opportunity that fits with his/her research well. For example, P12 said that “one of the challenges is finding a good fit. Something that your project fits what they’re looking for”. Another challenge more mentioned in the humanities group was derived from anonymous reviewers of proposals, as P13 explained: “when we apply for grants, we have to speak to people who are outside of our fields, right? Part of the difficulty is in figuring out how to boil your very specialized research down so that it’s accessible to people who might not know anything about it”.

Reasons. Different challenges in the two communities can be explained sociologically. In the natural science group, research is normally collaborative based upon shared understanding of collaborative research, which also leads to their common characterization of proposal writing as collaborative processes. Even collaboration across multi-institutions also takes place in this community, which adds more challenges to proposal writing tasks. Therefore, co-working seems to be the activity necessary for the task, which can be also challenging to natural scientists.

The challenge of finding a right funding opportunity from humanities scholars, may be generated by the nature of humanities: limited opportunities for funding and small size of the field. P12 addressed that “there are not that many opportunities for my field. It’s not like sciences.” He also added that his field is “a relatively small field. So, a lot of it’s by word of mouth, somebody is working on something.” Thus, the smaller number of funding sources and a smaller size of a field in some humanities, compared to science fields, seem to challenge humanities scholars in finding funding opportunities.

5.2.1.7 Priorities

Priorities of a task refer to activities that need to be done first and foremost for a task. Analysis of priorities of individuals in conducting a task is important to understand their attentional structures with respect to a task since the priorities are indicative of the most relevant and important things in doing for the task. Both disciplines tend to commonly prioritize “clearly writing a proposal” among the necessary activities for the task. Differences between the two fields also exist.

Differences. One difference found was that, some natural scientists tend to prioritize understanding needs of a specific funding agency for which they apply. For instance, the natural sciences participants highlighted the significance of knowing a funding agency well:

“Knowing the agency is next to being smart and a good scientist with good ideas.

The next skill you have to learn is know your agency.” (P3)

“You’re figuring out what the funding agency really wants. You’re figuring out whether your idea fits with what they want.” (P2)

This particular activity was not discussed in the humanities group; however, the humanities scholars pointed out demonstrating research significance as a priority of the task. For instance:

“You need to be able to demonstrate value, and it is very competitive for most of these grants.” (P11)

“You have to present in a way that’s clear to people and the significance is clear.” (P12)

Reasons. The natural scientists’ emphasis on understanding a funding agency in the whole process of the task may be generated from their substantial relevance to external research grants with respect to proposals. The variety of funding agencies that they typically consider for proposal writing seem to influence their focus on understanding funding agencies well. It can be also explained by their common focus on successfulness of the task in their group. They may stress understanding what a funding agency needs as they particularly view the certain aspect of the task, whether it is successful or not.

The humanities scholars' priority of identifying significance of their research project for proposal writing may be associated with the nature of humanities' limited funding opportunities, which is identified as a common challenge. Thus, limited funding sources available in the humanities fields may affect why humanities scholars particularly highlight delineating research significance as a fundamental activity in the whole task process.

5.2.2 Information Problems of a Task in Different Thought Communities

RQ2. Are there differences of individuals' information problems of a task in different thought communities?

The process of conducting a task requires individuals' recognition of what specifically should be done for the task. One significant aspect of "what should be done" consists of identification of information problems. Information problems can be tasks or assignments that require a person to identify information needs, locate corresponding information sources, extract and organize relevant information from each source, and synthesize information from a variety of sources (Brand-Gruwel, Wopereis, & Vermetten, 2005). Therefore, in this study, information problems were analyzed from two particular subthemes: subtasks, specific activities performed by the participants for their proposal writing, and information needed, the information types that they needed for task completion.

5.2.2.1 Subtasks

First, analyses of the participants' processes of writing a research proposal resulted in 28 types of subtasks, and these are classified into five categories using

Algon's (1997) task classification: administration, communication, strategic formulation, analysis, and report generation. Subtasks commonly considered by the natural sciences and the humanities include: identifying research questions, literature analysis, draft writing, proofreading and revising a proposal, writing a full proposal, and writing a resume. Among the five generic categories of subtasks, report generation was the most common type of subtask in both fields. Table 11 presents a list of subtasks (codes) identified from the data analysis, categorized by task classification, and whether and how the two groups are different in terms of the occurrence of the codes. Again, the comparison of occurrence of the codes followed the rules discussed earlier in section

4.6.3 Comparative Analysis.

Table 11. Codes of "Subtasks" and Comparative Analysis of Code Occurrence

*SI: Similar, ND: Not Different, NS: More Occurrences in Natural Sciences, HU: More Occurrences in Humanities

Category	Subtask	Comparative Analysis
Administration	Budgeting	NS
Communication	Co-working	NS
	Communicating with a grant office	NS
	Discussing with collaborators	NS
	Giving a talk	ND
	Lining up team members	NS
	Submitting a proposal to a grant office	ND
	Teaching a class	HU
	Writing scholarly publications	NS
Strategic	Framing a project	ND
Formulation	Planning a research process	NS
Analysis	Broadening thinking	ND
	Identifying research goals	NA
	Identifying research questions	SI
	Identifying research significance	HU
	Literature review	SI
	Understanding funding agency's needs	SI
Report Generation	Compiling files for submission	ND

Draft writing	SI
Proofreading and revising	SI
Writing a full proposal	SI
Writing a resume	SI

Differences. Differences of subtasks are explicit between the two fields. First, most of the natural scientists worked on budgeting in relation to proposal writing, such as:

“Whenever you’re going to write a proposal, one of the first things you have to do is you have to tell the university that you’re writing this proposal, and then you have to do all the paperwork of the budgets and the endorsement form.” (P2)

“You have to submit budget and budget justification.” (P4)

They also intensively performed various communicative tasks in the course of proposal writing, such as co-working, communicating with a grant office, discussing with collaborators, lining up team members, and writing scholarly publications. The examples for each of these subtasks are as follows:

Co-working: “Sent draft back and forth to colleague to finish writing.” (P6)

Communicating with a grant office: “Communicating with (a grant office name) is done via the App that they have the portal. At least in theory, you’re supposed to be able to just communicate with them through there, like when your proposals are ready, you just click on a button that says, ‘please review my proposal and approve it’.” (P2)

Discussing with collaborators: “That [proposal] is more of a group conversation. We’ll have as many face-to-face meetings as possible. I’ll travel to the other PIs

throughout the whole process and spend a day down in Virginia, spend a day in Santa Cruz or whatever, working on the different sections.” (P3)

Lining up team members: “If you don’t have it [knowledge], that’s when you need a team member who does and that’s how you build your team. And if I needed to do something that was categorized in the literature-base on some swath, I can’t do that. But I bet you could. So, I’m going to call you and say, ‘hey, I got this project. What do you think, who do you know, you would be interested in?’ So that’s where you build your collaborative linkages. You build the team around answering that question.” (P1)

Writing scholarly publications: “We will also designate, like for this proposal, it would be really important if we get this manuscript written before it’s submitted. A manuscript usually takes a year, so it takes months to write if you have all the data analyzed. It then takes months to get reviewed, and then, usually you have to revise it. So that’s usually a year. So that means, by summer if there’s some manuscripts we’ve decided we absolutely have to write before the renewal, we have to get that done because that’ll be one of the things they’ll review us on is what’s been your productivity with this project and have you been worth the money essentially.” (P3)

Another subtask unique to the natural scientists is planning the research process.

P1 and P6 explained the process of planning their research for proposal writing:

“I have to organize the parameters in my head, and then I can come up with a research plan. I can come up with a labor plan and an equipment plan and a timing plan. Once I have that labor time material analysis, then I can suggest how

long will it take to get the data I need with enough data to be able to do a statistical test.” (P1)

“I like to put it [timetable of experiments] in there [proposal] because I asked for five years. You can ask for three to five. Everybody asks for five and you want them to see this really is a five-year project, not a three-year project. So, I always justify” (P6)

In contrast to the various subtasks of proposal writing identified by the natural scientists, only two types of subtasks were distinctively relevant to the humanities group: teaching a class and identifying research significance. It is noteworthy that teaching a class was considered a key subtask of proposal writing for the humanities scholars, which seemed to be irrelevant to natural scientists. For example, P9 and P10 demonstrated how teaching was helpful for writing proposals:

“I taught seminars related to it to help me begin to device the new projects.” (P9)

“I’ve been teaching this kind of subject for about six years. I started to teach actively, that means, reading critically many different essays and books on collecting and museums in Europe, United States, the Middle East, Japan, China, and so on, in different fields, like science, art, anthropology. So that’s where the idea came from.” (P10)

Identifying significance of a research project was another important step for the majority of the humanities scholars in writing a proposal, which was also a prioritized subtask for them (See 5.2.1.7 Priorities). For example, they emphasized that:

“I also have to show that my project is worthwhile, interesting, has some innovation, something that people haven’t worked on before and explain why that

is valuable. In that case, you can make the case that you have the material that I need, but you always have to articulate the value of your project.” (P10)

“I think the last portion of that [proposal writing] would be to relate my research to topics that were of urgent interest and more worthy to appeal to funding.” (P13)

In brief, although there are certain types of research-related subtasks relevant commonly to both groups, it is evident that the natural scientists tend to engage in more diverse kinds of subtasks when writing a research proposal than the humanities scholars, particularly being actively involved in communication with others throughout the process of the task, such as colleagues, offices and general scholarly communities.

Reasons. First, budgeting is one of the essential tasks for the natural scientists because of their relevant funding type, external research grants. Application for external research grants requires a budgeting process. Also, Stvilia et al. (2015) identified administration and coordination as common task types in physics, one of the natural science communities.

Reasons that the natural scientists engaged in diverse communicative subtasks, particularly co-working, lining up team members, and discussing with collaborators, are closely connected with a research norm in their field, collaboration and discussion for research. For example, P3 described the typical activity of discussing with people for general research: “I go to the right groups, the right people, toss ideas, make sure that I get defined them at coffee every day. I’m chair of the department and I make coffee free every day on our machine from 10 to 11 to 2 to 4 and all-day Fridays, because I get everyone to sit together having a cup of coffee and then nucleate ideas”.

Also, the characteristic of the field of working in a research group for performance of research can result in a range of communicative subtasks during the process of proposal writing. P3 pointed out involvement of various kinds of people in his research group: “It’s a big group right now we have. If you include graduate students, technicians and faculty, we are about 33 people in our group”.

It seems to be also related to their relevance to collaborative research including multi-institutional and interdisciplinary research for proposal writing, as revealed earlier in their characterization of the task. Communicating with a grant office is particularly relevant to the science group due to their subtask of budgeting, which requires scholars to understand budget-related details and other administrative requirements of their institution.

Another communicative task of the natural sciences, writing scholarly publications, can be associated with a characteristic of the science fields, which have high publication rates (Becher, 1994). It is also linked with individual funding agency’s preferences or requirement, as P3 reported that publication records are needed when renewal of grants is evaluated by a funding agency.

Furthermore, planning the research process was identified exclusively by the natural scientists. It is relevant to the norm of the scientific areas in research: empirical evidence is needed for knowledge validation (Donald, 1995) and data is one of the main tools and products of scientific activities. (Stvilia et al., 2015), which can be produced from experimental processes.

The humanities scholars’ distinct subtasks may be influenced by their disciplinary background. First, teaching a class seems closely associated with their normal way of

conducting research that benefits from teaching. Some of the humanities participants highlighted the role of teaching in their scholarship, such as:

“Teaching at the graduate level in particular not only feeds into your research, so it is the great preliminary research.” (P10)

“Since I’m teaching, it’s a way of bringing my research program into my teaching and allowing my teaching to advance my research program until I have the time to actually devote full time to the project.” (P9)

It is also consistent with a previous study, indicating that teaching and research are so intertwined in the humanities (Brockman et al, 2001).

Why identifying research significance is a critical subtask to humanities scholars is probably linked to the nature of the field of humanities, which has limited funding opportunities, as discussed in **5.2.1.7 Priorities**. It is also associated with relatively low success rates of getting funds in humanities, as P13 pointed out that “humanities scholars may be less inclined to apply for those grants because the chances of actually receiving one, it’s low”.

5.2.2.2 Information Types Needed

Types of information needed by the respondents were analyzed for understanding their information problems from a proposal writing task. In total, 15 different information types were needed by them according to the data analysis, related either to funding application or to research design. Funding application is concerned with information types needed for understanding a funding opportunity and for processing the funding application. The research design type refers to information needed in relation to

designing and conducting a research project for proposals. Table 12 shows the list of codes of information needed under these two categories, and whether and how the code occurrence is different between the two field for each code. The comparison of occurrence of the codes followed the rules discussed in section 4.6.3 Comparative Analysis.

Table 12. Codes of “Information Needed” and Comparative Analysis of Code Occurrence
* ND: Not Different, NS: More Occurrences in Natural Sciences, HU: More Occurrences in Humanities

Category	Information Types Needed	Comparative Analysis
Funding Application	Budget information	NS
	Feedback on proposal	ND
	Gap between what a funding agency says and what is actually funded	ND
	Guidelines of how to write a proposal	NS
	Previous projects funded	ND
Research Design	Figures	NS
	New publications in the field	HU
	Other scholar’s work	NS
	Preliminary data	NS
	Primary source	HU
	Source availability	HU
	Syllabi	HU

Differences. Differences of information needed between the two disciplinary communities were discovered from the data analysis. Overall, the comparison of the two groups in information needed reveals that the natural scientists were in need of information related to funding application as well as research design, whereas the humanities scholars demanded information mostly for designing research for proposals.

First, the natural scientists were much more likely to look for information with respect to funding application than the humanities scholars, such as budget-related

information and specific guidelines of how to write a proposal provided by funding agencies. For example, P3 addressed the need of specific information regarding budgeting: “I need budget information: ‘How many months of technician time do I need to do the work? What are the costs of the instrument so I want to buy?’ And just to figure out, ‘Is my budget too big or is it too small?’ Because you sort of generally have an idea of what’s a safe budget place to land it”.

Also, information about how to write a proposal, specified by a target funding agency, was needed by the natural scientists. P2 needed “the information about how you functionally write the proposal. That information is usually on the website of the funding agency”.

With respect to designing research, the natural scientists were particularly in need of information related to other scholars’ expertise and work. For example, P5 mentioned the necessity for getting ideas of what other scholars are doing: “what’s being done in the field by other people outside (institution name) in terms of the competitors or people in the field.”

They also needed research data, such as figures and preliminary data, to be incorporated into their proposal, as P3 addressed: “you need to have usually some good graphics for most proposals. You can present data in a way that’s effective to help make your point because a good data figure can tell a story. That might take two pages. So, you need to have the data in hand and the capabilities to make a good, compelling argument with data”.

The group of humanities scholars tended to focus more on information about research design, than information about funding application, in the process of proposal

writing. They tended to seek information about publications and sources, particularly primary sources and source availability. The majority of them highlighted the need of knowing about recent publications in their research area, such as:

“It [information needed] can be research on what are the new books coming out.”

(P10)

“I needed to make sure that I was aware of new publications, recent publications that look at my field in different ways than previous. So, I had to make sure I gathered these titles, assembled the bibliography and read and read widely.” (P9)

Also, primary sources are an essential type of information for humanities scholars to conduct research and write a proposal. They described that:

“I guess I need primary sources. I identify primary sources and it could be either printed or archival.” (P13)

“I’m reading the original sources.” (P12)

Some of the humanities scholars who needed to access rare manuscripts also pointed out their need for knowing whether such sources are available or accessible. For example, P11 explained that he needed access of documentary sources during the process of proposal writing. “The other thing is to see what we have access to. There is a literature, but there’s also literature itself. ‘Where are the main manuscripts? Are they accessible to us?’ As I mentioned, some of them are in private hands to owner of these manuscripts. Would they be willing to share this material with us? So, before I even begin applying for the grant, you need to make sure that I have access to this.”

The other distinctive information need of the humanities scholars is syllabi. P10 demonstrated why syllabi are necessary when working on a research proposal: “it

[information seeking] happens through talking to colleagues and friends, seeing the syllabi of what colleagues and friends have been teaching, seeing the good things there, borrowing from that, adding things that they don't cover that interest you."

Reasons. The central reason that the natural scientists were looking for information regarding how to write a proposal from funding agencies may be linked with their relevant funding type for proposal submission, external grants, which varies in guidelines for proposal submission. For example, P6 pointed out that different rules need to be applied for different grant agencies: "there's something now called a multiple PI, which is allowed on NIH grants, but not the other grants, only for NIH. The other ones are called co-PI, which even though you could be technically considered a multi-PI, they won't allow for the title, which is a problem". In addition, the natural scientists' salient activity in writing a proposal, understanding funding agency's needs, as described in **5.2.1.7 Priorities**, may also lead them to particularly seek information about specific instructions of proposal writing provided by a funding agency.

Budget information was needed by the natural scientists since budgeting is deemed one of their essential subtasks for proposal writing as discussed in the prior section. Figures and preliminary data were also pointed out by the natural scientists as the information types needed, which seem to be relevant to the sciences' values on empirical research and presentations of images in writings (Donald, 1995; Hartley, 2006).

They also needed to know what other scholars in their field are doing for research. It can be explained by the effects of a norm of the field which values collaborative research. They can design a collaborative research project only after understanding other scholars' work for effective and productive cooperation. Also, their common subtask of

lining up team members is related to this particular information need. For example, P2 explained that she wants to know what others are doing, to see whether collaboration with them is necessary: “it would be really helpful to know what other people are doing, like somebody else writing almost exactly the same proposal that I am. In which case, either mine has to be better or we should collaborate”. Their attention to information about competitors in their field seems to be also caused by competitive nature of disciplinary culture in pure science (Becher, 1994).

The humanities scholars’ need for knowing new publications may be influenced by their normal activity for information gathering, keeping up with publications. The data analysis confirms that they typically keep up with new literature published in their research field, for example:

“There are not that many journals for this field, so I can keep track of what’s being published.” (P12)

“If I have a Friday that I can read all day, I try to keep up with the literature on heretics and heresy and so on and read stuff.” (P8)

Due to their scholarly routine of being aware of new publications, they need new publications for their proposal writing more than the natural scientists who did not exhibit such a routine.

Moreover, their focus on new publications also appears to be related to the group’s common value placed on writing a book. They particularly mentioned looking for books in the process of proposal writing. For example:

“Using library databases, and Google and Amazon to see what the latest books are.” (P10)

“Books and articles that are published, anything on the topic.” (P12)

Since writing a book is an important task to do in their community, knowing what is being published in their field seems to be necessary for their general research as well as proposal writing.

Another distinguishing information need of the humanities scholars is syllabi, which seems to be associated with the field’s general consideration of teaching as a part of research. In line with this, teaching a class is considered to be one of the key subtasks of proposal writing by the humanities scholars, which seems to further generate their need of syllabi to perform the task.

Primary/original sources and source availability are the information types needed only by the humanities scholars, as the nature of their research areas require them to examine such sources.

5.2.3 Choice of Action to Resolve Information Problems of a Task in Different Thought Communities

RQ3. Are there differences of individuals’ choice of action to resolve the information problems in different thought communities?

Individuals’ choice of action to resolve information problems was examined by looking mainly into how the participants carried out their subtasks of proposal writing by interacting with information needed, such as finding, accessing, and using the information. Specifically, their choice of information sources, searching activity that arose during the process of information seeking, and other information-related activities, including information evaluation, management, and communication, were analyzed and compared between the two disciplines.

5.2.3.1 Information Source Selection

There were 29 types of information sources selected by the participants for proposal writing from the two disciplines, which are grouped into six categories: document, online database, people, own knowledge, place, and website. Table 13 presents specific source types under the six categories and whether and how they occurred differently between the two disciplines. The comparison of occurrence of the codes followed the rules discussed in section 4.6.3 Comparative Analysis.

Table 13. Codes of “Information Source Selection” and Comparative Analysis of Code Occurrence

*SI: Similar, ND: Not Different, NS: More Occurrences in Natural Sciences, HU: More Occurrences in Humanities

Category	Information Source Type	Comparative Analysis
Document	Bibliography	HU
	Books	HU
	Budget template	NS
	Footnotes	HU
	Own note	NS
	Previous proposal	ND
	Prior research project	SI
Online Database	Academic journal database	NS
People	Colleague	SI
	Department’s administrator	NS
	Lab member	NS
	People at a funding agency	ND
Knowledge	Own knowledge	SI
Website	Funding agency’s website	SI
	Grant office website	NS
	Social networking site	HU
	Library	SI

Both groups tend to similarly access prior research projects, colleagues, their own knowledge, funding agencies' websites, and libraries as information sources while working on research proposals. They were also different in choosing the sources.

Differences. The natural scientists used people as an information source most frequently. In particular, a department's administrator and lab members are exclusively accessed by this group. For example, P6 highlighted a bookkeeper in her department as a useful source in preparing for a proposal: "the primary thing I do is I call (person name). I guess she would be called a bookkeeper, but she helps us submit proposals. She helps us spend the money once you've got the proposal and keep track of your budgets and make sure people get paid and everything." P1 stated that his lab students are accessed to get information regarding how to plan a research project: "I needed to talk with my students in my lab team to see what they thought they needed for their piece of the grant, their part of the program, how many students, how many hours, how many students, how many hours. If we train them to do task A, how much time each of you needs so that that task can get moved and we can make the right labor pitch".

The natural scientists also used documentary types of sources to obtain information, such as budget templates and own notes. For example, P2 mentioned the use of a budget template for budgeting: "this budget, they have a template. They have a excel spreadsheet that you download it and you put all of your numbers in it, and it's supposed to calculate everything for you".

Personal notes were another key source of information for the natural scientists while working on proposals, as P5 exemplified: "my own notes. Sometimes it was one sentence, 'Make sure you did this. Make sure you say this. Make sure you say this.' I

hypothetically outline, and then write off of that. I have some notes. EndNote has a note field. I also have some paper notes, because if I have the paper on my desk, I can write on my computer and see my paper”.

Besides, the natural scientists tend to access online materials. One is a website of the grant office in their institution. For example, P6 included the office’s website as a primary type of information sources during the process of proposal writing. Similarly, P2 said that “I was on their [the grant office’s] website yesterday, trying to figure out how much my graduate students should be paid”.

Also, most of the natural scientists pointed out that they use various academic journal databases for proposal writing. Especially, PubMed and Web of Science were the most common tools for them. The relevant quotes are as follows:

“I’m typically looking web of science, type things.” (P1)

“Then you just spend some time on Web of science. I’m looking and reading and doing backgrounds trying to figure out.” (P2)

“I use PubMed mostly. Sometimes, I use Web of Science to do my surveys.”

“PubMed is the main one. PubMed has everything usually that we want.” (P6)

Their use of online databases also corresponds with the result of previous studies on the relationships between research culture and use of library resources (e.g. Talja et al., 2007). That study demonstrated that scientists, who work together, rather than alone, used journal databases significantly more than scholars in other fields who work alone, such as humanities, social sciences, and economics.

To the humanities scholars, the most frequently used information source was the various types of documents, particularly bibliographies, books and footnotes. The examples for their use of each of these sources are as follows:

Bibliography: “You either have your own books or you go to the library, you look at their bibliographies.” (P11)

Book: “I use a lot of history books.” (P9)

Footnote: “I would read that article from which I’d get ideas, but also, get more bibliography from her footnotes.” (P8)

Online websites were another useful channel for the humanities scholars to get information, particularly social networking sites, such as Academia.edu or Twitter. The examples are as follows:

“Other things that I know about, because they come up on academia.edu. There are different feeds that I would get. Exhibitions are very important in my field too, because they often bring new research. So, there are certain authors that I would follow.” (P9)

“Now I even look at Twitter sometimes because I’m on a lot of groups where people talk about what the topics that interest people and that are getting a lot of attention.” (P13)

Although a fewer number of the humanities scholars accessed academic journal databases to get information than the natural scientists, half of them commonly utilize a specific kind of academic journal database, Jstor, which is a different kind from the natural scientists:

“I use Jstor a lot. I’m going on Jstor, and saying Jstor have this journal, and then I get a PDF of it, put it my computer.” (P8)

“You look through articles in Jstor.” (P9)

“We use Jstor a lot.” (P11)

Reasons. Some reasons for differences in choice of information sources between the natural scientists and the humanities scholars may be attributed to their disciplinary background. First of all, the natural scientists’ frequent access to people as an information source while writing a proposal, more than the humanities scholars, can be analyzed from a sociological perspective, based on how they have learned proposal writing throughout their career. They mainly learned from people, such as advisors and grant specialists, which was rarely mentioned by the humanities scholars. Related quotes from the natural scientists are as follows:

“One [way to learn how to write a good proposal] is having a good mentor that allows you to try.” (P1)

“I started writing proposals with my postdoc advisor and that’s really where I learned most of what I learned about writing proposals.” (P2)

Therefore, the scientists’ learning experience of how to write a proposal throughout their academic life may lead to their attention to people as an information source in relation to proposal writing.

In particular, the natural scientists’ preference to access lab members for information acquisition is associated with the research culture and practice in the science field; research takes place in a laboratory (Toms & O’Brien, 2008), within tightly knit groups (Ortega, 2015). As the data analysis suggests, a research group is a place where

research is normally conducted together in natural sciences and a source from which the scientists normally obtain information for research. For example, P6 addressed her normal activity of delegating information seeking to lab students, particularly for gaining research data that will be included in a proposal: “sometimes I know that someone’s working on something and I need it for the grant and I will go to them [lab members] and say, ‘I need a figure on X, Y and Z. I know you’ve done this experiment, but you haven’t graphed it yet. This is the kind of figure I need’. Or, the figures that they sent me, sometimes it has too much stuff on it that I don’t need. And I’ll actually just take the part I need. So, it’s usually student or postdoc, right now with students’ data. Usually, they have the experiment done already and I would say about 75% of the time they’ve already sent me a figure, but the other 25% of the time they have to generate the figure for me.” This research norm and routine of data sharing at research labs seems to influence the scientists’ delegation of search and information to the lab members.

Another key source of information for the natural scientists is a grant office’s website, which can be explained by the effect of their subtask of communicating with a grant office necessary for proposal writing, as found from **5.2.2.1 Subtasks**. They needed to access the office’s website to communicate with them.

Also, some scientists contacted the department’s administrator who is in charge of assisting faculty’s activity of proposal writing and submission, which may be influenced by availability of human resources for the task at a scholar’s department or institution. It can be understood as an organizational factor, rather than a sociological factor.

In the document types, budget templates were accessed by the natural science group, since budgeting is one of the essential subtasks in writing a proposal to them. The

specific reason for the scientists' choice of own notes as an information source was not clearly identified from the data analysis; however, it is noted that scribbling and jotting is common activity for scientists (Palmer & Cragin, 2008), which play a key role in mediating information in scientific work (Rheinberger, 2003). Thus, such a typical way of doing research in the discipline can be associated with their action for choosing information sources.

The collective reason for proposal writing for the humanities scholars is concerned with support for writing and publishing a book by receiving a fellowship. Due to their focus on book writing, the scholars attended to several types of documents including books, bibliographies and footnotes, which contain rich information about publications and citations. Furthermore, data analysis shows that they tend to keep up with new publications as a scholarly practice. Such everyday routine of the humanities scholars may also influence why they chose publications as an information source for proposal writing. This finding also matches with the existing knowledge concerning general traits and information behavior of this group: humanities scholars opt for deep reading of books (Talja & Maula, 2003), and often use citations and clues found in print sources including catalogues, newspapers, and print bibliographies (Tibbo, 2002).

The humanities scholars' choice of social networking sites as an information source seems related to their tendency to access such sources, in that some studies have demonstrated that researchers from the humanities area are much more active on social media sites, such as Academia.edu and twitter, than sciences area (Ortega, 2015; Thelwall & Kousha, 2014).

The more frequent use of academic journal databases in the natural sciences is not clearly identified from the data analysis. However, with respect to different types of academic journal databases used in each community (i.e., PubMed, Web of Science v. Jstor), it is likely to be related to the scholars' socialization to each discipline by learning specific types of databases that are useful and trustworthy in their fields as the source to obtain scholarly papers.

5.2.3.2 Information Searching

Some participants described their searching behavior; activities of finding information in information systems, such as the Internet, a database, and a personal computer, although no particular questions regarding information searching processes were asked of them. Both groups described keyword search activity in their personal computer or in online databases.

Differences. Search activity was described by the natural scientists more than by the humanities scholars. In particular, the scientists stressed their access to multiple databases to search for information while conducting research, which corresponds to findings from previous research: scientists search for research materials across multiple resources (Sahu & Singh, 2013). For example, some of them described the steps of finding information with the help of multiple databases:

“If I know of somebody or something or I hear about somebody or something, I’ll just do a straight google search, refine what I think I’m looking for as far as search terms or get a better name, then I will go to web of science. Or then I’ll go

to google scholar or go to Scopus or one of those big aggregation sites and find some information there.” (P1)

“I would do my search in PubMed. I would search for topic, I would search for people I know who were working the field. I would still search by chemical name. PubMed has a thing where if I find a paper, it will tell me who else cited that paper. I can look at those papers, and then I would typically look at Web of Science. Web of Science is harder to get into because I have to go through (institution name) portal. They’re not as easy to search because of the way the database, the way that they have their interface. I would then use that mainly to search for people to find out what else they have published in the area.” (P5)

Reasons. The natural scientists’ greater frequency in search activity and use of multiple sources for searching may be associated with their commonly stronger attention to academic journal databases when finding information for proposal writing, as discussed in the previous section (5.2.3.1 Information Source Selection). Since they access academic journal databases more actively to get information than the humanities scholars, search activity should also occur more often with using those databases.

5.2.3.3 Information Evaluation

Another kind of information-related action analyzed in this study is how people evaluated information before choosing it, by examining participants’ criteria for information evaluation in the process of proposal writing. Basically, the two groups were similar in terms of their assessment criteria for information: both groups tend to evaluate information based on their own knowledge, reputation of authors/producers of

information, reputation of information sources, and relevance to their research topics. For instance, both groups indicated use of their own knowledge and intuition for information evaluation: P2 from the natural sciences said that she is already “very familiar with who has good data and which data is reliable”, and P11 from the humanities also “rely upon the intuitions and the observations of my predecessors in the scholarly continuum”. No difference was found in terms of information evaluation that occurred while writing research proposals.

5.2.3.4 Information Management

How the participants managed their information that was used in proposal writing was analyzed and compared in two fields.

Differences. The data analysis shows differences between the two groups in their methods used for information management. While the humanities scholars tend to manage information using paper copies and a personal computer, the majority of the natural scientists were more likely to utilize software for storing and managing their information. The following example is the quote from a humanities scholar regarding management of information with papers: “I also take paper notes. I do not take any notes on any computer. No notes. I take notes on paper, writing. I have notebooks.” (P10)

Also, personal computer is a key means for managing information for humanities scholars, as P8 said: “I use my computer. I joke about my computer is my brain, right? So I use my computer a lot, making sub-folders and trying to figure out ways to organize the information so I won’t lose it. I mean that’s mostly it. It [information] is in my computer”.

In contrast, most natural scientists stated the use of specific software, such as:

“Where I have secure stuff, I’m using a lot of secure FTP sites and stuff on my different projects.” (P2)

“I have EndNote. I have groups inside EndNote of papers. I have papers that one person in my lab is supposed to read.” (P5)

Reasons. A fundamental reason for the difference in managing information can be explained from relevant types of information the natural scientists needed and used for proposal writing. They were in need of data and figures, which are normally produced and stored through certain types of software. It is also supported by other research (Aker & Doty, 2013), which notes that the basic sciences rely heavily on specialized instruments for data collection and are more likely to have larger quantities (i.e., terabytes) of data than arts and humanities.

Furthermore, the scientists’ use of software results from their collaborative activities while working on proposal writing. Their relevance to collaborative research projects for writing proposals tends to lead them to manage information together using tools that provide multiple access points to information for multiple collaborators.

Reasons for the humanities scholars’ manner of information management are more related to personal than discipline factors, such as personal preference and individuals’ research areas. For example, P10 pointed out his personal preference to use papers over electric types: “I have a very specific management problem with computers. If I have a document of many pages, I find it extremely difficult to have to scroll. A piece of paper is a vastly underestimated piece of cutting-edge intellectual technology because it has the value of being a bounded space. What I will do is I will write notes on a piece

of paper and I know that I only have this much space. Why? Because I want to be able to see everything at once. And that's how I work. If I'm on a computer, I can never be sure that I'm seeing everything at once because it has to scroll and scroll. So, when I'm actually composing what I'm formulating, how do I write this essay, how do I write this proposal, I need everything on one sheet because I need to connect. That's the thing. I can't have it be on page after page. So that is why I do paper".

Also, a scholar's specific research area can affect how to manage information in humanities. For example, P13 explained that she had to manage hard copies because the main sources of research are print materials: "I keep a lot in hard copy on my desk here in my home office and my office at the university, mostly because I work with a lot of printed materials. I've just kept them physically available and I manage them by organizing them in a physical space".

5.2.3.5 Information Communication

Similar to information management, the participants' ways of information communication, how they deliver, receive, or share information while writing a proposal, was examined and compared between the two disciplines.

Differences. Differences between the two fields were found in information communication. Basically, this particular behavior was exclusively relevant to the natural science group. The respondents from this group tend to communicate information with other scholars in various ways, including calling, emailing, and using software, whereas none of the humanities scholars mentioned the activity of information communication

with regard to proposal writing. For example, calling is a common way of communication for the scientists:

“We had a bunch of phone conversations.” (P3)

“We were talking on the phone a lot.” (P4)

Emailing was another primary channel to send or receive information in this group. For example, P2 explained email use of scientists and professors: “I think that most scientists and professors like me really communicate by email. I mean that is the main primary thing that I do. My students want to text me and I’m like, ‘No, write me email, it has a trail and you can follow, but your text messages disappear’. Email is good and you can send attachments and files and stuff. So, most of my communication is done via email”.

Similar to information management, some of the natural scientists made use of technology for information communication. These quotes below are from two different natural scientists:

“The other thing that’s becoming a big deal for me now, in terms of communication, is that because we’re starting to send back and forth these large files, we’re starting to use a lot of like Google Drive.” (P2)

“Sometimes, if we’re writing together, not this proposal, but a proposal I wrote five years ago, I wrote half, somebody else wrote half. They sent me their EndNote database to use for their half of the proposal.” (P5)

Reasons. A reason that the natural scientists are active in communicating information while writing a research proposal may be associated not only with their relevance to a collaborative research for proposal writing, similar to the reasons for the

differences in information management, but also with their inclusion of a variety of communicative tasks (i.e., communicating with a grant office, discussing with collaborators) to their key subtasks for proposal writing. On the other hand, the humanities scholars are less likely to communicate information since they basically perceived a proposal writing task as an individualistic process (**5.2.1.1 Task Characterization**) and engaged little in communicative activities during the process (**5.2.2.1 Subtasks**).

5.2.4 Summary of Findings

Table 14 below summarizes the findings of the study according to the three research questions: differences in understanding a task, identifying information problems, and choosing action to resolve the information problems, and related reasons that may lead to or influence such differences found from the data analysis.

Table 14. Summary of Differences and Reasons for the Differences in the Two Disciplines

* NS: Natural sciences, HU: Humanities

Differences		Reasons
<i>RQ1. Understanding of a task</i>		
Relevant funding types	<ul style="list-style-type: none"> • NS: External grants • HU: Fellowships, Subventions/institutional grants 	<ul style="list-style-type: none"> • Reasons for funding application • Nature of fields • Social norms of fields
Task Characterization	<ul style="list-style-type: none"> • NS: Collaborative work, successfulness, long-term projects • HU: Solitary work, natural extension of research 	<ul style="list-style-type: none"> • Social norms of fields • Funding agency's preferences • Collective relevant funding types • Normal ways of doing research • Research areas

		<ul style="list-style-type: none"> • Reasons for funding application
Complexity	<ul style="list-style-type: none"> • NS: Varying • HU: Very complex 	<ul style="list-style-type: none"> • Not clear
Importance	<ul style="list-style-type: none"> • NS: Very important • HU: Varying 	<ul style="list-style-type: none"> • Social norms of fields • Reasons for funding application
Feelings	<ul style="list-style-type: none"> • NS: Emotional expressions • HU: None 	<ul style="list-style-type: none"> • Not clear
Challenges	<ul style="list-style-type: none"> • NS: Co-working • HU: Finding right funding opportunities; considering anonymous reviewers 	<ul style="list-style-type: none"> • Social norms of fields • Collective task characterization • Nature of fields
Priorities	<ul style="list-style-type: none"> • NS: Understanding funding agency's needs • HU: Demonstrating research significance 	<ul style="list-style-type: none"> • Collective relevant funding types • Funding agency's preferences • Nature of fields
<i>RQ2. Information problems of a task</i>		
Subtasks	<ul style="list-style-type: none"> • NS: budgeting, co-working, communicating with a grant office, discussing with collaborators, lining up team members, writing scholarly publications, planning a research process, thinking of new things • HU: teaching a class, identifying research significance 	<ul style="list-style-type: none"> • Collective relevant funding types • Normal ways of doing research • Nature of a field • Collective task characterization • Nature of fields • Collective challenge in task • Funding agency's preferences

Information needed	<ul style="list-style-type: none"> • NS: budget-related information, guidelines of how to write a proposal (funding application); data, figures, competitors' work (research design) • HU: publication, primary source, source availability, syllabi (research design) 	<ul style="list-style-type: none"> • Collective relevant funding types • Collective priority of task • Collective subtask • Social norms of fields • Normal activity of information gathering • Normal way of doing research
<i>RQ3. Choice of action for a task</i>		
Information source selection	<ul style="list-style-type: none"> • NS: administrator, lab members (people); budget template, academic journal databases (e.g., PubMed, Web of Science), own notes, a grant office's website • HU: bibliographies, books, footnotes (document types); social networking sites, academic journal databases (e.g., Jstor) 	<ul style="list-style-type: none"> • Normal way of learning proposal writing • Normal way of doing research • Normal activity of information gathering • Collective subtask • Institution's resources • Social norms of fields • Characteristics of fields
Information searching	<ul style="list-style-type: none"> • NS: more active, using multiple online databases • HU: little relevance 	<ul style="list-style-type: none"> • Collective source selection
Information management	<ul style="list-style-type: none"> • NS: software • HU: papers, personal computer 	<ul style="list-style-type: none"> • Collective information need • Collective task characterization • Collective subtasks • Research area
Information communication	<ul style="list-style-type: none"> • NS: calling, emailing, using software • HU: None 	<ul style="list-style-type: none"> • Collective task characterization • Collective subtasks

CHAPTER 6. DISCUSSION

In this dissertation, how individuals understand and conduct the research proposal writing task was compared in two different disciplines, natural sciences and humanities, in order to examine effects of social context on task-based information seeking behavior. Specifically, three steps of cognitive and behavioral activity with respect to the task were focused on: understanding a task, identifying information problems from a task, and choosing action to resolve information problems, based on a preliminary model of task-based information seeking behavior (See Figure 1). In this chapter, how these three phases are influenced by the social context of a task, a thought community in this study, is discussed from the cognitive sociological perspective.

6.1 Effects of Thought Communities on Understanding of a Task (RQ1)

Results of this study show that the same type of task, research proposal writing, was differently recognized by members from the two disciplines. Analysis of reasons for the differences revealed that some of the individuals' cognitive activities related to understanding the task were influenced by social aspects of their discipline. Specifically, social norms and practices were the major social dimensions of each discipline that influenced the socially cognitive processes of individuals. This section discusses how social norms and practices affect individuals' perception of the proposal writing task.

6.1.1 Effects of Social Norms of Thought Communities on Understanding of a Task

First, social norms of the disciplines were associated with the scholars' cognitive activities in understanding the proposal writing task. Data analysis revealed that each

discipline has distinctive styles of what is important and valuable with respect to scholarship and research, which directed or influenced how individuals perceive and perform proposal writing tasks. Such individuals' cognitive structures of values and beliefs that are collectively constructed within their communities are understood as the social norms (DiMaggio, 1997). It is similar to the common meaning of social norms in library and information science, as collective sense of standard of behavior in sociocultural groups (Chatman, 1999; Jaeger & Burnett, 2010). However, this study also viewed the social norms from the cognitive sociological stance that stresses everyday cognition relying on culturally available schemata (DiMaggio, 1997), in order to focus on the direct relationship between social norms and cognition during the process of a task.

According to the results, the natural sciences has a norm of obtaining funding for successful career. For example, P2 emphasized the need to write proposals to obtain grants for promotion, and P3 also stated that proposal writing is considered to be a required task in his field for getting funding for research. This norm of the field is relevant to the natural scientists' perceptions of the task: their emphasis on success rates of proposals, whether or not a proposal is accepted, their focus on external grants for proposal writing, and their high level of perceived importance of the task. It also indirectly affects the group's priority of understanding funding agency's needs in doing the task, as this cognitive act results from their focus on external grants and success rates of the task.

Also, a norm of collaborative research was identified by the natural scientists. For example, P4 mentioned that collaborating with others for research is expected in this community due to the complex nature of natural sciences. This particular norm of the

discipline directly or indirectly influenced their understanding of the task: characterizing the task as a collaborative process and identifying co-working as a challenge of the task.

Effects of social norms on individuals' understanding of a task also occurred in the humanities participants. The results show that a key distinctive norm of humanities is writing a book. Most participants of this group described common expectations of humanities scholars to write and publish a book for their successful career. This norm influenced how the humanities participants view proposal writing: they primarily considered fellowships and subventions in relation to proposal writing which help them write and publish a book. Such relevant funding types further influenced their characterization of proposal writing as solitary work, since fellowships and subventions are the types of scholarship awarded to individual scholars. Therefore, the humanities scholars' cognitive acts in perceiving a proposal writing task were closely related to the discipline's norm of book writing in scholarship. As such, different social norms in the two disciplines lead to the scholars' different perceptions of a proposal writing task. Table 15 presents social norms of each discipline revealed from the data and cognitive activity in understanding of a proposal writing task related to the norms.

Table 15. Cognitive Activity in Understanding of a Task Influenced by Social Norms in Two Disciplines

Discipline	Social Norm	Related Cognitive Activity
Natural Sciences	Obtaining grants	<ul style="list-style-type: none"> • Relating external research grants to a task • Considering a task very important • Focusing on success rates of a task • Prioritizing understanding funding agency's needs
	Collaborative research	<ul style="list-style-type: none"> • Characterizing a task as collaborative work • Co-working as perceived challenge

Humanities	Writing a book	<ul style="list-style-type: none"> • Relating fellowships and subventions to a task • Characterizing a task as solitary work
------------	----------------	--

Hence, social norms of thought communities contribute to shaping members' way of understanding a task. Zerubavel (2009) stated that people follow optical norms of their social environment by maintaining a view of the world that is matched with the one commonly shared by others around them. The finding of the disciplines' norms affecting the scholars' understanding of the proposal writing task also supports the optical norms of the disciplines that enable the scholars to view a task in certain ways, following common beliefs and values of their field.

6.1.2 Effects of Social Practices of Thought Communities on Understanding of a Task

The results indicate that individuals' understanding of the proposal writing task was influenced by the discipline's social practices: shared actions including the ways of doing and approaching things among members of a community (Wenger, 1999). The concept of social practices in this study is slightly different from the general approach to information practices used in the field of library and information science, which shifts the focus away from the behavior, action, motives, and skills of monological individuals to members of communities that constitute the context of their mundane activities (Savolainen, 2007). In this study, however, social practices are still considered as a type of individuals' behaviors, which were learned from their thought communities through socialization, rather than being shaped by their purely personal motivations. Data analysis showed that the scholars in each disciplinary community have common ways to do

certain things when it comes to their general scholarship and information gathering in their everyday life. Thus, in this study, social practices are defined as individuals' routinized activities with regard to conducting research and gaining scholarly information, as a scholar in a certain discipline.

One of the discipline's practices related to proposal writing tasks is concerned with what typically makes scholars decide to write a proposal and get funding. The results reveal that the natural scientists commonly write a proposal to obtain funding to continue research and to pay people in a research group run by them. The practices of using funding in such ways led them to relate various types of external research grants to the task of proposal writing, including long term research grants that provide a large amount of funding. It also affected the natural scientists' commonly agreed recognition that the task is very important in their scholarship, since the task enables them to earn money for research and payment to related people.

The humanities scholars had a different practice in relation to proposal writing. All of them participating in this study described that they typically write a proposal to apply for funds that are used to gain research-focused time. This particular practice of the group also affected their understanding of the task: they primarily considered fellowships for proposals, which can relieve them from other duties, such as teaching and administration, and enable them to focus particularly on research.

In addition, the humanities scholars revealed a research practice that normally connects their teaching with general research work. For example, P9 and P10 described that their research projects and work of teaching classes are integrated. Such a particular research practice of the humanities group led the scholars to characterize the proposal

writing task as a natural extension of general scholarly work, not separating it from their job. Therefore, some aspects of individuals' understanding of a task can be understood as socially constructed, due to the effects of practices that members have typically and conventionally performed within their communities. Table 16 summarizes the social practices of the two disciplines and related cognitive activities in perceiving proposal writing, influenced by the social practices of the disciplines.

Table 16. Cognitive Activity in Understanding of a Task Influenced by Social Practices in Two Disciplines

Discipline	Social Practice	Related Cognitive Activity
Natural Sciences	Getting funding to continue research and pay lab members	<ul style="list-style-type: none"> • Relating external grants (including long-term research grants) to a task • Considering a task very important
	Getting funding to earn time for research	<ul style="list-style-type: none"> • Relating fellowships to a task
Humanities	Connecting teaching to research	<ul style="list-style-type: none"> • Characterizing a task as a natural extension of scholarly work

In essence, the results answer RQ1: understanding of the task by individuals in different thought communities is different and the reasons for the differences are related to social norms and practices of each thought community. Social norms and practices influence how to look at a task because they seem to take an impersonal outlook on the task that scholars acquire through their membership in a particular disciplinary community (Zerubavel, 2009). Thus, individuals' understanding of a task can be not only personal, but also social, which suggests individuals' socially constructed understanding of a task. It can be explained using the sociology of perception in cognitive sociology: the very same object is often perceived somewhat differently by different people due to their

optical socialization to different thought communities where they learn to look at things in social ways (Zerubavel, 2009).

6.2 Effects of Thought Communities on Information Problems of a Task (RQ2)

This study compared how individuals articulated information problems associated with a proposal writing task in two different thought communities, in order to explore whether or not social relevance, collective ways to focus on certain problems, influences task-based information seeking behavior. Individuals' information problems were analyzed in terms of two aspects: specific subtasks of proposal writing and information types needed in the process of performing a task. The comparative analysis revealed that there are differences between the two disciplines in the information problems identified for the same task. The analysis of reasons for such differences illuminates social effects on individuals' attention to certain information problems.

6.2.1 Effects of Social Norms of Thought Communities on Information Problems of a Task

Similar to understanding of a task, individuals' identification of information problems from a task was influenced by social norms of the disciplines, particularly in the natural sciences group. Specifically, according to the results, the norm of collaborative research in the natural sciences led the scholars in this group to write a proposal collaboratively, which results in their involvement in various communicative subtasks, including lining up team members, discussing with collaborators and co-working. Also, the norm affected what kind of information is relevant to them. For

example, P2 explained that she looked for information regarding research work or specialty of other scholars to request collaboration for research projects.

Another norm of the natural sciences discovered from the data analysis was networking. For example, P2 pointed out that networking and talking to people is really important in research, and P5 also highlighted the importance of going to meetings to keep contact with people in the same field. This norm also influenced the scientists' subtask of discussing with collaborators and information need for what others are doing for research in proposal writing.

The existing literature on norms of a science community also provides evidence for the effects of norms on information problems. For example, Donald (1995) described that there is a common norm of gaining empirical evidence for knowledge validation in science fields. This particular research norm is related to one of the subtasks relevant to the natural scientists, planning the research process. For example, P1 and P6 particularly included the phase of planning experiments to the research proposal task, which allows them to produce empirical evidence. Also, their need for preliminary data for proposal writing is derived from the norm of the field developing empirical evidence for research.

Some of the natural scientists mentioned that they specifically need figures for proposal writing. The scientists' attention to this particular information type can be also explained by the influence of the science community's norm in writing: the natural science community places importance on incorporating tables, diagrams, and other illustrative images in their writings (Hartley, 2006). Thus, the norms related to research and career in natural sciences appear to be the important social factors that allow scholars to discern relevant things to do and relevant information to be found for proposal writing.

In the humanities group, new publications, particularly books, were one of the common information types needed in completing a proposal writing task. Their need for being familiar with new books as they are published is associated with their discipline's norm that prioritizes book writing. In consequence, the humanities scholars focused on what is being published in their field when conducting research and writing a proposal, because, to them, the proposal writing normally aims to write and publish a book in the end. Table 17 shows social norms of the two disciplines and the scholars' information problems of proposal writing affected by each of the social norms.

Table 17. Information Problems of a Task Influenced by Social Norms in Two Disciplines

Discipline	Social Norm	Relevant Information Problems
Natural Sciences	Collaborative research	<ul style="list-style-type: none"> • Lining up team members • Discussing with collaborators • Co-working • Information about other scholars' research work or specialty
	Networking	<ul style="list-style-type: none"> • Lining up team members • Information about other scholars' research work or specialty
	Empirical evidence for knowledge validation (Donald, 1995)	<ul style="list-style-type: none"> • Planning a research process • Preliminary data
	Incorporating tables, diagrams, and illustrative images in writings (Hartley, 2006)	<ul style="list-style-type: none"> • Figures
Humanities	Writing a book	<ul style="list-style-type: none"> • New publications (books)

The relationship between the social norms of thought communities and individuals' identification of information problems demonstrates that the social context of

a task affects when people delineate subtasks and information from a task relevant to them. It corresponds with social relevance as understood in cognitive sociology: what people consider relevant is usually defined as such in accordance with particular norms of focusing that they learn as part of optical socialization (Zerubavel, 2009). This study confirms that the scholars in a particular community regarded only certain kinds of information problems from a task due to the influences of the community's social norms, as a consequence of their learning about the norms of focusing from their discipline.

6.2.2 Effects of Social Practices of Thought Communities on Information Problems of a Task

According to data analysis, different kinds of information problems in the two fields were associated with the disciplines' different social practices related to research and information gathering. In the natural sciences, one of the research practices was discussion. For example, P3 illustrated that the discussion with colleagues that takes place every day in his department usually helps to define research problems and ideas. The natural scientists' research practice of discussion with people leads to their involvement in a subtask of discussing with collaborators.

In the humanities, teaching classes was identified as a key research practice of the field from the data analysis. Consequently, this practice led the humanities scholars to include teaching as a relevant subtask to a process of proposal writing, and syllabi as a type of information needed for them to write a proposal.

Information gathering practice seems also important as a social dimension of thought communities affecting identification of information problems in a task. In the

humanities, keeping up with publications was a typical way of information gathering in their general scholarship. For example, P8 stated that she normally chooses one day in a week to catch up all new literature on her research area. P9 also described a scholarly routine of keeping up with certain journals for research. Such an information gathering practice in the humanities led to their common attention to recent publications for writing a proposal.

Interestingly, the humanities scholars pointed out that they normally use students' research proposals submitted in their class as a source for having ideas of how to write a proposal. For example, P9 and P10 highlighted that reading students' proposals is a good reminder of what works and what does not for writing proposals. This distinctive practice can be also associated with their consideration of teaching a class as a subtask for proposal writing, since their class is a useful source for them to obtain information about how to write a proposal. Table 18 below summarizes social practices of the two disciplines and their subtasks and information types for proposal writing associated with each of the practices.

Table 18. Information Problems of a Task Influenced by Social Practices in Two Disciplines

Discipline	Social Practice	Relevant Information Problems
Natural Sciences	Discussing	<ul style="list-style-type: none"> • Discussing with collaborators
Humanities	Connecting teaching to research	<ul style="list-style-type: none"> • Teaching a class • Syllabi
	Keeping up with publications	<ul style="list-style-type: none"> • New publications
	Reading students' proposals	<ul style="list-style-type: none"> • Teaching a class

The finding of how social practices of the thought communities are connected with information problems of the task can support the existing conceptual understandings of relationships between practice theory and task-based information seeking. For

instance, Byström and Lloyd (2012) emphasized the influence of information practices on the ways of knowing how to perform work tasks. Talja and Nyce (2015) also explicated performance of task as the process entailing distinct ways of attending and ways of using the body in interaction with the social resource of the setting. This study plays a useful role in providing the empirical evidence on demonstrating how practices of communities influence processes and activities when people perform a task.

6.2.3 Effects of Social Understanding of Thought Communities on Information

Problems of a Task

The previous section (**6.1 Effects of Thought Communities on Understanding of a Task**) concludes that members of thought communities reveal social understanding of a task, in that some of the mental activities of individuals' understanding a task were influenced by the social dimensions of the disciplines. The social understanding of the task further influences the subsequent cognitive phase in task-based information seeking, identifying information problems of the task, since there were some subtasks and information types of the natural scientists influenced by their collective understanding of the task within their community. For instance, the natural scientists' subtask of budgeting and their need for budget-related information are related to their social understanding of a proposal writing task. As discussed earlier, the natural scientists commonly considered external research grants for proposal writing due to the influences of the social norm of obtaining funds and the practices of applying for funding to continue research as well as to pay lab members in the discipline. Since external grants require a budgeting process, they had to include such a subtask and information as relevant problems to proposal

writing. Their collective consideration of external research grants for proposal writing also leads to their specific need for funding agency's guidelines regarding proposal writing, as individual grant agencies tend to specify different rules and criteria on proposal writing and submission.

Similarly, discussing with collaborators and co-working, the subtasks relevant particularly to the natural scientists, were derived from another kind of social understanding of the task in this community: characterizing the task as collaborative work, which were influenced by the social norm of collaborative research in the natural sciences. Thus, some of the natural sciences' information problems are socially identified, influenced by their socially constructed perception of the task. Table 19 displays a summary of relations between social understanding and identification of information problems of the task in the natural science.

Table 19. Information Problems of a Task Influenced by Social Understanding in Natural Sciences

Discipline	Social Understanding	Relevant Information Problems
Natural Sciences	Relating external research grants to a task	<ul style="list-style-type: none"> • Budgeting/budget-related information • Funding agency's guidelines on how to write a proposal
	Characterizing a task as collaborative work	<ul style="list-style-type: none"> • Discussing with collaborators • Co-working

Hence, the data analysis shows that the natural scientists' social understandings of the task, specifically relating external research grants to the task and characterizing the task as collaborative work, seem to influence their following cognitive behaviors, such as determining subtasks and identifying information needed. It implies that social ways of

interpreting a task in a thought community may be associated with how to identify information problems for a task.

In sum, the analysis of individuals' information problems of a task provides the answer for RQ2: people in different thought communities identify information problems from a common task differently because of distinctive social norms and practices in different thought communities, as well as the communities' social understanding of a task shaped by social norms and practices of the communities. The different information problems between the two different disciplines can be understood from the cognitive sociological standpoint: when the scholars identified information problems, subtasks and information needed, they were influenced by social norms, social practices and social interpretation of the task existing in their discipline, which allowed them to focus only on particular subtasks and information types relevant to their community, which are possibly irrelevant to other communities holding different social norms and practices. It suggests that social relevance, collective attention to certain things, effects how individuals in thought communities identify information problems from a given task. Therefore, it can be concluded that individuals identify information problems from a task impersonally, not just personally, being influenced by their social context.

6.3 Effects of Thought Communities on Choice of Action (RQ3)

The participants' choice of action to resolve information problems from a task was analyzed according to information seeking and use activity in the process of task completion, including source selection, information searching, information evaluation,

information management and information communication. Differences between the natural sciences and the humanities were found from the individuals' source selection, information searching, information communication, and information management. The results reveal that some of the differences are related to social aspects of the disciplines, similar to understanding of a task and identification of information problems of a task.

6.3.1 Effects of Social Norms of Thought Communities on Information Seeking and Use

First, the difference between the two communities was concerned with their choice of information sources. The natural scientists accessed various types of human resources including colleagues, research lab members, and administrators, a lot more than the humanities scholars did, with respect to proposal writing. In contrast, the humanities scholars tend to access several types of documents, such as books, footnotes, and bibliographies, to obtain information for proposal writing, more often than the natural scientists. Such different choices of information sources are associated with the disciplinary norms of the natural sciences and of the humanities, which emphasize collaboration for research and book writing for research, respectively.

Also, the natural scientists' norm of collaborative research is associated with their active communication of the information with their colleagues or collaborators while working on a proposal, which was irrelevant to the humanities scholars. This can be also explained by the effect of their commonly accepted norm of collaboration for research on the action.

Therefore, norms of the disciplines seem to play an important role in shaping the scholars' actions in both fields, particularly when they choose information sources and communicate information. Table 20 describes specific norms of the two disciplines and actions related to information seeking and use influenced by the norms.

Table 20. Information Seeking and Use Behavior Influenced by Social Norms in Two Disciplines

Discipline	Social Norm	Information Seeking and Use
Natural Sciences	Collaborative research	<ul style="list-style-type: none"> • Accessing various human resources (colleagues, lab members, administrators) • Communicating information by calling, emailing and using software
Humanities	Writing a book	<ul style="list-style-type: none"> • Accessing various types of documents (books, footnotes, bibliographies)

This finding of the effects of social norms on information seeking and use is consistent with the Byström's (2007) socio-cultural perspective on task. She maintained that use of information sources follows explicit or implicit norm structures of the context where a task emerges. This study also suggests that people may be influenced by implicit norms of their thought community when choosing information sources. Also, some of the existing information behavior models that underline a social environment of information behavior have also introduced the role of norms of communities in constructing information seeking and use behavior; such as values and beliefs in Everyday Life Information Seeking model (Savolainen, 1995), social norms from Chatman's life in the round (1999), and social norms in information worlds (Jaeger & Burnett, 2010). Such concepts highlight the norms and values that can determine or substantially influence people's behavior in information seeking and use.

6.3.2 Effects of Social Practices of Thought Communities on Information Seeking and Use

The scholars' information seeking and use behavior in the two disciplines was different because of different social practices in each discipline with respect to research and information gathering. In the natural sciences, one of the research practices that emerged from the data analysis was discussion. It can be connected with the natural scientists' various information communication activities, such as calling and emailing, which were not mentioned by the humanities group. Their research practice of discussing with others led them to actively participate in communication of information in the process of proposal writing.

The scholars' information gathering practices also affected their information seeking behavior, especially choice of information sources. Specifically, one of the information gathering practices in the natural sciences was delegating information seeking to students for the research. This practice resulted in their tendency to access their lab members to obtain information while performing a task of proposal writing.

Similarly, the humanities scholars' routine of information gathering, which is keeping up with new publications to get information, is also associated with their source selection behavior: they accessed books and bibliographies for information acquisition while writing a research proposal, since these sources are used to find and learn about new publications. Table 21 presents a summary of two disciplines' social practices and certain action of information seeking and use relevant to each of the social practices.

Table 21. Information Seeking and Use Behavior Influenced by Social Practices in Two Disciplines

Discipline	Social Practice	Information Seeking and Use
Natural Sciences	Discussing for research	<ul style="list-style-type: none"> • Active information communication
	Delegating information seeking to students Conducting research within a lab	<ul style="list-style-type: none"> • Accessing lab members
Humanities	Keeping up with new publications	<ul style="list-style-type: none"> • Accessing books, footnotes, bibliographies

The identification of relationships between social practices and information seeking and use behavior can contribute to the literature on information practices that primarily focuses on information activities woven to social practices of a domain or a community in everyday life. For example, Isah and Byström (2016) demonstrated that information access occurs in communities that constitute the context of mundane activities which reflects the social and historical conditions of a setting. As such, the results can help expand understanding of how practices of communities shape people's information seeking behavior.

6.3.3 Effects of Social Understanding and Social Relevance of Thought Communities on Information Seeking and Use

As discussed earlier, the scholars' understanding of a task and identification of subtasks and information needed can be social. Some of the differences of the two fields in their information seeking and use can be explained by the influences of such social understanding and social relevance of thought communities with respect to proposal writing, which are the preceding cognitive activities of information seeking and use in the

procedure of task-based information seeking. Either social understanding or social relevance of a thought community can influence how people seek and use information. It is also possible that both social understanding and social relevance influence the subsequent behavior, information seeking and use.

According to the data analysis, in the humanities, social understanding influenced information seeking and use behavior. The humanities scholars' social understanding concerning a proposal writing task was that it is solitary work and not collaborative, particularly for fellowship applications, as a natural extension of general scholarship. This socially constructed interpretation of the task ended up barely communicating information with others while doing the task, which is substantially different from the natural sciences. Figure 2 presents how the social understanding of the humanities leads to information-related activity.

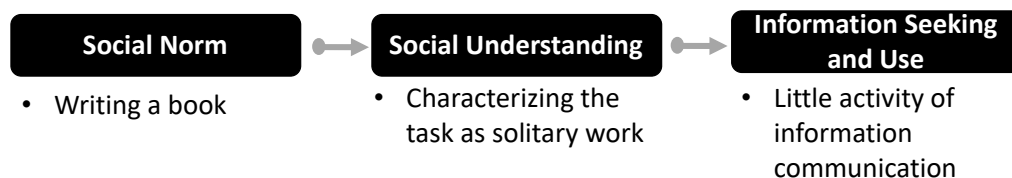


Figure 2. Information Seeking and Use Behavior Influenced by Social Understanding in the Humanities

Social relevance also influenced information seeking and use behavior, particularly in the natural sciences group. For example, using software for information management for proposal writing was a distinctive information use activity of the natural scientists according to the data analysis. This activity is influenced by their socially established relevance to certain kinds of information that they needed to write a research proposal, preliminary data and figures, as shown earlier. Figure 3 describes the example

of how the social relevance leads to information seeking and use behavior in the natural sciences.

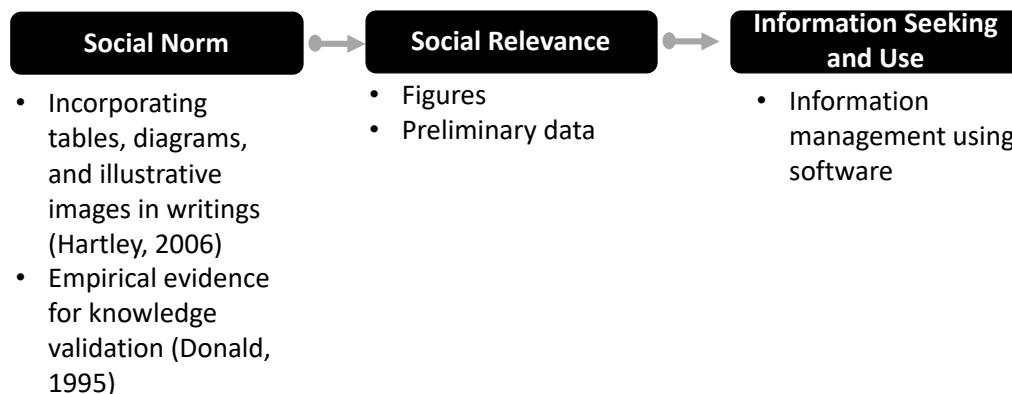


Figure 3. Information Seeking and Use Behavior Influenced by Social Relevance in the Natural Sciences

Furthermore, both social understanding and social relevance affected the scholars' information seeking and use, in the sequence of cognitive phases of the task. Specifically, the natural scientists revealed their social understanding of a proposal writing task by viewing it as collaborative work based on the social norms and practices of their community. Then, it led to social relevance of the task, their collective focus on the communicative subtasks, such as co-working, communicating with a grant office, lining up team members, and discussing with collaborators. The social relevance further generated the natural scientists' active information communication behavior by calling, emailing, and using software which help them effectively collaborate with other researchers. Thus, this particular example demonstrates that preceding socio-cognitive activities may influence the following information seeking and use behavior while performing a task. Figure 4 depicts how social understanding and social relevance of the natural sciences lead to the scholars' certain information use activity in sequence.

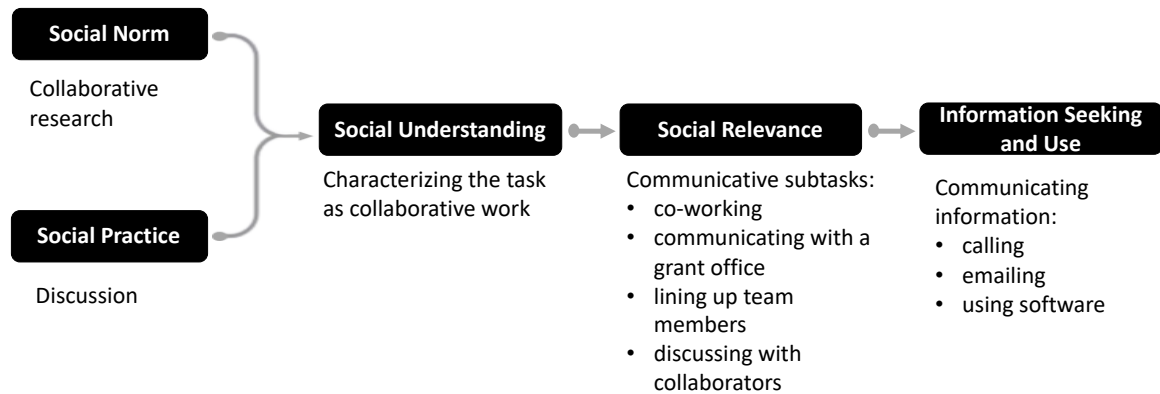


Figure 4. Information Seeking and Use Behavior Influenced by Both Social Understanding and Social Relevance in Natural Sciences

To sum up, individuals' information seeking and use behavior in the process of performing a task (specifically, the task of writing a research proposal) is different in different thought communities. Some of the differences are directly caused by the influences of social norms and practices of the communities. Also, social understanding and social relevance that individuals developed from their communities play an important role in shaping such behavior, too. Thus, task-based information seeking behavior can be influenced by their social context, not only by social factors of the context, but also sociological cognition used to perceive and perform a task.

6.4 Revised Model of Task-Based Information Seeking Behavior

The results and discussion identify social elements of thought communities that lead the members of the communities to perceive and conduct a task socially, not just personally, which include social norms and social practices of the communities. Importantly, the close relationship between the social elements and individuals' mental acts indicates the existence of social understanding and social relevance in thought

communities and their effects on task-based information seeking of members of the communities, including their perception and performance of a task, and information seeking behavior. Based on the results and their interpretation, the researcher revisited the preliminary model of information seeking behavior in task (See Figure 1 in **Section 3.3 The Preliminary Model**), proposed based mainly on the literature review and the theory of cognitive sociology, and revised it, by clarifying the process of task-based information seeking behavior and connecting it with relevant socio-cognitive interventions to the process. Figure 2 is the revised version of the model. The explanations for the model are presented in the following sections.

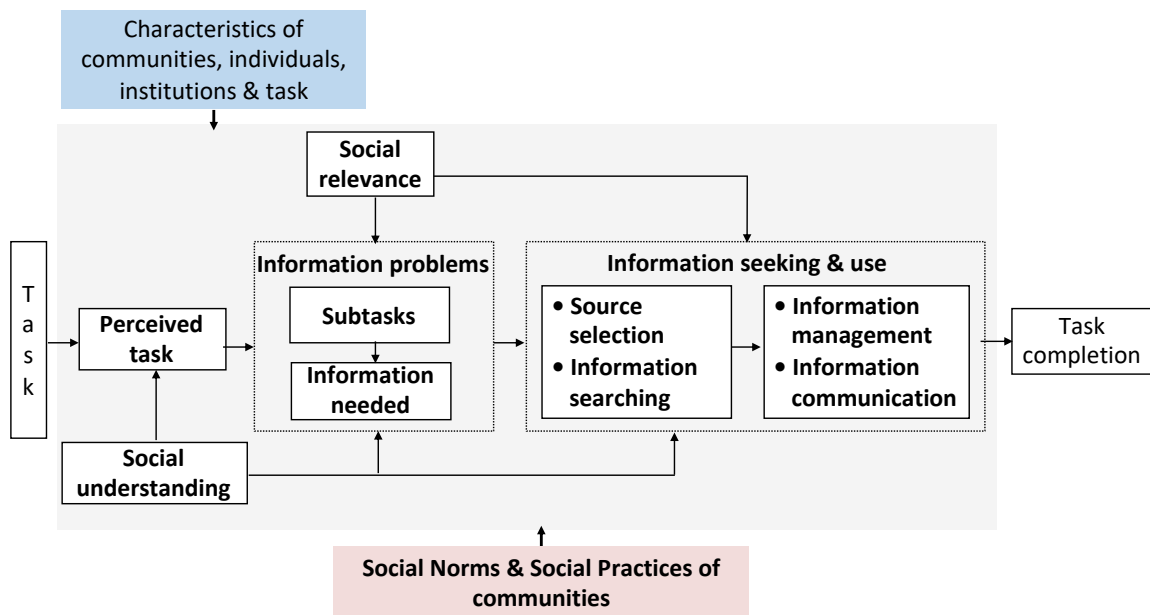


Figure 5. The Revised Model of Task-Based Information Seeking Behavior

6.4.1 Sociomental Factors in Task-Based Information Seeking Behavior

The model describes a process of task-based information seeking of individuals from the start of individuals perceiving a task, followed by identifying information

problems and by seeking and using information, to completion of the task, which is similar to the initial model.

The results of the study conclude that the first stage, perceiving a task, is influenced by social understanding, a community's collective way of viewing things and the reality. The perceived task, then, is analyzed to identify specific information problems, including subtasks that should be done for a task and information needed to complete such subtasks. At this phase, individuals focus on certain subtasks and information types relevant to their task as perceived, which is related to social relevance of their community, i.e., a community's common attention to a certain activity or information. Once relevant information problems are figured out, they are resolved by individuals accessing information sources and searching for information in information systems if necessary. The information found is further managed and communicated by individuals when it is needed. Information seeking and use can be influenced by social understanding and social relevance a thought community.

The model presents social norms and social practices of thought communities as the primary social products of the communities that directly and indirectly affect the overall process of information seeking in task; they particularly play a major role in generating the sociomental acts, social understanding and social relevance. This result is slightly different from the social elements in the preliminary model (Figure 1) which included more various types: norms, conventions, language, shared knowledge, and routines. According to the results of this study, language and shared knowledge in the disciplines did not emerge as critical elements in relation to how the scholars perceive and conduct a task in a social way. Routines and conventions of the disciplines seem to

influence their cognitive and physical activities for task-based information seeking. In this updated model, however, they were grouped into a broader concept, social practices, which refer to regular and typical ways of behaving in a thought community, due to the small size of data. Thus, the current model suggests social norms and practices as the principal components of thought communities that lead to members' sociomental activities in task-based information seeking. More types of social elements in thought communities leading to sociomental acts could be identified with the larger datasets in the future.

6.4.2 Other Factors in Task-Based Information Seeking Behavior

The model includes other non-social factors of task-based information seeking behavior: characteristics of communities, individuals, institutions, and task. The results of this study reveal these four types of factors that impact when individuals perform a task and seek information, which also confirms the current knowledge of the key factors of task-based information seeking behavior in other literature. Each of these factors is explained below, with specific examples from the data.

6.4.2.1 Characteristics of Communities

The characteristics of the disciplines, not necessarily social, impacted how the participants understood and performed the task. First, the typical cost of research and scholarship was one of the aspects that influenced how the scholars recognize a proposal writing task. Some natural scientists perceived high importance of proposal writing and focused on external grants for proposals due to the expensive nature of research of the

field. In contrast, research cost in humanities is generally low, compared to sciences, which also influences the scholars' perception of a proposal writing task as solitary work, as P13 mentioned: "humanities professors, whose work can be produced less expensively, don't need that large amount of overhead to do their research. They often can work independently. So that is kind of the obvious part."

Also, with respect to understanding of a task, the humanities scholars tend to feel difficulty in finding a good fit for proposal writing and prioritize demonstration of research significance in writing a proposal, according to the results. Such perceptions are also caused by the characteristic of the field: limited funding opportunities available in humanities, as revealed by the humanities participants.

6.4.2.2 Characteristics of Individuals

Individuals' characteristics and qualities, such as motivations, knowledge and experience, have been shown to be important for understanding task-based information seeking behavior. This study also identified the influences of individual task performers on the process of information seeking, specifically in terms of three types: scholars' specific research topics, prior experience, and personal preferences.

First, individual scholars' research topic is connected with how they recognize a proposal writing task. For example, P13 from humanities illustrated that, because of her research area, relevant funding sources are more diverse and wider than other humanities scholars: "I'm in the history of science and because of that, I had a lot more contact with scientists at (institution name), which is also a science-focus school. Also, I was eligible for National Science Foundation grants, which I've received one, and National Institutes

of Health grants and other granting agencies that tend to be interested in science and medicine because my research is about the history of science and medicine”.

A person’s previous experience in writing a proposal is another essential factor in relation to perceiving and conducting the task. For example, P4 and P5 from the natural sciences stressed that a lot of previous experience on proposal writing made them feel familiar with it.

Some participants were affected by their personal preferences when conducting a task. For instance, P2 showed negative emotion toward proposal writing because she personally like to work alone for proposal writing: “I think that this is one of the other reasons I hate writing proposals because I'm a total loner. I like to just work by myself”. P1 also explained the personal preference of accessing old books as an information source: “It's important to go back sometimes and check your assumptions and get your documentation. So I tend to move backward in time and try to get into some of the older materials to check the initial assumptions”. Such individualistic preferences and styles seem to influence how they perceive and perform proposal writing tasks.

Finally, status in career seems to be important in shaping individuals’ perception and behavior related to a task. Since this study chose professors in academia as a target thought community, the participants emphasized tenure as a crucial factor for understanding a proposal writing task, which reveals official status as a professor. For example, P2 and P13 said how tenure influences their ways of thinking about getting funding:

“I have tenure. So now, I think about it [proposal writing] more in terms of what are the true odds that I might actually get this project funded.” (P2)

“Tenure affects it [how to think of proposal writing]. I don’t need to write as many. I have more support and more stability in my job, so I don’t need as much outside funding to do my research.” (P13)

Therefore, various kinds of personal characteristics and attributes indeed affect task-related behavior and thoughts, corresponding with previous research in task-based information seeking and searching behavior.

6.4.2.3 Characteristics of Institutions

Institutions are a physical place or organization where the participants actually work as a faculty. A few institutional factors were identified from the data analysis. First, a geographical location of an institution was associated with perception of the task. For example, P10 from the humanities demonstrated that his understanding of proposal writing was dependent on the nation of institutions: “(Institution name 1) would not give you your own research money. (Institution name 2) does. That’s a difference between the Canadian and the US systems. When the Canadian system as a researcher, you have to obtain fellowship support from the federal government to fund a big project like that. In the US, if you were a member of a history department, you have your own research fund”.

Another institutional factor is concerned with resources of institutions available to individuals. In this study, three of the natural scientists (P2, P3, P5) mentioned that they accessed a department administrator who works for helping faculty prepare and submit a proposal. It can be only possible when such a human resource is provided by scholars’ institution or department. Thus, availability of particular sources in one’s institution

could influence how individuals access information sources while working on proposal writing.

The last institutional factor is the specific type of institutions. The participants of this study were all recruited from a single research university, but some of them stressed the effect of their current institutional background on how they perceive a proposal writing task, such as:

“Say I’m teaching at (institution name) where I have colleagues, tenured faculty even who teach seven or eight courses a year. When do you find the time to write research and publish with such a busy schedule? So, for such faculty, getting grants and getting time off from their teaching schedule is critical. If they want to have a vibrant research life, then they need the space and the time to do this. So really, the people who will suffer most from the loss of grant funding are those faculty members.” (P11)

“I’m at a research university. So, I can have any weird idea and I’ll apply for those grants if I like the idea, and the reason is my salary’s covered. If you look at my collaborators at the soft money institutions, they tend to become super specialists. They are very nervous about spending lots of times with lots of ideas that are orthogonal because they got to worry about making sure their salary is covered.” (P3)

Therefore, institutional (not necessarily social) environments are still important in task-based information seeking, which is consistent with existing knowledge of information seeking behavior in work and professional contexts that highlight the effects of work roles and workplace on information seeking behavior.

6.4.2.4 Characteristics of Task

Despite the control of task type for comparing cognition and behavior in the two communities, there are attributes of the proposal writing task itself, that affected how individuals perceive and perform the task. Specifically, funding agencies, funding size, and collaborators were articulated as the task-related factors in this study.

First, funding agencies that accept a research proposal seem to influence various types of cognitive and physical acts of the participants. In fact, this factor was stated from the majority of the participants in both disciplines. For instance, P3 emphasized different ways to work on proposals depending on different funding agencies: “you have to know each agency differently. So even if you're doing the exact same work, you use completely different language with different agencies.” Also, to P1 and P11, whether proposal writing is collaboratively conducted or not can depend on the type of funding agencies that they target to submit a proposal. For example, P1 said that: “This particular grant programming, it's about single or sometimes two PIs. So, it's a convention of that particular grant. At different grants, particularly federal formula grants, it's usually individual faculty or small teams of faculty. If it's something like NSF, which has completely competitive, you're probably having a larger team, where do you want to see multiple disciplines and multiple institutions”.

Funding size was another factor related to how the scholars perceive a task. If the funding size is big, writing a proposal is perceived to be more complex according to P2 and P3. Also, P6 mentioned the effect of funding size on understanding of a proposal writing process: “R01[project number] is 12 pages and R21[project number] is six pages and R01 can be funded for between three and five years. We always ask for five and R21

is for two years. So, the budget is smaller and the time period is smaller. So that's why the R21, in some respects, it's easier to write".

Finally, the process of writing a proposal seems to be influenced by who the scholars collaborate with. For example, P6 pointed out how collaborators influence when she works on the task: "we [the participant and the collaborator] sync very well. For example, she [collaborator] likes to start with an outline. I don't like to start with an outline, but she likes to start with an outline. So, she sent me an outline. I fill in my details or what preliminary data I would like to include. She looks at it, sends it back. We have phone calls. The process with her is a little bit different than my normal process because she's much more interactive, which is actually the way it should be. So, the grant writing process with her is actually much more equal than a lot of other grants that I write".

In brief, a wide range of non-social factors of task-based information seeking behavior emerged in this study, in addition to social and sociomental factors. Such factors play a useful role in confirming the existing understanding of key factors in information seeking and searching behavior, such as cognitive and organizational factors and attributes of task.

6.5 Summary

In sum, this chapter discussed how the individuals in this study are influenced by their thought communities when they perform the task of writing a research proposal, and engage in information seeking with respect to that task. This exploratory study found that, from the cognitive sociological perspective, social factors of thought communities

seem to affect how individuals perceive and perform a task, directly or indirectly. In particular, from the inductive process of data analysis, social norms and social practices of thought communities were identified as the social factors that may influence task-based information seeking of members of the communities. Specifically, perceiving a task and attending to certain aspects of a task in a social manner were influenced by them, which further led to different styles of information seeking and use between different thought communities.

As a consequence of analysis, the final model of task-based information seeking behavior is suggested, which depicts how a task triggers information seeking activity and what factors, including social and non-social, are associated with the process of task-based information seeking. It not only corresponds to existing factors of task-based information seeking/searching, widely known, such as personal and institutional factors and task attributes, but also newly suggests sociomental factors of the process. Therefore, this novel theoretical model containing both social and non-social factors of information seeking will contribute to understanding the relationships between task-based information seeking and a social context of task in more integrative and holistic ways.

CHAPTER 7. CONCLUSION

This exploratory study reveals that task-based information seeking behavior can be influenced by the social context of task, since individuals' cognitive processes related to a task are not merely personal, but also social. A novel model of task-based information seeking behavior is introduced, which introduces cognitive sociological variables of information seeking behavior, such as social understanding and social relevance. In this chapter, summary of study findings, detailed implications of the study, and some limitations are discussed. Directions for future research are also suggested.

7.1 Summary

This study explores how and why people in different thought communities reveal different cognition and behavior with respect to the same type of task, in order to understand the effects of the social context on individuals' task-based information seeking behavior. The differences were analyzed in terms of three aspects: understanding of a task, identification of information problems of a task, and choice of action to resolve the problems. The specific reasons for the differences were also examined to identify social reasons that explain such differences. Key findings for the research questions are summarized and takeaways from the findings follow.

RQ1: Are there differences of individuals' understanding of a task in different thought communities?

The natural sciences and the humanities differently perceived and interpreted a proposal writing task. Specifically, the differences between the two disciplines were

found in characterization of the task, complexity, importance of the task, target funding types for the task, feelings, challenges and priorities in doing the task. The reasons for such differences were associated with not only non-social aspects, such as characteristics of the disciplines, individual performers, and the task, but also social dimensions of the disciplines, particularly social norms and practices of the communities with respect to research performance, general scholarship, and academic career. Such sociological motivations to individuals' thoughts in interpreting the task explain social understanding of the task, a community's collective interpretation of proposal writing which has been socially agreed among the members of the community.

RQ2: Are there differences of individuals' information problems of a task in different thought communities?

Information problems of the proposal writing task, which denote the types of relevant subtasks and of information needed for the task, were different between the natural sciences and the humanities. The reasons for the different identifications of information problems from the same task were also related to the social components of the fields: social norms and practices of the fields, and social understanding of the task. Similar to their understanding of the task, each discipline's shared norms and practices regarding research and career play an important role in shaping their similar ways to attend to certain subtasks and information for the task. The disciplines' social understanding of the proposal writing task, discovered from the preceding step of identifying information problems, also affected how their members focus on particular subtasks and information types. Therefore, it reveals that social relevance to a task, a thought community's common manner of attending to certain subtasks or information, is

a possible socio-cognitive variable of the process of task-based information seeking behavior.

RQ3: Are there differences of individuals' choice of action to resolve the information problems in different thought communities?

The natural scientists and the humanities scholars chose different actions to resolve information problems identified from the preceding cognitive phase. Specifically, their choice of information sources, searching activity, and information management and communication were different in the two groups. Data analysis shows that the different information-related activities derived from characteristics of the disciplines and institutions as well as sociological dimensions of the disciplines, including disciplinary norms and practices. Also, the communities' social understanding or social relevance of the task, the socially constructed prior cognitive activities in the process of a task, seem to influence some of the subsequent information seeking and use activity of the members. Hence, task-based information seeking behavior may be closely associated with the social context in which a task is perceived and analyzed by individuals who use a particular sociomental lens to interact with the task and information in social ways.

In sum, task-based cognitive activities and information seeking behavior were influenced by thought communities in which individuals have been socialized in how to think and act, especially by learning social norms and practices of the communities. Using the theory of cognitive sociology, this study provides empirical evidence of the effects of social norms on individuals' task-oriented cognitive activities, including perception of a task and attention to information problems of a task, and information

seeking activities. This finding supports the existing claims from cognitive sociology that social norms are a major factor leading to socially constructed cognition (Brekhus, 2015; Zerubavel, 2009). Also, it corresponds to the influences of social norms of sociocultural groups on information interactions in library and information science (Chatman, 1999; Jaeger & Burnett, 2010). More importantly, it uncovers how social norms could affect people's cognition and behavior during the process of a task, which helps widen the understanding of the relationships between social norms and information seeking behavior, in particular.

Also, social practices of communities were found as another social factor that influences individuals' cognition and behavior in the task. Social practices point to everyday life routines shared within the boundaries of thought communities, referring to the definition from Wenger (1999). This definition is similar to the agreed meaning of information practices in the field of library and information science, in terms of highlighting continuity and habitualization of activities of a group that give rise to information interactions (Tuominen, Talja, & Savolainen, 2002). Therefore, this empirical study identifying social practices as a social factor influencing information seeking contributes to the body of literature in information practices and the social approaches to task-based information seeking behavior primarily using the practice-oriented perspective (Byström & Lloyd, 2012; Talja & Nyce, 2015). However, contemporary research in information practices focuses its attention particularly on language or discourse, as it is considered to be constitutive for the construction of selves and formation of meanings and to shape belief, thoughts, and emotions of people (Talja, Tuominen, & Savolainen, 2005). With the data collection and analysis in the present

study, evidence for the effects of linguistic representations of thought communities on individuals' cognition and behavior is limited. In order to develop a full picture of how task-based information seeking should be understood from the viewpoint of information practices, more analysis on linguistic and symbolic structures of communities is needed; such as utterances and forms of understandings of communities (Lloyd & Olson, 2019). Nonetheless, it is still worth noting that the study shows how both social norms and practices can interplay with each other in the context of task-based information seeking behavior, especially their integrative roles in shaping individuals' cognitive and behavioral activities that could arise in a task.

In conclusion, the study successfully explored a new aspect of task-based information seeking behavior, the cognitive sociological dimension of information seeking behavior, using the theory of cognitive sociology. It showed that the cognitive sociological stance was useful to analyze how social factors of particular thought communities influenced the members' task-related behaviors, including cognitive activities leading to information seeking activities from a given task. Hence, the study discovered, not confirmed, that there could be social effects on individuals' cognition and behavior in the process of task-based information seeking. This finding is novel in information behavior research, in terms of showing the relationships between social contexts and task-based information seeking behavior with particular focus on socio-cognitive activities related to tasks. As exploratory research, this study uncovers a new theme of information seeking behavior, sociomental activities in information seeking, which can be further explored through the replication process or tested through confirmatory research.

7.2 Implications

Implications of the study are addressed from the three perspectives: theoretical, methodological, and pragmatic.

7.2.1 Theoretical Implications

First, implications from the theoretical perspective indicate how this study contributes to expanding understanding of information seeking behavior in the field of information science. From this perspective, the main contribution is concerned with identifying social aspects of task-based information seeking behavior. To date, there is limited research analyzing information seeking behavior from socially-oriented approaches. In particular, social factors of task-based information seeking behavior has not received much attention due to the predominance of the individualistic perspectives on the area, focusing on individuals' qualities and characteristics with respect to information seeking. However, this study provides evidence for the relationships between the social context of a task and information seeking behavior, and relevant social factors.

Specifically, this study makes distinct contribution to the area of information behavior by discussing sociomental acts related to information seeking using the conceptual framework of cognitive sociology. Although a number of previous researches employed sociological or practice-oriented approaches to investigate social aspects of information behavior, little research has been conducted to examine social dimensions of individuals' cognitive processes related to information behavior. This study reveals that individuals' cognitive activities in the process of task-based information seeking, including interpreting a task and identifying information problems from a task, are

influenced by their social context. Such socio-cognitive activities occurring when individuals perceive and perform a task can further affect subsequent information seeking and use activity, such as information source selection and information management and communication. Exploration of the cognitive sociological aspects of task-based information seeking broadens the breadth of social viewpoints on information behavior and diversifies analytic lenses to cognitive and affective factors of information behavior.

Moreover, the findings of the cognitive sociological aspects of information seeking behavior play an important role in explaining why different social groups reveal different information behavior, which has been a consistent result in the previous literature. The cognitive sociological factors suggested in this study, social understanding and social relevance, can help understand what makes individuals in a certain social group act in a particular way, or why people in the same group tend to show similar information behavior, which is, however, different from others outside the group. For instance, scientists tend to use people as information sources according to the results of this study as well as other similar studies in information science. From the cognitive sociological framework, such a phenomenon can be explained as the result of their cognitive socialization to the scientific community, especially by learning and experiencing the community's distinctive norms of collaborative research and practices of delegating information seeking. Also, information sharing, one of the major topics in contemporary information behavior research, can also be understood from this perspective. For example, data sharing in scholarly communities, can be examined, looking into normative structures of such communities with regard to how to understand their information or data, whether it is sharable or not, which could reveal why

information sharing behavior varies across different academic communities. As such, the socio-cognitive aspects of information behavior can be used to identify underlying reasons or motivations that cause certain characteristics or patterns of information behavior in particular social and cultural communities.

7.2.2 Methodological Implications

From the methodological aspect, this study is important in terms of choosing and introducing a new theoretical framework for information behavior research. Given the interdisciplinary nature of research in human information behavior (Wilson, 1997), this study paid attention to cognitive sociology as a conceptual framework. The attempt to embrace the new theory widens the methodological scope and perspective on examining social aspects of information behavior by highlighting socio-cognitive variables of behavior, such as social understanding and social relevance. Taking consideration of the socio-cognitive variables in information behavior research allows researchers to investigate social dimensions of people's cognitive activities while interacting with information, which could help to advance understanding of how social milieu of information is related to human behavior.

For instance, the socio-cognitive variables can be adopted in the area of social informatics that primarily analyzes interactions between users and information technologies. The focal point of social informatics research is that, the social context of information technology development and use influences the ways that people use information and technologies, and thus influences their consequences for work, organizations, and other social relationships (Kling, 2007). In other words, it is vital to

understand the institutional, social and cultural context in which sociotechnical interactions occur. The socio-cognitive activities in relation to information seeking can be focused on for the analysis of how users perceive, evaluate, and attend to information technologies within their social context, which essentially aims to support users' interactions with technologies.

In addition, it is worth noting that the comparative approach chosen for this study successfully elicited individuals' socio-cognitive aspects in task-based information seeking, by identifying differences of individuals' perception and performance of a particular task and information seeking activity in two different thought communities. Qualitative inquiry based on the comparative approach allowed for identifying socially constructed cognition and action of individuals with respect to task-based information seeking. It corresponds to the common practice in cognitive sociology that utilizes a comparative method that would highlight people's cognitive diversity as members of different thought communities (Zerubavel, 2009). Therefore, this study implies that cognitive sociological aspects of information behavior can be captured through applications of qualitative methods and cross-context comparative analysis of individuals' cognition related to interactions with information.

7.2.3 Pragmatic Implications

From the pragmatic perspective, the study contributes to suggesting how to design information systems, particularly the systems for certain social and cultural groups, including professional groups. When it comes to designing and configuring information systems, it is crucial to understand a user group in depth in order to effectively assist and

facilitate their work and use of the systems. The findings of the study, including the theoretical model of information seeking behavior, can suggest how to analyze users in sociocultural groups or communities of practices, with particular focus on their cognitive and behavioral processes when they perform tasks and use information systems to complete tasks, when developing information systems. This process of analysis of users' socially constructed cognition and behavior can reveal what is considered important and what is neglected by particular groups when they interact with the systems and find information. Consequently, it will help to understand, or predict, various ways of how a certain social group uses information systems to perform tasks or seek information within their community. Therefore, the findings of the study make contribution to development and design of a system that effectively incorporates a group's common interest, attention and preferences.

7.3 Limitations

Limitations of the study are related to its research design and methods, a case study using qualitative methods. Case studies are typically limited in terms of the number of entities and variables that are investigated (Case & Given, 2016). This case study also focused on a small number of people from a single institution, which results in a challenge to transferability of the findings: whether the current study results can be generalized or transferred to other contexts or settings (Miles, Huberman, & Saldaña, 2014). The twelve individual participants in the humanities and the natural sciences are insufficient to be representative of all other individuals from those disciplines and be compared between the groups. Other professors in the same fields, but belonging to

different types of institutions, for instance, a teaching-intensive university, may be different from the current participants in the research-centered university with regard to how they think about and act for proposal writing tasks. Thus, with the specific and defined small-sized sample from a particular context using purposive sampling, the current study shows limited transferability of findings. However, case studies have a cumulative effect if further cases are investigated in future research (Case & Given, 2016). Hence, the findings of this study will be more useful in understanding social aspects of information seeking behavior when more researches in the similar research settings are performed, by collecting and analyzing data from multiple sites with multiple cases (Krathwohl, 2009).

As qualitative research, this study employed an interview method and a diary method. Despite the researcher's original intention to balance the numbers of participants for the two data collection methods, an individual interview and a diary study, to achieve triangulation, it turned out that the interview was the primary method for collecting the data, and the diary study played only a supplementary role in data collection. This was primarily due to problems of recruitment within the limited time of the study. The individual interviews revealed the limitation in obtaining the participants' full description of the process of task-based information seeking, in that they had to rely on their memory to answer the questions about previous experience. It is possible that participants answer interview questions inaccurately or incompletely if their memory is unclear. In addition, during the interview process, the researcher's bias or assumptions to each discipline may influence how the participants answer the questions, which is typically deemed to be the individual interview's limitation (Connaway & Radford, 2017). In order to minimize the

limitations of the individual interview method, more data should be collected from the diary method, which helps not only generate more accurate real time data regarding task-specific action and related information seeking action, but also reduce the possible effects of the researcher's bias on participants' answers from interviews.

7.4 Future Research

The findings of this exploratory study can be further examined and extended to develop more holistic understanding of social aspects of task-based information seeking behavior. One of the potential research directions is to collect more data to verify the exploratory results of this study and refine the conceptual model suggested in this study. The current model has been constructed based on the findings from a small-sized sample of this study. Therefore, more empirical evidence is necessary to validate the model, by finding more interview participants from humanities and natural sciences. It is also important to employ methods other than individual interviews to obtain more reliable data, such as a diary method or a focus group. As noted in the limitations, this study could not balance the amount of data from the two methods, an individual interview and a diary. Thus, for the future research extending the findings of this study, multiple data collection methods should be chosen to increase validity of the data by comparing results and interpretations among different types of methods.

Another way to extend the present research is selecting different types of thought communities and tasks to compare information seeking behavior of individuals, in order to improve transferability of the study results. As noted from the study limitations earlier, this study focused on disciplinary communities as a type of thought communities, and on

one of their tasks, research proposal writing. Besides, the participants were recruited from the single institution. Choice of different types of social groups and task, or participants from multiple institutions, can help confirm or validate the current study's findings of socio-cognitive factors, including a theoretical model of task-based information seeking behavior introduced from this study.

In consideration of generality of results, using quantitative research methods, such as surveys, can be another potential way to extend the findings. As wider-scale investigations, quantitative research that generates large datasets concerning human thoughts and behaviors in different communities may be able to reveal more explicit differences of task-based information seeking behavior between the communities. Also, new types of socially influenced thoughts and behaviors of individuals when performing a task can emerge from data analysis of quantitative studies.

Finally, future research can focus on analyzing social aspects of information searching behavior, paying attention to search tasks and related activity. The current study examined effects of social context on information seeking behavior with little consideration of information searching activity of individuals. Information search processes also entail a variety of cognitive activities, such as expressing the information need for search formulation, i.e., articulation of search terms, and executing and reformulating a query (Marchionini, 1995). Such activities have been extensively analyzed from the cognitive viewpoint; for instance, how search terms or choice of sources are different depending on individuals' experience or knowledge levels. Since this study articulated that individuals' cognitive processes while performing an information seeking task can be influenced by their membership to certain thought

communities, it is also possible that information searching behavior can be related to their social background. Therefore, the analysis of the social influences on cognitive activities during search processes will be potentially beneficial in information searching behavior research, as it could help articulate the reasoning process behind term selection and relevance assessment for understanding information searching better (Vakkari, 2016).

APPENDICES
Appendix 1
Email Recruitment Script

To: Faculty members in [Name of the discipline/department]
 From: Eun Youp Rha, Ph.D. Candidate
 Subject: An Invitation to Participate in Study on Social Aspects of Task-Based Information Seeking Behavior

I am Eun Rha, a doctoral student at School of Communication and Information at Rutgers University. For my dissertation, I am investigating thoughts and behaviors of scholars, when they prepare/submit a research proposal, with special emphasis on related information seeking activities. I will be comparing the experiences of scholars in the Humanities, with that of scholars in the Natural Sciences. I am particularly looking for tenured professors to participate in this study.

For the **eligibility of participation**, you must have experience of preparing and submitting a research proposal in the past, at least once (Research proposal: any kind of proposal that aims to fund or support your research or scholarship from external funding sources; such as a grant proposal, a fellowship proposal)

If you participate in this study, you will be asked to do either an in-depth interview or a self-record diary accompanied with two interviews, depending on your situation related to the research proposal:

- **In-depth interview:** If you finished a proposal in the past, you will be asked to do the in-depth interview, lasting up to two hours. As a token of appreciation for your participation, you will be given a \$30 gift card.
- **Diary study:** If you are currently preparing for a proposal OR about to start writing a proposal soon, you will be asked to do a self-report diary over a month (or less than a month depending on a progress of proposal submission), with a short initial interview and an exit interview. As a token of appreciation for your participation, you will be given a \$90 gift card.

Please note that, I am interested in understanding how individual professors perceive and perform the task of preparing a research proposal and finding information for the task, not in examining specific topics, methods, or approaches used in designing their research project. Therefore, there will be no inquiry about detailed ideas with respect to a participant's research project.

The success of this dissertation relies on professors' participation, so I hope that, if you meet any of the criteria for inclusion in the study, you will consider participating. I would greatly appreciate if you could help us learn more about social aspects of information seeking behavior, which have been rarely discussed yet. This will clearly help expand knowledge in information seeking behavior studies and contribute to create foundations for designing socially- and culturally-oriented information retrieval systems in the future.

If you are interested in participating in this study or need more information about the study, please contact me at eunyoup.rha@rutgers.edu

Thank you very much for considering this invitation!

Sincerely,
Eun Rha

Eun Youp Rha
Doctoral Candidate
Department of Library and Information Science
School of Communication and Information
Rutgers University
4 Huntington street
New Brunswick, NJ 08901-1071 USA

Appendix 2

INTERVIEW INFORMED CONSENT FORM

You are invited to participate in a research study that is being conducted by Eun Youp Rha, who is a doctoral candidate in the Department of Library and Information Science at the School of Communication and Information at Rutgers University. The purpose of this research is to analyze how faculty members conduct a scholarly task, preparing and submitting a research proposal, and how they find information for the task.

Approximately 30 subjects will participate in the study, and each individual's participation will last up to 2 hours.

The study procedure includes an in-depth interview. During the interview, the researcher will ask you some questions about your recent experience with preparing and submitting a particular research proposal. You will need to recall how you worked on the proposal and answer the questions based on your memories and any relevant documents you may wish to consult or present. The questions will be concerned with how you perceived, understood, and performed your task of developing a research proposal and how you found information while working on the research proposal. An example question is "Could you describe how you prepared the proposal in terms of some phases; for instance, early, mid, and last phases? Please feel free to talk about related topics and ideas, not limited to the given questions."

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes name, age, gender, ethnicity, and educational history. Please note that we will keep this information confidential by limiting individual's access to the research data and keeping it in a secure location, a password protected computer accessed by only the PIs.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for three years and destroyed upon publication of study results.

There are no foreseeable risks to participation in this study. Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions from the interview with which you are not comfortable.

You will receive a \$30 gift card as a token of appreciation for your participation.

If you have any questions about the study or study procedures, you may contact myself at:

Department of Library and Information Science
 School of Communication & Information
 Rutgers University
 4 Huntington St.
 New Brunswick, NJ 08901
 Tel: (732) 519-2779
 Email: eunyoup.rha@rutgers.edu

You may also contact my faculty advisor Nicholas J. Belkin at:
 Department of Library and Information Science
 School of Communication & Information
 Rutgers University
 4 Huntington St.
 New Brunswick, NJ 08901
 Tel: 848-932-7608
 Email: belkin@rutgers.edu

If you have any questions about your rights as a research subject, please contact an IRB Administrator at the Rutgers University, Arts and Sciences IRB:

Institutional Review Board
 Rutgers University, the State University of New Jersey
 Liberty Plaza / Suite 3200
 335 George Street, 3rd Floor
 New Brunswick, NJ 08901
 Phone: 732-235-2866
 Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.

Sign below if you agree to participate in this research study:

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Audio/Visual Addendum to Consent Form

You have already agreed to participate in a research study entitled: Social Aspects of Task-Based Information Seeking Behavior conducted by Eun Youp Rha. We are asking for your permission to allow us to audiotape the interview as part of that research study. If you say anything that you believe at a later point may be hurtful and/or damage your

reputation, then you can ask the interviewer to rewind the recording and record over such information OR you can ask that certain text be removed from the dataset/transcripts.

The recording(s) will be used for transcription and analysis. The recording(s) will include identifiers, such as age, gender, ethnicity, and academic history. The recording(s) will be stored in a principle investigator's secure computer system with password protection and labeled with a participant number generated at the beginning of the initial interview. The recordings will be destroyed upon publication of study results.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix 3

DIARY STUDY INFORMED CONSENT FORM

You are invited to participate in a research study that is being conducted by Eun Youp Rha, who is a doctoral candidate in the Department of Library and Information Science at the School of Communication and Information at Rutgers University. The purpose of this research is to analyze how faculty members conduct a scholarly task, preparing and submitting a research proposal, and how they find information for the task.

Approximately 30 subjects will participate in the study, and each individual's participation will last up to a month.

The study procedures include three separate steps: an initial interview, self-report diaries, and an exit interview.

The first step is an initial interview, which occurs today, introducing the study process and asking questions about your academic background, and your general understanding and perceptions of a research proposal.

Next, you will be asked to keep self-report diaries. In this step, you will need to write what you have done while working on your research proposal, including specific activities for preparing research proposal, information that you need, sources that you select to get the information needed, etc. Each diary entry can be completed whenever you perform particular proposal preparation tasks over a month; for instance, analyzing literature, budgeting, writing a section, communicating with a colleague/co-PI, etc. To record diary entries, you will be given an online template. If, at any time, information that you decided to keep is private or confidential, please exclude it from the diary.

Finally, an exit interview will be performed after a week from the completion of diary study. This step aims to clarify data from the diaries and ask additional questions about reasons/motivations of your perceptions and behaviors found from the diaries.

Please feel free to talk about related topics and ideas for both initial and exit interviews, not limited to the given questions.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. Some of the information collected about you includes name, age, gender, ethnicity, educational history, and research ideas. Please note that we will keep this information confidential by limiting individual's access to the research data and keeping it in a secure location, a password protected computer accessed by only PIs.

The research team and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for three years and destroyed upon publication of study results.

There are no foreseeable risks to participation in this study. Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions from the interview with which you are not comfortable.

You will receive a \$90 gift card as a token of appreciation for participating in the entire study; if you decide to end participation during the study, you will be compensated on a prorated basis, for hours spent on your participation.

If you have any questions about the study or study procedures, you may contact myself at:

Department of Library and Information Science
School of Communication & Information
Rutgers University
4 Huntington St.
New Brunswick, NJ 08901
Tel: (732) 519-2779
Email: eunyoup.rha@rutgers.edu

You may also contact my faculty advisor Nicholas J. Belkin at:

Department of Library and Information Science
School of Communication & Information
Rutgers University
4 Huntington St.
New Brunswick, NJ 08901
Tel: 848-932-7608
Email: belkin@rutgers.edu

If you have any questions about your rights as a research subject, please contact an IRB Administrator at the Rutgers University, Arts and Sciences IRB:

Institutional Review Board
Rutgers University, the State University of New Jersey
Liberty Plaza / Suite 3200
335 George Street, 3rd Floor
New Brunswick, NJ 08901
Phone: 732-235-2866
Email: humansubjects@orsp.rutgers.edu

You will be given a copy of this consent form for your records.

Sign below if you agree to participate in this research study:

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Audio/Visual Addendum to Consent Form

You have already agreed to participate in a research study entitled: Social Aspects of Task-Based Information Seeking Behavior conducted by Eun Youp Rha. We are asking for your permission to allow us to audiotape the initial interview and the exit interview as part of that research study. You do not have to agree to be recorded in order to participate in the main part of the study.

The recording(s) will be used for transcription and analysis. The recording(s) will include identifiers, such as age, gender, ethnicity, and academic history. If you say anything that you believe at a later point may be hurtful and/or damage your reputation, then you can ask the interviewer to rewind the recording and record over such information OR you can ask that certain text be removed from the dataset/transcripts.

The recording(s) will be stored in a principle investigator's secure computer system with password protection and labeled with a participant number generated at the beginning of the initial interview. The recordings will be destroyed upon publication of study results.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

Appendix 4

Individual Interview Questions

Thank you for agreeing to participate in this research study. The aim of this study is to understand how faculty members in a certain discipline perform their scholarly task of designing a research proposal and related information seeking tasks. Before starting the interview, please let me know if you have any questions about the study or the process.

First of all, I would like to know about your academic background.

Q1. What discipline have you been involved in?

Q2. Please describe your education history, from first college degree to the highest degree.

Q3. How long have you been a faculty in higher education, including the time when you worked at other institutions in the past?

Now, let's talk about your task. I would like you to reflect on your latest, recent or special experience of preparing and submitting a research proposal as a scholarly task, such as a grant proposal or other types of research proposal that aim to support your research, then answer the following questions. It should be limited to original submission, not resubmission.

Q4. Could you freely talk about your proposal in detail so that I could understand the nature of your proposal? Description about your proposal will remain confidential and will not be reported in any description of my research.

[Use sub-questions as a guideline if necessary]

Q4-1. How long did it take to complete it? If it is still continuing, when did you start it and when is it expected to be done?

Q4-2. Where did (or will) you submit it?

Q4-3. Did you collaborate with others for the proposal? [IF YES]: Who are the collaborators?

Q5. Now, I would like to ask about the overall procedure of designing the research proposal. Could you describe how you went about preparing the proposal in terms of some phases; for instance, early, mid, and last phases?

Q6. What were the most important tasks or priorities among the whole set of tasks you performed from thinking of the project to submit it, and why?

Q7. Please tell me how you viewed about preparing and submitting the proposal based on the following questions:

Q7-1. Were you familiar with preparing/submitting this kind of proposal?

[No familiarity – low familiarity – moderate familiarity – high familiarity – extreme familiarity]

Q7-2. Was preparing/submitting the proposal complicated to you?

[No complexity – low complexity – moderate complexity – high complexity – extreme complexity]

Q7-3. Was preparing/submitting the proposal difficult?

[No difficulty – low difficulty – moderate difficulty – high difficulty – extreme difficulty]

Q7-4. How important is preparing/submitting the proposal in your role as a scholar? In what ways do you think that it is important??

[No importance – low importance – moderate importance – high importance – extreme importance]

Q8. I would like to know about each of the tasks that you conducted to prepare the proposal. In the earlier question, you mentioned that you did [tasks: answer of Q6]. Please answer the following questions based on the first task: [Task 1].

Q8-1. Task 1:	
Actions	1. What did you do to complete the task?
Task goal	2. Why did you do this task?
Information needs	3. What kind of information did you need to get this task done? → Information items can be either physical or digital forms. Physical forms may include documents, books, paper notes, photos, films, etc. Digital form may include Word files, text files, excel files, PowerPoint slides, music files, image files, PDFs, etc.
Information sources	4. How did you obtain the information you needed? Please tell me specific sources chosen to get the information. → Sources may include people, organizations (e.g. libraries, research centers), websites (including search engines), databases, or anything accessed to get the information needed.
Why chosen	5. What made you choose such sources?
Perceptions of sources	6. How did you view about these sources? (For example, usefulness, applicability, accessibility, familiarity)

[Repeat this set of questions for other tasks]

Now, I am going to ask your overall experience of information seeking activity while you were working on the research proposal.

Q9. Was there any problem that you encountered while you were seeking information to prepare the proposal? **[IF YES]:** Please answer the following sub-questions.

Q9-1. How and why did the problem arise?

Q9-2. How did the problem affect your information seeking process?

Q9-3. How did you resolve or try to resolve the problem?

Q10. How did you evaluate and select the information items among what you found from information seeking activities?

Q11. How did you use, manage, or communicate the information that you selected?

Please also tell me why you did so.

Q12. Is there anything you want to tell me more?

Q13. Finally, could you tell me your demographic information including age, gender, and ethnicity?

Appendix 5

Diary Study Initial Interview Questions

Thank you for agreeing to participate in this research study. The purpose of this study is to understand how faculty members in a certain discipline perform their scholarly task of designing a research proposal and conduct related information seeking tasks. The procedures of your participation in the study include this initial interview, keeping a diary of activities related to your research proposal for two weeks, and an exit interview, which will occur a week after finishing the diary stage. The initial interview, which is happening today, covers some questions about your academic background, the nature of your research proposal and your perceptions of the research proposal. At the diary stage, you will be recording, in a diary, activities associated with preparing your proposal for two weeks. After the completion of the diary stage, we will have an exit interview to talk about the data that you enter in your diary.

Before starting the initial interview, please let me know if you have any question about the study or the process.

As the first step, I would like to know about your academic background.

Q1. What discipline have you been involved in?

Q2. Please describe your education history, from first college degree to the highest degree.

Q3. How long have you been a faculty in higher education, including the time when you worked at other institutions in the past?

Now, I am going to ask some questions about your research proposal that you have been preparing to submit (or that you are about to start soon). A research proposal can be a grant proposal, or any kind of research proposal that primarily aims to support your research, for instance, a research fellowship.

Q4. I would like to understand the nature of your research proposal. Please answer the following questions.

Q4-1. What stage are you in with respect to preparing your proposal? (e.g., beginning, middle, final)

Q4-2. When are you going to submit it?

- (If it is about to start) When do you plan to submit the proposal?
- (If it is in the middle of the process) How long do you think it would take until you submit it from the beginning?

Q4-3. Where are you going to submit it?

Q4-4. What is expected to be a final outcome of this research?

Q4-5. Do you collaborate with others for this proposal? [IF YES]: Who are the collaborators?

Q4-6. Please tell me if there is anything you want to add about your proposal.

Q5. How do you view about preparing and submitting the proposal as a scholar in your field? Please answer the following sub-questions.

Q5-1. Are you familiar with preparing/submitting this kind of proposal?

No familiarity – low familiarity – moderate familiarity – high familiarity – extreme familiarity

Q5-2. Is preparing/submitting the proposal complicated? (whether it involves multiple steps)

No complexity – low complexity – moderate complexity – high complexity – extreme complexity

Q5-3. Is preparing/submitting the proposal difficult? (whether it is difficult to finish)

No difficulty – low difficulty – moderate difficulty – high difficulty – extreme difficulty

Q5-4. How important is preparing/submitting the proposal in your role as a scholar? (If it is quite important) In what ways you think that it's important?

No importance – low importance – moderate importance – high importance – extreme importance

Q6. Now, I would like to ask about the overall procedure of designing your research proposal. Could you describe how you are going to develop the proposal, particularly in terms of some phases, for instance, early, mid, and last phases? If you have started it already, please describe how you are going to finish from the current state.

Q7. What are the most important tasks or priorities among the whole set of tasks you may perform from thinking of the project to submit it, and why?

Q8. What are the information sources that you may access while working on a research proposal? Information sources include any sources from which you can obtain the information you need, such as websites, library materials, journal articles, human resources, etc.

- Could you also tell me why you would access them?

Q9. Finally, could you tell me your demographic information including age, gender, and ethnicity?

Appendix 6

Dairy Study Instructions

Thank you for agreeing to participate in this study. The purpose of this study is to understand how faculty members in a certain field perform their scholarly task of designing a research proposal and the related information seeking tasks. A research proposal can be a grant proposal, or any kinds of research proposal that primarily aim to support your research. Information seeking tasks refer to any kinds of tasks related to finding information in the process of designing your research proposal; for instance, finding recent conference papers, asking colleagues about proposal details, accessing online database to find journal articles, etc.

For two weeks, please set aside about 10 minutes for recording a diary entry in the following format whenever you perform a particular task entailing information seeking tasks while preparing your research proposal; for instance, analyzing literature, budgeting, writing a section, communicating with a colleague/co-PI, ...). Each entry should be related to one particular kind of task.

If, at any time, information that you decided to keep is private or confidential, please exclude it from the diary. You do not have to describe details of ideas or approaches of your research project in the diary.

Please record incidents completely as much detail as possible.

If you have any question while recording the diary entries, please do not hesitate to contact me at: eunyoup.rha@rutgers.edu

Thank you very much for your participation!

Appendix 7

Diary Study Template

Please answer the following questions for each particular task you perform in the process of designing your research proposal.

Q1. What is the task that you were doing for your research proposal? Please specify a

--

stage or phase of the task of the whole research proposal work.

Q2. What was the goal of doing this task?

--

Q3. What kinds of information did you need to get this task done?

(Information items can be either physical or digital forms. Physical forms may include documents, books, paper notes, photos, films, etc. Digital form may include Word files, text files, excel files, PowerPoint slides, music files, image files, PDFs, etc.)

--

Q4. How did you obtain the information you needed? Please describe specific sources you chose to get the information and also why you chose them. Sources may include people, organizations (e.g. libraries, research centers), websites (including search engines), databases, or anything accessed to get the information needed.

Information item	Sources selected	Reasons for selecting sources

Q5. Please evaluate the sources you mentioned in the prior question according to the following criteria:

Source name	Usefulness	Applicability	Accessibility	Familiarity

Q6. Please list the information items you selected and describe why you selected them.

Information selected	Reasons for selecting the information

Q7. How did you use, manage, or communicate the information that you selected? What made you do so?

Information selected	Use, manage, or communicate	Why did you do so?

Q8. Was there any problem that you encountered while you were seeking information for your tasks? Answer the following questions **only if YES**.

Q8-1. Please describe how and why the problem arose.

Q8-2. Please describe how the problem affected your seeking processes.

Q8-3. How did you resolve or try to resolve the problem?

Appendix 8

Diary Study Exit Interview Questions

Thank you for your efforts on making diary entries for two weeks. Now I would like to ask a few questions about the data you recorded in the diaries.

Q1. What stage were you in with respect to proposal submission when you finished diary recording? Have you finished the proposal and submitted it?

Q2. [If necessary] I would like to ask you a question to clarify your answer from a diary entry. Could you tell me more about [reason described] in terms of how it led you to [actions taken by a participant]?

Q3. You mentioned in the first interview, that the most important tasks are [the answer of Q7 from the initial interview]. Do you still think these were more important than any other tasks? Could you tell me if you found different tasks that were also very important during this participation? And in what ways do you think they are most important?

Q4. What would be the next step of this proposal?

Q5. Is there anything you want to tell me more?

Appendix 9

Revised Interview Questions

Basically this research study aims to understand how faculty members in a certain discipline perform their scholarly task of designing a research proposal and related information seeking tasks. Research proposal can be any types of a proposal that aims to support or fund your scholarship from external sources, such as a grant proposal and a fellowship proposal. Before starting the interview, please let me know if you have any questions about the study or the process.

First of all, I would like to know about your academic background and general experience of research proposal writing.

Q1. What discipline(s) have you been involved in as a faculty?

Q2. Please describe your education history, from first college degree to the highest degree. Please also tell me the name of your PhD supervisor.

Q3. How long have you been a faculty in higher education, including the time when you worked at other institutions in the past?

Q4. How long have you been writing a research proposal?

Q5. How often do you write a research proposal?

Q6. Is there any specific funding agency or organizations that you are typically interested in for proposal writing?

Now I would like to ask you how you think about general proposal writing work.

Q7. How do you perceive the proposal writing work as a scholar in your field? How do you think it is important for you to get support in your scholarship?

Q8. How do you view about preparing and submitting the proposal in terms of three aspects, [familiarity, complexity, and difficulty]? Please evaluate each aspect based on the scale from 1 to 5: **1 is not at all, 5 is extremely**:

- Familiarity: 1 not at all – 5 extremely
- Complexity: 1 not at all – 5 extremely
- Difficulty: 1 not at all – 5 extremely

Now, I would like you to reflect on your latest, recent or special experience of preparing and submitting a research proposal.

Q9. Could you freely talk about your proposal in detail so that I could understand the nature of your proposal? Description about your proposal will remain confidential and will not be reported in any description of my research.

[Use sub-questions as a guideline if necessary]

- How long did it take to complete it? If it is still continuing, when did you start it and when is it expected to be done?
- Where did (or will) you submit it?
- Did you collaborate with others for the proposal? [IF YES]: Who are the collaborators?

Q10. Could you please describe how you developed the proposal, particularly in terms of some phases, for instance, early, mid, and last phases?

Q11. I would like to know about your information seeking activities based on what you did while preparing for the proposal.

Q11-1. Could you tell me about your information seeking activity from [Subtask 1], such as kinds of information that you needed, sources or channels you accessed to get the information needed?

Kinds of information may be related to the proposal content (e.g., articles, theories, news, ideas, etc.), and the process of proposal writing (e.g., guidelines from a funder, research site information, proposal opportunity, etc.). Information sources can be people, organizations (e.g. libraries, research centers), websites (including search engines), databases, or anything accessed to get the information needed.

Clarification questions if needed:

- *If there's any distinct source not commonly used by scholars:* Why did you access [source name]?
- *If multiple sources were used for finding the same information type:* Why did you access multiple sources/channels?

[Repeat Q11-1 for a different kind of subtasks]

Q12. Among the whole set of tasks or activities you performed for your proposal writing, what were the most important tasks or priorities from thinking of the project to submit it, and why?

Q13. How did you evaluate and select the information that you used for the proposal? Were there any specific criteria for evaluating and selecting information?

Q14. How did you manage or communicate the information that you used for proposal writing? And why did you do so?

Q15. Finally, I am interested in understanding your learning experiences with respect to proposal writing. How did you learn about what constitute a good proposal? Could you think of specific examples or instances which allowed you to learn or know how to prepare for a good proposal in your field? For example, making a mistake, learning from others, or getting trained in your field, etc.

Q16. Is there anything you want to tell me more?

Appendix 10

Revised Diary Study Initial Interview Questions

Introduction: Thank you for agreeing to participate in this research study. The purpose of this study is to understand how faculty members in certain disciplines perform their scholarly task of designing a research proposal and conduct related information seeking tasks. The procedures of your participation in the study include this initial interview, keeping a diary of activities related to your research proposal for a month, and an exit interview. The initial interview, which is happening today, covers some questions about your academic background, the nature of your research proposal and your perceptions and processes of writing a research proposal. At the diary stage, you will be recording, in the diary, activities for any particular proposal preparation tasks that you perform, after finishing each of the tasks, or at the end of each week, over a month. After the completion of the diary stage, we will have an exit interview, which will occur a week after finishing the diary stage, to talk about the data that you enter in your diary.

Before starting the initial interview, please let me know if you have any question about the study or the process.

First of all, I would like to know about your academic background and general experience of research proposal writing.

- Q1. What discipline(s) have you been involved in as a faculty?
- Q2. Please describe your education history, from first college degree to the highest degree. Please also tell me the name of your PhD supervisor.
- Q3. How long have you been a faculty in higher education, including the time when you worked at other institutions in the past?
- Q4. How long have you been writing research proposals?
- Q5. How often do you write a research proposal?
- Q6. Is there any specific funding agency or organization that you are typically interested in for proposal submission?

Now, I would like to ask you how you think and act in relation to general proposal writing.

- Q7. How do you perceive the proposal writing work as a scholar in your field? How important do you think it is for you to get support in your scholarship?
- Q8. How do you view preparing and submitting proposals in terms of three aspects, [familiarity, complexity, and difficulty]? Please evaluate each aspect based on the scale from 1 to 5: **1 is not at all, 5 is extremely**:
 - Familiarity: 1 not at all – 5 extremely
 - Complexity: 1 not at all – 5 extremely
 - Difficulty: 1 not at all – 5 extremely
- Q9. Could you please describe how you normally develop a proposal, particularly in terms of some phases, for instance, early, mid, and last phases?

Q10. I am going to ask a few questions about your specific research proposal which will be used for your diary study participation. As notified in the recruitment letter, a research

proposal for this study can be any kind of research proposal that primarily aims to support or fund your scholarship from external sources, for instance, a fellowship proposal, a grant proposal. etc.

Q10-1. What stage are you in with respect to preparing your proposal? (e.g., beginning, middle, final)

Q10-2. Where and when are you going to submit it?

Q10-3. What is expected to be a final outcome of this research? (e.g., programs, policies, books, papers, etc.)

Q10-4. Do you collaborate with others for this proposal? [IF YES]: Who are the collaborators?

Q10-5. Please tell me if there is anything you want to add about your proposal.

Appendix 11

Revised Diary Study Template

Please answer the following questions for each particular task that you performed in the process of preparing for your research proposal.

Q1. Please briefly describe the task that you were doing for your research proposal.

--

Q2. What kinds of information did you need to get this task done? Please list them all. Kinds of information may be related to the proposal content (e.g., articles, theories, news, ideas, etc.), and the process of proposal writing (e.g., proposal instructions, travel information, proposal opportunity, etc.)

--

Q3. How did you obtain the information you needed? Please describe specific sources you chose to get the information and also why you chose them. Sources may include people (e.g. colleagues, students, experts), organizations (e.g. libraries, research centers, universities), websites (including search engines), databases or anything accessed to get the information needed.

Information item	Sources selected	Reasons for selecting sources

Q4. Please list the information you selected for this task and describe how you evaluated to select them.

Information selected	Criteria for evaluating/selecting information

Q5. How did you use, manage, or communicate the information that you selected? What made you do so?

Information selected	Use, manage, or communicate	Why did you do so?

Appendix 12

Revised Diary Study Exit Interview Questions

Thank you for your efforts on making diary entries over a month. Now I would like to ask a few questions with respect to the data you recorded in the diaries.

Q1. Have you finished the proposal and submitted it? If not, when do you expect to do so?

Q2. Among the tasks recorded in your diaries, what are the most important tasks or priorities from thinking of the project to submit it, and why?

[Based on any particular tasks requiring clarification, follow up with questions about that task, including:]

Q3. According to your diaries, you used multiple sources to obtain a particular information type; could you tell me why you accessed multiple sources?

[Learning experience in general]

Q4. Finally, I am interested in understanding your learning experiences with respect to proposal writing. How did you learn about what constitute a good proposal? Could you think of specific examples or instances which allowed you to learn or know how to prepare for a good proposal in your field? For example, making a mistake, learning from others, or getting trained in your field, etc.

Appendix 13. Final Codebook

Code Level 1: Major Theme (separate tables)

- **Understanding of task:** the participant's understanding of the task
- **Information problems:** the participant's identification of information problems from the task
- **Choice of action:** the participant's specific activities in doing the task and seeking information
- **Social factors:** social aspects of the participant's discipline associated with his/her understanding and performance of the task and information-related activities
- **Other factors:** factors influencing the participant's understanding and performance of the task and information-related activities other than social aspects of his/her discipline

Code Level 2: Subtheme (first level of the codes)

Code Level 3: Code (second level of the codes)

Code Level 4: Subcode (third level of the codes)

Code Level 5: Sub-subcode (fourth level of the codes)

Major Theme 1. Understanding of task

Code	Definition	Example
Challenges	The participant explains what makes the task complicated or difficult to do	
anonymous reviewers	Preparing a proposal to be reviewed by anonymous people	"When we apply for grants, funding institutions, we have to speak to people who are outside of our fields, right? Part of the difficulty is in figuring out how to boil your very specialized research down so that it's accessible to people who might not know anything about it." (P13)
budgeting	Difficulty derived from budgeting in proposal preparation	"It's really hard because you don't know what tuition is going to be built in a raise and you know, how much is allowed for travel." (P6)
co-working	Difficulty derived from collaborating with others	"Anytime you're working with multiple team members, that adds to the complexity" (P2)
finding a right funding opportunity	Challenge to find proper funding sources	"It was one of the challenges is finding a good fit. Something that your project fits what they're looking for." (P12)
getting reference letters	Challenge to ask a reference letter to others	"The biggest deterrent is, you know, do they require people to write letters for you? I assume you don't want to bother people to write another letter. Sometimes you feel you don't want to be a burden for people" (P9)

multiple demands	Dealing with various expectations from multiple parties	“The difficult part again comes with navigating or negotiating these other demands. The stakeholders’ right to the sponsoring agency to (institution name), to the scholar public. Each of them is going to be difficult. What my colleagues expect of me as a scholar is different from what (institution name) expects of me as an employee, is different from the federal government expects of me as you know, a custodian of public funds. (P11)
political issues	Challenge derived from political issues	“Getting a grant, even if you have a great idea, some of it's political, right? And there's bias, especially being a woman. I mean you have to bring gender in, right? They showed that women get less grants that are more harshly scored than men.” (P6)
variations of funding agencies		
Characterization	traits or attributes of proposal writing task that are perceptually present by participants	
collaboration	Whether a task requires collaboration	
collaborative work	Proposal writing is collaborative	
interdisciplinary project	A research project conducted by scholars across disciplines	“I did the microbiology direction. Somebody else did chemistry, somebody else did engineering, somebody else did toxicology and then we all worked together. Even the sociology part did a proposal” (P5)
multi-institutional project	A research project collaboratively conducted by scholars from multiple institutions	“There's one PI and then I think we have eight co PIs at different institutions.” (P3)
solitary work	Proposal writing is individual work	“There was no collaboration. It's just for the individual scholar. So it's not a collaborative project” (P9)
research-oriented	Task’s characteristic related to research	
natural extension of research	Task is a part of general scholarly research activity	“It's just a natural extension of what we do. We are doing, everybody is doing some kind of research and then you have an idea that this topic has not been explored before.” (P12)
synthesis of ideas	Task requires synthesis of research ideas	“the work I do has always sought to bring different things together rather than one well identified thing.” (P10)
Successfulness	Whether proposal is succeeded or failed	
high success rate	Proposals were highly	“our success rates maybe around 20,

	accepted	30%, which is pretty high.” (P3)
low success rate	Proposals were not often accepted	“I find it the hardest thing to do. It's got the lowest success rate” (P2)
time		
consistency	Proposal writing/submission is consistently performed	“I think our target every year for grant awards is about 2 to 4 million. So that's what we've been doing pretty consistently since the late nineties when we went through our big grant.” (P3)
iterative process	Proposal writing is done back and forth, rather than at once.	“I always feel like I have to be at a certain point in the research before I can write a proposal about it. So the more I do the better my proposal. But on the other hand, I need the time, the proposal gives me to do the work. So it's always sort of a back and forth.” (P8)
long-term project	Proposal writing for a research project lasting for several years	“So that's with the National Science Foundation. So we run a time series site and Antarctica and this is our 27th year of the time series” (P3)
time consuming	Proposal writing takes much time and effort	“I don't think it's complicated. Time consuming, but not really complicated.” (P12)
Complexity	The level of complexity of proposal writing task measured by participants	
high complexity	Scale 4-5	“I would say that's also a five. It's extremely complicated.” (P11)
low complexity	Scale 1-3	“For me it's not complicated cause it's what I do.” (P12)
variable	Varying complexity depending on projects	“It varies on a topic.” (P4)
criteria for selecting a funding opportunity	Things or situations that motivate a participant to focus on funding opportunity	
life issue	Applying for a funding in consideration of life-related situations	“My experience is that those centers were really great, but now that I'm older and I have a kid and I'm married, I have not applied for one of those again, because that's not mobile. I'm not able to take my child and my spouse and go and move some place for six months or for a year.” (P13)
limited competition	Competition of funding is limited and small compared to other kinds of funding opportunities	“Dupont specifically used to put out a request for proposals for New Jersey institutions. So that means that the competition is pretty limited.” (P2)
perfect fit	Writing a proposal when a topic is perfectly fitting with a scholar's specialization	“I think about it and I only apply if I really think that I fit” (P12)
request by a funding agency	Writing a proposal when a funding agency directly requests	“often what happens is, if we're developing something and then some program manager and another thing

		wants to add some value, they'll come to us and say, 'would you be interested in trying this out or doing this?'" (P3)
what I really want	Writing a proposal on what a participant really wants and likes	"it's much more like, what do I really want to do with my life. Do I really want to spend it writing a bunch of proposals that have very little chance of getting funded, or do I want to spend it writing the papers and teaching and helping my students and stuff." (P2)
Difficulty	The level of difficulty of proposal writing task assessed by participants	
high difficulty	Scale 4-5	"I would say that difficulty is also very high" (P11)
low difficulty	Scale 1-2, not difficult	"I don't think, because it's your own research, so it's just what you spend your time doing. It's not really difficult. It just takes time." (P2)
medium difficulty	Scale 3	"Writing proposals is probably a three for me. It's, it's complicated. It's harder than writing a lecture or something. But, um, but I feel like I have a pretty good grasp of what goes into it." (P8)
variable	Varying difficulty depending on projects	"The difficulty again is the difficulty is usually tied to two things. It's tied to how long the grant is or how much money it is." (P3)
Familiarity	The participant's description of close association with a proposal writing task (including the use of scale from 1 to 5)	
somewhat familiar	Scale 3-4	"Four, quite familiar. And I read proposals a lot too." (P8)
very familiar	Scale 5	"At this point I will say five. Very familiar with what I think from experience, it should be." (P10)
Feelings	participants' emotional attitudes towards proposal writing	
negative	Feeling negatively toward proposal writing	
hate	Disliking proposal writing	"I hate writing proposals. I mean, I hate it. It's the worst part of my job." (P2)
stress	Feeling stressful concerning proposal writing and funding	"I'm nervous because we've been funded for 27, 28 years, and then we're going to write a renewal. And of course, I don't want our time series to be interrupted. And so there's a lot of stress." (P3)
positive	Feeling positively toward proposal writing	

fun	Enjoying proposal writing	"It's a very fun work." (P4)
love	Liking proposal writing	"I love to write proposals. Yeah. I'm going to tell you why I love to write them because you feel like you learn a lot and your ideas come together." (P6)
Importance	Perceived importance of writing a research proposal for getting external support	
not important	Proposal writing is not important in the participant's general scholarship	"the grants, they do an interesting supplemental role in the eco system of the humanities. But I don't think that their role is particularly critical." (P11)
somewhat important	Proposal writing is quite important in the participant's general scholarship	"So for me, it's a matter of getting the funding so that I can have the leave time to really work intensively on my research" (P8)
very important	Proposal writing is very important in the participant's general scholarship	"It has been extremely important throughout my career." (P10)
Priorities	Salient activity in terms of writing and submitting a proposal	
budgeting	Planning budgets and writing budget documents	"Of which the budget is perhaps the most important. Really what you need to do when you are putting together the grant is you have to start with a budget." (P11)
communicating	Networking and talking to people	"what I find is much more important is the first phase where you're lining up your team members"
demonstrating research significance	Clearly identifying importance of a research project	"So you have to present in a way that's clear to people and the significance is clear." (P12)
designing a research project	Activities related to designing a research project for a proposal: including developing a research question, analyzing literature, identifying research goals	"Preparing the question is the most important." (P1)
understanding funding agency's needs	Knowing about what a funding agency needs with respect to a proposal	"knowing the agency is next to being smart and a good scientist with good ideas. The next skill you have to learn is know your agency." (P3)
writing clearly	Clearly writing a proposal	"Making sure that is clear for the person who reads it." (P5)
Relevant funding type	Types of research funding that the participant has applied for	
contract	Legally binding agreement to acquire goods or services for the direct use of funding agencies.	"I had a few contracts with different industries, companies." (P4)
external research grant	Assistance mechanism to support research of scholars	

	from outside institution	
federal agency	Applying funding to government organizations that set up for a specific purpose	"Then I've also written NSF and the DOD, Department of Defense grants." (P3)
foundation	Applying funding to non-profit foundations or organizations	"I've also applied for grants from the US government or other nonprofit organizations." (P13)
fellowship	Applying the merit-based scholarship awarded to scholars to support their research	"I was a fellow at the Institute for Advanced Study in Princeton where for one semester I could do my own work, I could review the research that I had gathered, write chapters, formulate my ideas." (P10)
institutional grant	Research grants available within institutions (e.g. Rutgers research council grants)	"I applied to the Research Council and got some money to go to travel and see things so that, I was starting, just initiating the research" (P9)
subvention	Applying financial supports on publications based on merit	"There are also all the smaller grants, like I was talking about subvention grants, small research grants that allow you to go to a library or archive." (P13)

Major Theme 2. Information Problems

Code	Definition	Example
Information needed	Information types that the participant needs to write a research proposal	
funding application	Information types needed for understanding a funding opportunity itself and for processing funding application	
budget information	Information related to budgeting	"I need budget information. 'How many months of technician time do I need to do the work? What are the costs of the instrument so I want to buy?', and just to figure out is my budget too big or is it too small. Cause you sort of generally have an idea of what's a safe budget place to land it." (P3)
competition of funding opportunity	Information related to how much a funding opportunity is competitive	"The other thing you always want to do is to get an idea of what the competition is. And so I could see who else was applying and kind of look at it and say, 'do I think I could beat that person?' It's like, I think I could beat that guy, this person, probably not, so that was my first thing." (P2)
feedback on proposal	Feedback or comments on a research proposal by others	"And then I give it [proposal] to my colleagues to get feedback and I kind

		of, you know, make sure I have an almost complete draft.” (P6)
gap between what a funding agency says and what is actually funded	Differences between a funding agency’s factual details of a funding opportunity and actual results of funding given	“You have to figure out each time what you're dealing with because of the gap. The unspoken rules.” (P10)
guidelines of how to write a proposal	Detailed guidelines of how to write a research proposal provided by a funding agency	“There's the information about how do you functionally write the proposal. That information is on usually the website of the funding agency. Usually they have a pdf file that you can download that walks you through it.” (P2)
previous project funded	Previous research projects funded by a funding agency	“First I would go to the sponsoring agency's website and some of them like the NEH make it easy for you by providing you with past examples of successful grants.” (P11)
proposal opportunity	Funding opportunities currently available	“The first thing you need to know is that there is a request for proposals out there.” (P2)
research design	information types needed in relation to designing and conducting a research project for proposals	
contemporary issues in the field	Contemporary or recent issues in the participant’s research area	“I really needed just access to contemporary society. So access to contemporary cultural conversations, contemporary ideas of what is being taught and researched in universities, contemporary media, whatever defines, what topics are interesting and valuable.” (P13)
figures	Figures that should be included to a research proposal	“Needed my published figures” (P6)
new publications in the field	Recent publications in the participant’s research area	“It can be research on what are the new books coming out.” (P10)
other scholar's work	Research work published or performed by other scholars in a similar area to the participant	“What's being done in the field by other people outside (institution name) in terms of the competitors or people in the field.” (P5)
preliminary data	Preliminary data of research used in writing a proposal	“Sometimes if it's something that's rather unknown to you, you have to do it and run that protocol to look at how sensitive the data is. And that's where you start getting a preliminary data establishing.” (P1)
primary source	an original source of information about the participant’s research topic	“I guess I need primary sources and also scholarly works from a library generally.” (P13)
quality of research questions	Quality of research questions for a research project used for proposal writing	“The next sort of information we need is, ‘do we have the right question’ and ‘do we have it framed right? Is it too simple a question? Is it too complex a

		question?" and we need to hone that question." (P3)
source availability	Whether or not a source is available or accessible	"The other thing is to see what we have access to. You know, so there is a literature, but there's also literature itself. 'Where are the main manuscripts? Are they accessible to us?' As I mentioned, some of them are in private hands to owner of these manuscripts. 'Would they be willing to share this material with us?' So before I even begin applying for the grant, you need to make sure that I have access to this." (P11)
syllabi	Syllabi of courses taught by the participant or colleagues	"You're looking at what other people have done, other people's syllabi." (P10)
subtasks	Activities or steps that should be done in order to complete the task	
administration	Administration-related procedural activities, such as coordinating, tracking, scheduling, auditing, training	
budgeting	Activity for budgeting a research project	"Budget, budget justification, why you're applying, what you're buying." (P6)
analysis	determining/confirming what is needed or what to do by reviewing, identifying, analyzing, calculating, comparing, assessing	
broadening thinking	Brainstorming or extending and organizing ideas on a research topic for proposal writing	"I wanted to broaden out and look at all of the writing about heresy in the Byzantine Empire." (P8)
creating a bibliography	Making a bibliography used for a research project	"I know what's being published in the field, and then I read those and I use their footnotes and bibliographies and, you know, sort of, end up compiling a bibliography." (P8)
identifying methodology	Choosing a specific methodology used for a research project	"Secondly a methodological statement about what kinds of ideas I would use to frame the question of the individual collector. And here I drew on work in the history of science on the idea of scientific persona, a persona as a performed identity rather than an essential identity. So I articulated a way of using this idea to write about the persona of the collector." (P10)
identifying research goals	Making specific goals of a research project	"Worked on Specific Aims" (P6)
identifying research questions	Making specific research questions of a research project	"And the middle phase, the middle phase consists of basically identifying

		those research questions and forming hypotheses that we would then pose to the, we will put in our report, because essentially you need to be investigating something for a National Endowment for a research grant.” (P11)
identifying research significance	Defining the importance of a research project	“So I think like the last portion of that I guess would be to relate my research to topics that were of urgent interest and more worthy to appeal to funding.” (P13)
literature review	Reviewing and analyzing related literature for a research project	“I did a literature review and read some.” (P5)
thinking of new things	Coming up with new things that the participant hasn’t thought or researched on before	“To that part, when I’m writing, I might start coming up with new things that I didn’t researched on.” (P5)
understanding funding agency's needs	Understanding what a funding agency needs or expects from a funding opportunity	“Usually I look at the funding agency and their focus or their mission. So for example, National Institute of Health has many, many different missions. But let’s say I’m involved in traumatic brain injury research. I will then look and try to understand what they’re looking for.” (P6)
communication	Activity related to communicating with people; such as making a contact/asking someone for something, resolving a conflict/discussing an issue, influencing/facilitating, presenting; participating/discussing	
attending a meeting organized by a funding agency	Attending a conference or a workshop prepared/organized by a funding agency	“So the earliest phase is when (funding agency name), you know, put out this request for proposals and said, we’re going to have a meeting, you can come to and learn about what we’re doing. So I went to that.” (P2)
co-working	Working together with other scholars	“So the four of us can work on cleaning up a real final draft.” (P3)
communicating with a grant office	Communicating with a grant office in the participant’s institution	“e-mail to administrators; phone calls to administrators” (P6)
discussing with collaborators	Discussing with collaborators of a research project	“We’ll have as many face-to-face meetings as possible. And so I’ll travel to the other PIs throughout the whole process and spend a day down in Virginia, spend a day, you know, in Santa Cruz or whatever, working on the different sections.” (P3)

giving a talk	Giving a talk at professional meetings	"I have given a talk in order to advance and aspect of my research, which will then become part of the fellowship application." (P9)
having an art exhibition	Exhibiting the artwork	"I also did an exhibition." (P9)
lining up team members	Developing a research team for proposal writing	"Then I went to my buddy (person name) who's no longer with us. He left the university, but he was here and I went to him and I said, 'hey (person name), you are an expert on this, would you be my Co-PI?'" (P2)
submitting a proposal to a grant office	Sending a final proposal to a grant office at the participant's institution	"It has to be submitted by your (grant office name). And in order for them to submit it, you need to send it to them two weeks in advance." (P11)
teaching a class	Teaching undergraduate or graduate classes in the participant's institution	"So I taught seminars related to it to help me begin to device the new projects." (P9)
writing scholarly publication	Writing and publishing a scholarly paper based on results of a research project	"The deliverable is new knowledge, and in practical terms it's delivered by writing scientific papers and presenting the work in professional conferences or books or writing chapters. So we have done all of them." (P4)
report generation	Editing, revising, reviewing, or amending; completing a form; drafting, writing a report or a proposal; assembling a package; compiling a list or table	
compiling files for submission	Collecting and compiling individual files as a package to submit a proposal	"So the final stage involves putting together the actual physical proposal." (P11)
draft writing	Making a proposal draft	"Final process was both drafting and redrafting." (P10)
proofreading and revising a proposal	Proofreading and editing a proposal	"Then I go back and polish a number of times." (P6)
writing a proposal	Writing a full proposal	"And so the next step is to describe clearly and accessibly for the proposal." (P12)
writing a resume	Preparing a resume as a part of a proposal submission package	"You have to submit your two-page resume." (P4)
writing an annual report	Writing an annual report to submit to a funding agency	"I typically have several going at once, and they require annual reports." (P1)
strategic formulation	developing, describing, recommending, providing a strategy or plan of research or proposal writing	
framing a project	Designing an overall research project before starting proposal writing	"Then 'how do you break it apart into study components?'. Once I've broken into components, 'what are the explicit tasks I can use to address those components?'" (P1)

planning a research process	Determining a specific process of how to conduct a research including experiments	"I write the plan, which means the experiments that we're going to do, why we're going to do them, and then that's the complete proposal." (P6)
-----------------------------	---	---

Major Theme 3. Choice of action

Code	Definition	Example
Information communication	The participant's ways of communicating information with others while writing a proposal	
calling	Communicating information by a phone call	"We had a bunch of phone conversations" (P3)
emailing	Communicating information by emailing	"I then e-mailed my student about what to change." (P6)
presentation	Communicating information by presenting research in conferences or meetings	"I spent a lot of time off campus at different conferences, talking to practitioners about trees. And I put the information directly in their labs as part of the presentation." (P1)
software	Communicating information by using software	"What we usually do is write everything in Microsoft word and then we use reviewing function in Word, so that when people make changes, they show up in different colors and you know, who made which changes and you can have comments and stuff. So that's great for collaborating." (P2)
Information evaluation	The participant's ways of assessing information that is used for proposal writing	
colleagues	Evaluating information by asking colleagues	"If I don't know, then I will reach out to a colleague and saying, 'what do you think about this article?'" (P9)
own knowledge	Evaluating information based on the participant's own knowledge	"I'm very familiar with who has good data and which data is reliable." (P2)
scholar's reputation	Evaluating information based on reputation of authors of publications	"You know the people who did the work. So if they have good reputation, I try to see what they have done that I can use." (P4)
source's reputation	Evaluating information based on reputation of journals or databases	"I guess I look at the reputation of the publication venue, for instance journal name." (P13)
topic relevance	Evaluating information based on relevance of information to a research topic	"I would say that some of the historians of collecting that I use to fit the topic because they are relevant, aren't necessarily viewed as the most brilliant scholars ever to have walked the earth with all due respect to them, but they are the relevant on that particular topic." (P10)
Information	Participants' ways of storing and	

management	managing information that was used for proposal writing	
papers	Managing and organizing information printed in papers	"I keep a lot in hard copy on my desk here in my home office and my office at the university. Mostly because I work with a lot of printed materials. I've just kept them physically available and I manage them by organizing them in a physical space." (P13)
personal computer	Managing and organizing information with folders in one's computer	"I manage it on folders on my computer and hard copy too. I have both, but mostly on my computer." (P9)
software	Managing and organizing information using software	"I have EndNote. I have groups inside EndNote of papers. I have papers that one person in my lab is supposed to read. I have things divided by authors, special authors, depending upon what I'm researching." (P5)
specialist	Managing and organizing information with the help of a person in charge of information management in a department	"We have a computer person in our department who backs up all of our servers and I do everything off the server. So, so that's one way that I ensured that we did is in good shape." (P2)
Information source selection	Tools or channels that the participant accessed to obtain the information needed	
document	documentary sources (including electronic formats)	
bibliographies	A list of works used for research	"So you either have your own books or you go to the library, you look at their bibliographies" (P11)
books	Including paper books and electronic formats	"I use a lot of history books." (P9)
budget template	A template for writing budget details of a research proposal	"I have my own Excel spreadsheet. I do my budget myself on my spreadsheet. (institution name) gives you a budget template. I fill that out using my numbers from my spreadsheet. As an example, I call this a scratch budget." (P5)
footnotes	A note or comment on the bottom of literature	"I will read their [articles'] footnotes and endnotes." (P9)
own notes	A note that the participant makes himself	"My own notes. Sometimes it was one sentence, like, 'Make sure you did this. Make sure you say this. Make sure you say this.' I hypothetically outline, and then write off of that."
previous proposals	The participant's old proposal that was previously prepared and/or submitted	"(Grant name) had similar experiments, so I modified the timetable from that grant." (P6)
prior research project	Research work that was done by the participant	"I'm using previous work as a preliminary. This reflects the

		continuation of the past four years of work.” (P1)
online database	Database accessible from the internet	
academic journal database	Online database that provides access to academic journals	“PubMed is the main one. PubMed has everything usually that we want.” (P6)
data repository	Online resources archiving data collections for public uses or subscribers	“I use usually publicly available datasets. So like for the proposal that I'm ready for startup, I was already kind of thinking about it even before I got the RFP. And so I had downloaded a bunch of data from the EPA's website and I ran some models on it and stuff.” (P2)
grant database	Online database that provides information about grant funding opportunities	“You log into (institution name) and then it takes you to Grants.gov. It's how that works. (P2)
image database	Online databases that allows for image search	“I use a lot of image databases.” (P9)
own knowledge	The participant's existing knowledge	“So most people in humanities, they apply for developing their own work, so they already have a good idea of what's existing.” (P12)
people	Human resources	
colleague	Co-workers or other scholars in similar areas of research and scholarship	“I talked to colleagues. Well the main thing is you talk to your colleagues and say, ‘What are you doing lately? Have you seen this?’. You meet at conferences and you talk about your question.” (P1)
department's administrator	Administrative staffs in the participant's department	“Our department is known as a big grant writing department and this whole front office is there to set up to help us. So I still do all my resumes and budgets and everything, but they review everything and funnel it through the system very quick.” (P3)
grant specialist	Staffs who assist faculty for proposal submission at the participant's institution	“grant office contact” (P6)
lab member	Members belong to the participant's research group or laboratory	“I needed to talk with my students in my lab team to see what they thought they needed for their piece of the grant.” (P1)
people at a funding agency	program managers or staffs at a funding agency	“The agency never publishes all its details explicitly. You have to talk to them.” (P10)
previous grantee	Individuals who received a particular research grant	“It's better to talk to successful authors and figure out what they've done.” (P11)
website	Online websites	
Amazon	A commercial website for book sales	“So searching through Amazon for numerous publications.” (P10)
funding agency's website	A website of an agency that provides a funding opportunity	“almost every funding agency you can go on their website and they will have a list of the projects that have been funded in the past.” (P2)

individual scholar's website	A personal website of individual scholars	"I go to somebody's home page and I'll look at what they have on their homepage." (P5)
library	A website of academic libraries of the participant's institution	"Then at the final start edge, I have to do some more library research on that particular topic." (P5)
newspaper and magazine	Online newspapers and magazines	"So newspapers, magazines, internet sources" (P13)
Grant office website	A website of an organization in charge of processing proposal submission within the participant's institution	"I have to go to (grant office name)." (P11)
social networking site	General or academic social media, such as Facebook, Twitter, Academia.edu, etc.	"I get notices when things come up on academia.com." (P8)
university website	A website of any universities	"Probably course materials. So, syllabi, university websites." (P13)
Search activity	Activity related to finding information using search systems	
keyword search	Searching for information on information systems by entering a keyword	"I was looking with keywords for new publications on collecting from Amazon. That's how I learned about it." (P10)
multiple search methods	More than one method is used to search for a particular information item	"If I know of somebody or something or I hear about somebody or something, I'll just do a straight google search, refine what I think I'm looking for as far as search terms or get a better name, then I will go to web of science. Or then I'll go to google scholar or go to Scopus or one of those big aggregation sites and find some information there." (P1)
search in a computer	Searching for information in a participant's computer	"I mean I have long bibliographies everywhere on my computer. I use the search function on my computer a lot." (P8)
search in database	Searching for information in a database	"I would do my search in PubMed. I would search for topic, I would search for people I know who were working the field. I would still search by chemical name." (P5)

Major Theme 4. Social Factors

Code	Definition	Example
Normal activity	The participant's normal activity related to scholarship and research	
normal information gathering activity	Everyday life information seeking activity for participant's scholarship	
attending a conference	Going to professional conferences	"I go to conferences normally." (P5)

delegating information	Asking someone to get information needed	“So it's usually student or postdoc, right now with students data. Usually they have the experiment done already and I would say about 75% of the time they've already sent me a figure, but the other 25% of the time they have to generate the figure for me.” (P6)
keeping up with publications	Being aware of new publications in the participant's field	“These things, you know, aware of what's being published, and through publisher's journals in your own field often hear about new publications and listservs online. Books and articles that are published, anything on the topic. There are certain journals usually you'll find them in. All books you hear about them reviewed in journals or advertised by publishers.” (P12)
reading scholarly papers	Reading research papers published in the participant's field	“I'm constantly reading papers.” (P1)
receiving articles from colleagues	Getting research papers directly from colleagues who wrote the papers	“I mean I'm now at this stage of my career where I think I know what's coming out on heresy because I know the people because they know me because people send me off prints of their article.” (P8)
reading students' proposals	reading students' proposals from classes	“Sometimes I just read, I mean, in general, over my career, I read student proposals all the time. So. if I read other people's proposals, it gives me ideas of what is effective and what is not effective.” (P9)
normal ways of doing research	Processes or ways of how participants normally conduct research	
defining a question	Determining a research question to initiate a research project	“Sometimes I'll have conversations with students in the lab and start to form a basis for what is the question and how am I going to answer that question.” (P6)
discussion	Discussing with people	“I go to the right groups, the right people, toss ideas, you know, make sure that I get defined them at coffee every day.” (P3)
reviewing literature	Reading literature in the related area	“I mean it begins with the literature. So you either have your own books or you go to the library, you look at their bibliographies, you read articles, you do a search of your journals and see what people have written about in the past.” (P11)
teaching	Teaching courses in the participant's institution	“Since I'm teaching, it's a way of bringing my research program into my teaching and allowing my teaching to advance my research program until I

		have the time to actually devote full time to the project.” (P9)
Norms of field	The participant’s understanding of important things to do in their field	
collaborative research	Research should be done collaboratively	“The natural sciences nowadays are very complex. So people often work in teams because it's so complex that no one person can have all the expertise. So you need expertise from different people in order to create a full picture.” (P4)
getting funds	It is important to apply for funding	“You're very much trained since being a graduate student, submitting grants. It's part of the business. It's just what you do in this kind of field.” (P3)
networking	Importance of meeting and talking with people in academia	“You really have to, you have to network, you have to talk to people, you have to find out who else is out there, what proposals they might be writing and see where yours might fit in. And that's where your network is really important.” (P2)
writing a book	Importance of writing and publishing a book as a scholar	“In the humanities books are the big thing.” (P8)
Purpose of funding application	Typical reasons why participants write a research proposal to get external support	
assisting research activity	Getting funds for research-related activity, such as travel, conference, fieldwork etc.	“But for many art historians, you must travel somewhere to see your objects. So I travel for my research and I traveled to see exhibitions. I was in Paris in January. I traveled from Paris to Munich to see one painting. I traveled from Munich to the Netherlands to see an exhibition. So these things cost money.” (P9)
buying resources	Getting funds to purchase resources for conducting a research, such as supplies, equipment, books, copyrights, etc.	“Biology is very expensive. So it's not just salaries, it's all of the supplies and the equipment that you need. It's very expensive.” (P6)
continuing research	Getting funds to continue a participant’s research in general	“It's a continuation, for me as a PI, was always. My responsibility was that there will be money coming into continue that work. That's what I did.” (P4)
focusing on research	Earning time to focus on research and write a book, being off from teaching and services at the participant’s institution	“So the first thing that comes to mind when applying for one of these grants is simply that is to find the time in order to conduct research at a university, which encumbers us with teaching and service responsibilities.” (P11)
funding people	Paying students and researchers in a lab	“The money that I bring in funds graduate students or undergraduate students, so I don't work by myself.” (P1)

identifying a research project	Developing a research project in a competitive setting	"I thought even if it doesn't work out, I need to do this because it helps me to articulate my project. This is a new project. I need to have a real situation where I'm trying to convince a funding body to give me money to pursue this project." (P10)
publishing a book	Getting funds that help publish participant's books	"I applied many times in the National Endowment of Humanities. I've won two of those grants, each of us about a hundred thousand dollars for basically doing a critical edition of a text and publishing it in my field." (P11)
Sources of learning how to write a proposal	Participant's understanding of how they could learn about writing a good proposal previously	
conversation	Learning from conversations with colleagues or feedback from them	"As opposed to downloading a pdf from online, which doesn't help, I mean, it helps a lot. But it's better to talk to a successful authors and figure out what they've done." (P11)
grant writing workshop	Attending a workshop on how to write a proposal	"Workshop, sort of, and that's where I really learn." (P8)
mentor	Learning from a mentor or an advisor	"One is having a good mentor that allows you to try." (P1)
reviewer	Learning by serving as a reviewer of other proposals	"If you ever sit on a panel where you have to look at these things and choose who gets money and who doesn't get money, you learn very quickly what an effective grant application looks like." (P1)
successful proposals	Viewing prior successful proposal examples	"The Endowment for the Humanities has a list of previously funded proposals where their narratives online that you can download and look at them. So you'll get an idea of what they consider to be a good proposal and how it is structured." (P11)
trial and error	Trying to submit a proposal until it is successful	"To be honest it was trial and error. I never had any kind of sample or model of a good proposal. But yeah, just try to follow this principles like set about writing." (P12)

Major Theme 4. Other Factors

Code	Definition	Example
Disciplinary factor	Characteristics of a discipline in relation to scholarship and research	

cost of research	Cost of conducting research	
expensive	High cost of conducting research	“Well, so like ocean science work is really expensive, so to go out on a research vessel, like a real research vessel, the cost per day of the ship can be up to \$75,000 a day.” (P3)
inexpensive	Low cost of conducting research	“So humanities professors whose work can be produced less expensively, you know, don't need that large amount of overhead to do their research.” (P13)
funding opportunity	Available chances to apply for funding	
limited	Limited opportunity of funding application	“There are not that many opportunities for my field. It's not like sciences.” (P12)
interdisciplinarity	A discipline involves multiple disciplines	“The environmental field is, you know, it's kind of so dispersed, you know, it's kind of inherently interdisciplinary.” (P2)
research group	The participant works within a research group, involving students, postdocs, researchers or staffs, for his/her research	“Usually there'll be 12 different people on a given tree-related camp. It was a program with me and, one or two faculty, one or two, maybe three graduate students and undergraduate students that are working in that grouping, and their own little thing.” (P1)
size	General size of a discipline	
small	A small-sized field	“It's a relatively small field. So a lot of it's by word of mouth, somebody is working on something. But then also, you know, they're not that many journals for this field, so I can keep track of what's being published.” (P12)
travel for research	Frequent traveling is necessary for research	“But for many art historians, you must travel somewhere to see your objects.” (P9)
Institutional factor	Factors related to environmental settings other than discipline	
location of institutions	a region/nation where the participant's institution is located	“(Institution name 1) would not give you your own research money. (institution name 2) does. That's a difference between the Canadian and the US systems. So when the Canadian system as a researcher, you have to obtain fellowship support from the federal government to fund a big project like that. In the US, if you were a member of a history department, you have your own research fund.” (P10)
resource of institution	Resources available in the institution, used for proposal writing	“Because in (institution name), a specialized administrator helped me to work on my grant so that I was able to learn how to write.” (P13)
type of institutions	Specific types of institutions where a scholar works for (e.g.,	“I'm at a research university. So I can have any weird idea and I'll apply for

	research university, teaching university, research center, etc.)	those grants if I like the idea, and the reason is my salary's covered. If you look at my collaborators at the soft money institutions, they tend to become super specialists. So they own that space and no one's going to win our grant against him in this tiny space. But they are very nervous about spending lots of times with lots of ideas that are orthogonal because they got to worry about making sure their salary's covered." (P3)
Personal factor	Factors related to individual's qualities and preferences	
personal preferences	Behavior or perception that is influenced by personal tastes	"That's a choice I make, just because I hate meetings and you get really big teams, they're really long meetings." (P1)
prior experience	The participant's previous experience related to research or proposal writing	"Why I am familiar with that, because I have done it so many times and I have reviewed so many proposals." (P4)
specific research topic	The participant's specific research areas or topics	"Well that's why I was able to write for NSF and NIH because of my science and medicine topics." (P13)
tenure	Whether or not the participant already received tenure in his/her field	"Tenure affects it [proposal writing]. I don't need to write as many. I have more support and more stability in my job, so I don't need as many, I don't need as much outside funding to do my research." (P3)
Task-related factor	Factors related to characteristics or qualities of a task	
collaborator	People who a participant works with for the research project	"I find that collaborating with females is easier than collaborating with males. I feel that the process is much more giving. It's give and take, I feel that there's more equity." (P6)
funding agency	Specific types of funding agencies the participant applies to	"You have to know each agency differently. And so even if you're doing the exact same work, you use completely different language with different agencies." (P3)
funding size	Size of funding that the participant applies for	"R01 is 12 pages and R21 is 6 pages and R01 can be funded for between three and five years. We always ask for five and R21 is for two years. So the budget is smaller and the time period is smaller. So that's why the R21, in some respects, it's easier to write, and we already had a draft from another grant that we've written." (P6)

BIBLIOGRAPHY

- Agada, J. (1999). Inner-city gatekeepers: An exploratory survey of their information use environment. *Journal of the American Society for Information Science and Technology*, 50(1), 74-85.
- Akers, K. G., & Doty, J. (2013). Disciplinary differences in faculty research data management practices and perspectives. *International Journal of Digital Curation*, 8(2), 5-26.
- Allen, B. L. (1991). Topic knowledge and online catalog search formulation. *Library Quarterly*, 61(2), 188-213.
- Allen, T. J. (1966). Studies of the problem-solving process in engineering design. *IEEE Transactions on Engineering Management*, (2), 72-83.
- Babbie, E. (2001). *The practice of social research* (9th ed.). Belmont, CA: Wadsworth/Thompson.
- Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher education*, 19(2), 151-161.
- Belkin, N. J. (1990). The cognitive viewpoint in information science. *Journal of information science*, 16(1), 11-15.
- Bell, D. J., & Ruthven, I. (2004, April). Searcher's assessments of task complexity for web searching. In *European Conference on Information Retrieval* (pp. 57-71). Springer Berlin Heidelberg.
- Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge* (Vol. 589). New York: Doubleday.
- Beyerlein, K., & Vaisey, S. (2013). Individualism revisited: Moral worldviews and civic engagement. *Poetics*, 41(4), 384-406.
- Brand-Gruwel, S., Kammerer, Y., Meeuwen, L., & Gog, T. (2017). Source evaluation of domain experts and novices during Web search. *Journal of Computer Assisted Learning*, 33(3), 234-251.
- Brekhus, W. (2007). The Rutgers school: A Zerubavelian culturalist cognitive sociology. *European Journal of Social Theory*, 10(3), 448-464.
- Brekhus, W. (2015). *Culture and Cognition: Patterns in the Social Construction of Reality*. Malden, MA: Polity Press.
- Bronstein, J. (2017). Information grounds as a vehicle for social inclusion of domestic migrant workers in Israel. *Journal of Documentation*, 73(5), 934-952.
- Bruner, J. (1990). *Acts of meaning: Four lectures on mind and culture (Jerusalem-Harvard Lectures)*. Cambridge, MA: Harvard University Press
- Byström, K. (2002). Information and information sources in tasks of varying complexity. *Journal of the American Society for information Science and Technology*, 53(7), 581-591.

- Byström, K. (2007). Approaches to "task" in contemporary information studies. *Information Research*, 12(4), 12-14.
- Byström, K., & Hansen, P. (2005). Conceptual framework for tasks in information studies. *Journal of the American Society for Information Science and Technology*, 56(10), 1050-1061.
- Byström, K., & Järvelin, K. (1995). Task complexity affects information seeking and use. *Information processing & management*, 31(2), 191-213.
- Byström, K., & Lloyd, A. (2012). Practice theory and work task performance: How are they related and how can they contribute to a study of information practices. *Proceedings of the Association for Information Science and Technology*, 49(1), 1-5.
- Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semi-structured interviews: Problems of unitization and intercoder reliability and agreement. *Sociological Methods & Research*, 42(3), 294-320.
- Case, D., & Given, L. (2016). *Looking for information: A survey of research on information seeking, needs, and behavior* (4th ed.). London: Emerald Group.
- Casey, T. W., Riseborough, K. M., & Krauss, A. D. (2015). Do you see what I see? Effects of national culture on employees' safety-related perceptions and behavior. *Accident Analysis & Prevention*, 78, 173-184.
- Cetina, K. K. (1999). *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.
- Chatman, E. A. (1999). A theory of life in the round. *Journal of the Association for Information Science and Technology*, 50(3), 207.
- Cobbledick, S. (1996). The information-seeking behavior of artists: Exploratory interviews. *The Library Quarterly*, 66(4), 343-372.
- Cole, M. J., Gwizdka, J., Liu, C., Bierig, R., Belkin, N. J., & Zhang, X. (2011). Task and user effects on reading patterns in information search. *Interacting with Computers*, 23(4), 346-362.
- Connaway, L. S., & Radford, M. L. (2017). *Research methods for library and information science* (6th ed.). Littleton, CO: Libraries Unlimited.
- Cool, C., & Spink, A. (2002). Issues of context in information retrieval (IR): an introduction to the special issue. *Information Processing & Management*, 38(5), 605-611.
- Courtright, C. (2007) Context in information behavior research. *Annual Review of Information Science and Technology*, 41(1), 273-306.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage.
- Daipha, P. (2010). Visual perception at work: Lessons from the world of meteorology. *Poetics*, 38(2), 151-165.

- Dill, D. D. (1986). Research as a Scholarly Activity: Context and Culture. *New directions for institutional research*, 13(2), 7-23.
- DiMaggio, P. (1997). Culture and cognition. *Annual review of sociology*, 23(1), 263-287.
- Donald, J. G. (1995). Disciplinary Differences in Knowledge Validation. *New directions for teaching and learning*, 64, 7-17.
- Du, J. T. (2014). The information journey of marketing professionals: Incorporating work task-driven information seeking, information judgments, information use, and information sharing. *Journal of the Association for Information Science and Technology*, 65(9), 1850-1869.
- Durkheim, E. (2005). The dualism of human nature and its social conditions. *Durkheimian Studies*, 11(1), 35-45.
- Fidel, R. (2012). *Human information interaction: an ecological approach to information behavior*. Cambridge, MA: MIT Press.
- Fleck, L. (1981). *Genesis and development of a scientific fact*. Chicago, IL: University of Chicago Press.
- Foster, J. (2009). Understanding interaction in information seeking and use as a discourse: a dialogic approach. *Journal of Documentation*, 65(1), 83-105.
- Freund, L., Toms, E. G., & Clarke, C. L. (2005, August). Modeling task-genre relationships for IR in the workplace. In *Proceedings of the 28th annual international ACM SIGIR conference on Research and development in information retrieval* (pp. 441-448). ACM.
- Fry, J., & Talja, S. (2007). The intellectual and social organization of academic fields and the shaping of digital resources. *Journal of information Science*, 33(2), 115-133.
- Gao, L. L., Larsson, M., & Luo, S. Y. (2013). Internet use by Chinese women seeking pregnancy-related information. *Midwifery*, 29(7), 730-735.
- Gorman, P. N. (1995). Information needs of physicians. *Journal of the American Society for Information Science*, 46(10), 729-736.
- Gwizdka, J., & Spence, I. (2006). What can searching behavior tell us about the difficulty of information tasks? A study of web navigation. *Proceedings of the American Society for Information Science and Technology*, 43(1), 1-22.
- Hackos, J. T., & Redish, J. (1998). *User and task analysis for interface design* (Vol. 1). New York: Wiley.
- Hansen, P. (2009). Work task information-seeking and retrieval processes. (pp.392-396). In Fisher, K. Erdelez, S. & McKechnie, L., (Ed.). *Theories of information behavior*, Medford, NJ: Information Today.
- Hartley, J. (2006). Reading and writing book reviews across the disciplines. *Journal of the American Society for Information Science and Technology*, 57(9), 1194-1207

- Hembrooke, H. A., Granka, L. A., Gay, G. K., & Liddy, E. D. (2005). The effects of expertise and feedback on search term selection and subsequent learning. *Journal of the Association for Information Science and Technology*, 56(8), 861-871.
- Hjørland, B. (2002). Epistemology and the socio-cognitive perspective in information science. *Journal of the American Society for Information Science and Technology*, 53(4), 257-270.
- Hjørland, B., & Albrechtsen, H. (1995). Toward a new horizon in information science: domain-analysis. *Journal of the Association for Information Science and Technology*, 46(6), 400-425.
- Hsieh-Yee, I. (1993). Effects of search experience and subject knowledge on the search tactics of novice and experienced searchers. *Journal of the American Society for Information Science*, 44(3), 161-174.
- Huang, K., & Kelly, D. (2013). The daily image information needs and seeking behavior of Chinese undergraduate students. *College & Research Libraries*, 74(3), 243-261.
- Ignatow, G. (2009). Culture and embodied cognition: Moral discourses in internet support groups for overeaters. *Social Forces*, 88(2), 643-669.
- Ingwersen, P. (1999). Cognitive Information Retrieval. *Annual review of information science and technology (ARIST)*, 34, 3-52.
- Ingwersen, P., & Järvelin, K. (2006). *The turn: Integration of information seeking and retrieval in context* (Vol. 18). Dordrecht, Netherland: Springer.
- Isah, E. E., & Byström, K. (2016). Physicians' learning at work through everyday access to information. *Journal of the Association for Information Science and Technology*, 67(2), 318-332.
- Jaeger, P. T., & Burnett, G. (2010). *Information worlds: Social context, technology, and information behavior in the age of the Internet* (Vol. 8). New York: Routledge.
- Jarrahi, M. H., & Thomson, L. (2017). The interplay between information practices and information context: The case of mobile knowledge workers. *Journal of the Association for Information Science and Technology*, 68(5), 1073-1089.
- Jeong, W. (2004). Unbreakable ethnic bonds: Information-seeking behavior of Korean graduate students in the United States. *Library & Information Science Research*, 26(3), 384-400.
- Jiang, J., He, D., & Allan, J. (2014, July). Searching, browsing, and clicking in a search session: changes in user behavior by task and over time. In *Proceedings of the 37th international ACM SIGIR conference on Research & development in information retrieval* (pp. 607-616). ACM.
- Kallehauge, J. (2010). Stage-driven information seeking process: Value and uncertainty of work tasks from initiation to resolution. *Journal of Information Science*, 36(2), 242-262.

- Känsäkoski, H., & Huotari, M. L. (2016). Applying the theory of information worlds within a health care practice in Finland. *Journal of Documentation*, 72(2), 321-341.
- Kazmer, M. M., Glueckauf, R. L., Ma, J., & Burnett, K. (2013). Information use environments of African-American dementia caregivers over the course of cognitive-behavioral therapy for depression. *Library & information science research*, 35(3), 191-199.
- Kelly, D. (2006). Measuring online information seeking context, Part 1: Background and method. *Journal of the Association for Information Science and Technology*, 57(13), 1729-1739.
- Kelly, D., & Cool, C. (2002). The effects of topic familiarity on information search behavior. In *Proceedings of the 10th ACM/IEEE-CS Joint Conference on Digital Libraries (JCDL) 2002* (pp. 74-75).
- Kim, J. (2006, April). Task difficulty as a predictor and indicator of web searching interaction. In *CHI'06 Extended Abstracts on Human Factors in Computing Systems* (pp. 959-964). ACM.
- Kling, R. (2007). What is social informatics and why does it matter? *The Information Society*, 23(4), 205-220.
- Krathwohl, D. R. (2009). *Methods of educational and social science research: The logic of methods*. Long Grove, IL: Waveland Press.
- Kuhlthau, C. C. (1991). Inside the search process: information seeking from the user's perspective. *Journal of the American Society for Information Science*, 42(5), 361-371.
- Kuhlthau, C. C. (1999). The role of experience in the information search process of an early career information worker: Perceptions of uncertainty, complexity, construction, and sources. *Journal of the American Society for information Science*, 50(5), 399-412.
- Kumpulainen, S., Keskustalo, H., Zhang, B., & Stefanidis, K. (2020). Historical reasoning in authentic research tasks: Mapping cognitive and document spaces. *Journal of the Association for Information Science and Technology*.
- Kurasaki, K. S. (2000). Intercode reliability for validating conclusions drawn from open-ended interview data. *Field methods*, 12(3), 179-194.
- Lambert, J. D. (2010). The information-seeking habits of Baptist ministers. *Journal of Religious & Theological Information*, 9(1-2), 1-19.
- Lamont, M. (2009). *How professors think*. Cambridge, MA: Harvard University Press.
- Landry, C. F. (2006). Work roles, tasks, and the information behavior of dentists. *Journal of the American Society for Information Science and Technology*, 57(14), 1896-1908.

- Lea French, R., & Williamson, K. (2016). The information practices of welfare workers: Conceptualising and modelling information bricolage. *Journal of Documentation*, 72(4), 737-754.
- Leckie, G. J., Pettigrew, K. E., & Sylvain, C. (1996). Modeling the information seeking of professionals: A general model derived from research on engineers, health care professionals, and lawyers. *The Library Quarterly*, 66(2), 161-193.
- Li, Y., & Belkin, N. J. (2008). A faceted approach to conceptualizing tasks in information seeking. *Information Processing & Management*, 44(6), 1822-1837.
- Li, Y., & Belkin, N. J. (2010). An exploration of the relationships between work task and interactive information search behavior. *Journal of the American Society for Information Science and Technology*, 61(9), 1771-1789.
- Liu, J., Cole, M. J., Liu, C., Bierig, R., Gwizdka, J., Belkin, N. J., ... & Zhang, X. (2010, June). Search behaviors in different task types. In *Proceedings of the 10th annual joint conference on Digital libraries* (pp. 69-78). ACM.
- Liu, M. (1995). Ethnicity and information seeking. *The Reference Librarian*, 23(49-50), 123-134.
- Lloyd, A. (2010). Framing information literacy as information practice: site ontology and practice theory. *Journal of Documentation*, 66(2), 245-258.
- Lloyd, A., & Olsson, M. (2019). Untangling the knot: The information practices of enthusiast car restorers. *Journal of the Association for Information Science and Technology*, 70(12), 1311-1323.
- Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human communication research*, 28(4), 587-604.
- Mackenzie, M. L. (2003). An exploratory study investigating the information behaviour of line managers within a business environment. *The New Review of Information Behaviour Research*, 4(1), 63-78.
- MacPhail, C., Khoza, N., Abler, L., & Ranganathan, M. (2016). Process guidelines for establishing Intercoder Reliability in qualitative studies. *Qualitative Research*, 16(2), 198-212.
- Manheim, K. (1949). *Ideology and utopia: An Introduction to the Sociology of Knowledge*. New York: Harcourt, Brace and World.
- Marchionini, G. (1997). *Information seeking in electronic environments* (No. 9). Cambridge: Cambridge University Press.
- Martyn, J., & Lancaster, F. W. (1981). *Investigative methods in library and information science*. Arlington, VA: Information Resources Press.
- McKenzie, P. J. (2003). A model of information practices in accounts of everyday-life information seeking. *Journal of documentation*, 59(1), 19-40.

- Miles, A. (2015). The (re) genesis of values examining the importance of values for action. *American Sociological Review*, 80(4), 680-704.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Thousand Oaks, CA: Sage.
- Nicolini, D. (2009). Articulating practice through the interview to the double. *Management Learning*, 40(2), 195-212.
- Olsson, M. (2016). Making sense of the past: The embodied information practices of field archaeologists. *Journal of Information Science*, 42(3), 410-419.
Online Information, 39(4), 520-536.
- Ortega, J.L. (2015). Disciplinary differences in the use of academic social networking sites. *Online Information*, 39(4), 520-536.
- Paisley, W. J. (1968). Information needs and uses. *Annual review of information science and technology*, 3(1), 1-30.
- Palmer, C. L., & Cragin, M. H. (2008). Scholarship and disciplinary practices. *Annual review of information science and technology*, 42(1), 163-212.
- Palmquist, R. A. (2009). Taylor's information use environment. (pp.354-357). In Fisher, K. Erdelez, S. & McKechnie, L., (Ed.). *Theories of information behavior*, Medford, NJ: Information Today.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
- Patton, M. Q., & Stockdill, M. H. (1987). Summative external evaluation. In T.C. Turner, S.H. Stockdill (Eds.), *The Technology for literacy project evaluation*. (Report Prepared for the TLC Project Donor Review Board). St. Paul, MN. The Saint Paul Foundation.
- Pinelli, T. E. (1991). The information-seeking habits and practices of engineers. *Science & Technology Libraries*, 11(3), 5-25.
- Quirke, L. (2011). Exploring the Settlement Experiences and Information Practices of Afghan Newcomer Youth in Toronto. *Canadian Journal of Information and Library Science*, 35(4), 345-353.
- Radford, G. P., & Radford, M. L. (2001). Libraries, librarians, and the discourse of fear. *The Library Quarterly*, 71(3), 299-329.
- Rasmussen, J., Pejtersen, A. M., & Goodstein, L. P. (1994). *Cognitive systems engineering*. New York: Wiley
- Raudenbush, D. T. (2012). Race and Interactions on Public Transportation: Social Cohesion and the Production of Common Norms and a Collective Black Identity. *Symbolic Interaction*, 35(4), 456-473.
- Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory*, 5(2), 243-263.

- Reiter, B. (2017). Theory and methodology of exploratory social science research. *International Journal of Science and Research Methodology*, 5(4), 129.
- Rieh, S. Y. (2004). On the Web at home: Information seeking and Web searching in the home environment. *Journal of the Association for Information Science and Technology*, 55(8), 743-753.
- Rosenbloom, R. S., & Wolek, F. W. (1967). *Technology, Information and Organization; Information Transfer in Industrial R&D*. Boston: Graduate School of Business Administration, Harvard University.
- Saastamoinen, M., & Järvelin, K. (2017). Search task features in work tasks of varying types and complexity. *Journal of the Association for Information Science and Technology*, 68(5), 1111-1123.
- Saastamoinen, M., Kumpulainen, S., & Järvelin, K. (2012, August). Task complexity and information searching in administrative tasks revisited. In *Proceedings of the 4th Information Interaction in Context Symposium* (pp. 204-213). ACM.
- Sahu, H. K. & Singh, S. N. (2013). Information seeking behavior of astronomy/astrophysics scientists. *Aslib Proceedings*, 65(2), 109-142.
- Savolainen, R. (1995). Everyday life information seeking: Approaching information seeking in the context of “way of life”. *Library & information science research*, 17(3), 259-294.
- Savolainen, R. (2007). Information Behavior and Information Practice: Reviewing the “Umbrella Concepts” of Information-Seeking Studies 1. *The Library Quarterly*, 77(2), 109-132.
- Schutz, A., & Luckmann, T. (1973). *The structures of the life-world* (Vol. 1). Northwestern University Press.
- Silverman, D. (2005). *Doing qualitative research (2nd ed.)*. Thousand Oaks, CA: Sage.
- Talja, S., & Maula, H. (2003). Reasons for the use and non-use of electronic journals and databases: A domain analytic study in four scholarly disciplines. *Journal of documentation*, 59(6), 673-691.
- Talja, S., & Nyce, J. M. (2015). The problem with problematic situations: Differences between practices, tasks, and situations as units of analysis. *Library & Information Science Research*, 37(1), 61-67.
- Talja, S., Keso, H., & Pietiläinen, T. (1999). The production of ‘context’ in information seeking research: a metatheoretical view. *Information Processing & Management*, 35(6), 751-763.
- Talja, S., Savolainen, R., & Maula, H. (2004). Field Differences in the Use and Perceived Usefulness of Scholarly Mailing Lists. *Information Research: an international electronic journal*, 10(1), n1.
- Talja, S., Tuominen, K., & Savolainen, R. (2005). "Isms" in information science: constructivism, collectivism and constructionism. *Journal of Documentation*, 61(1), 79-101.

- Talja, S., Vakkari, P., Fry, J., & Wouters, P. (2007). Impact of research cultures on the use of digital library resources. *Journal of the Association for Information Science and Technology*, 58(11), 1674-1685.
- Taylor, A. R., Cool, C., Belkin, N. J., & Amadio, W. J. (2007). Relationships between categories of relevance criteria and stage in task completion. *Information Processing & Management*, 43(4), 1071-1084.
- Taylor, R. S. (1986). *Value-added processes in information systems*. Norwood, NJ: Ablex Publishing.
- Taylor, R. S. (1991). Information use environments. *Progress in communication sciences*, 10(217), 55.
- Thelwall, M., & Kousha, K. (2014). Academia.edu: Social network or Academic Network?. *Journal of the Association for Information Science and Technology*, 65(4), 721-731.
- Toms, E. G. (2011). Task-based information searching and retrieval. In I. Ruthven & D. Kelly (Eds.) *Interactive Information Seeking, Behaviour and Retrieval*. Facet Publishing, 43-59.
- Toms, E. G., & O'Brien, H. L. (2008). Understanding the information and communication technology needs of the e-humanist. *Journal of Documentation*, 64(1), 102-130.
- Toms, E. G., Freund, L., Kopak, R., & Bartlett, J. C. (2003, October). The effect of task domain on search. In *Proceedings of the 2003 conference of the Centre for Advanced Studies on Collaborative research* (pp. 303-312). IBM Press.
- Toms, E. G., O'Brien, H., Mackenzie, T., Jordan, C., Freund, L., Toze, S., ... & Macnutt, A. (2007, December). Task effects on interactive search: The query factor. In *International Workshop of the Initiative for the Evaluation of XML Retrieval* (pp. 359-372). Springer, Berlin, Heidelberg.
- Toms, E.G., & Duff, W. (2002). "I spent 1 1/2 hours sifting through one large box. . . .": Diaries as information behavior of the archives user: Lessons learned. *Journal of the American Society for Information Science and Technology*, 53(14), 1232-1238.
- Tuominen, K., Savolainen, R., & Talja, S. (2005). Information literacy as a sociotechnical practice. *The Library Quarterly*, 75(3), 329-345.
- Tuominen, K., Talja, S. & Savolainen, R. (2002). Discourse, cognition and reality: toward a social constructionist metatheory for library and information science. In H. Bruce, R. Fidel, P. Ingwersen, & P. Vakkari (Eds.), *Emerging frameworks and methods: proceedings of the Fourth International Conference on Conceptions of Library and Information Science (CoLIS4)*, Seattle, WA, USA. (pp. 271-283). Greenwood Village, CO: Libraries Unlimited.
- Vaisey, S., & Lizardo, O. (2010). Can cultural worldviews influence network composition?. *Social Forces*, 88(4), 1595-1618.

- Vakkari, P. (2003). Task-based information searching. *Annual review of information science and technology*, 37(1), 413-464.
- Vakkari, P. (2016). Searching as learning: A systematization based on literature. *Journal of Information Science*, 42(1), 7-18.
- Vakkari, P., & Hakala, N. (2000). Changes in relevance criteria and problem stages in task performance. *Journal of documentation*, 56(5), 540-562.
- Vakkari, P., Pennanen, M., & Serola, S. (2003). Changes of search terms and tactics while writing a research proposal: A longitudinal case study. *Information processing & management*, 39(3), 445-463.
- Vaughan, D. (2002). Signals and interpretive work: The role of culture in a theory of practical action. In K. A. Cerulo (Ed.), *Culture in mind: Toward a sociology of culture and cognition* (pp. 28-54). New York: Routledge.
- Walsh, J. P., Kucker, S., Maloney, N. G., & Gabbay, S. (2000). Connecting minds: Computer-mediated communication and scientific work. *Journal of the Association for Information Science and Technology*, 51(14), 1295-1305.
- Wang, J., & Komlodi, A. (2018, March). Switching Languages in Online Searching: A Qualitative Study of Web Users' Code-Switching Search Behaviors. In *Proceedings of the 2018 Conference on Human Information Interaction & Retrieval* (pp. 201-210). ACM.
- Weller, T., & Monroe-Gulick, A. (2014). Understanding methodological and disciplinary differences in the data practices of academic researchers. *Library Hi Tech*, 32(3), 467-482.
- Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*. Cambridge, England: Cambridge University Press.
- White, R. W., Dumais, S. T., & Teevan, J. (2009, February). Characterizing the influence of domain expertise on web search behavior. In *Proceedings of the second ACM international conference on web search and data mining* (pp. 132-141). ACM.
- Wildemuth, B. M. (2004). The effects of domain knowledge on search tactic formulation. *Journal of the Association for Information Science and Technology*, 55(3), 246-258.
- Wilson, T. D. (1997). Information behaviour: an interdisciplinary perspective. *Information Processing & Management*, 33(4), 551-572.
- Yin, R. K. (2017). *Case study research and applications: Design and methods*. Thousand Oaks, CA: Sage.
- Zach, L. (2006). Using a multiple-case studies design to investigate the information-seeking behavior of arts administrators. *Library Trends*, 55(1), 4-21.
- Zerubavel, E. (1993). Horizons: On the Sociomental Foundations of Relevance. *Social Research*, 60(2), 397-413.

- Zerubavel, E. (1995). The rigid, the fuzzy, and the flexible: Notes on the mental sculpting of academic identity. *Social Research*, 1093-1106.
- Zerubavel, E. (2009). *Social mindscapes: An invitation to cognitive sociology*. Cambridge, MA: Harvard University Press.
- Zerubavel, E. (2015). *Hidden in Plain Sight: The Social Structure of Irrelevance*. New York: Oxford University Press.
- Zhang, Y., & Gwizdka, J. (2014). Effects of tasks at similar and different complexity levels. *Proceedings of the American Society for Information Science and Technology*, 51(1), 1-4.