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TRUSTWORTHINESS EVALUATION
IN RECOMMENDATION SEEKING BEHAVIOR

By

EUN JUNG BAIK

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ABSTRACT OF THE DISSERTATION

Trustworthiness Evaluation in Recommendation Seeking Behavior

by EUN JUNG BAIK

Dissertation Director:

Professor Nicholas J. Belkin

Recommendations often play a key role in making routine daily decisions or consuming a variety of information, and therefore, recommender systems (RSs) that evaluate, filter, and deliver personalized information are becoming increasingly important. Despite its growing significance, the trustworthiness evaluation of recommenders and recommendations has been relatively unexplored. The goal of this dissertation is to understand the influence of cognitive and social factors on the trustworthiness evaluation in active recommendation seeking behavior under natural or uncontrolled settings. Four research questions (RQs) were addressed: the motivations of engaging in recommendation seeking behavior (RQ1); the influence of cognitive (Propensity to Trust, Topic Familiarity, Risk, and Uncertainty) (RQ2) and social (Tie Strength and Homophily) (RQ3) factors on the trustworthiness evaluation; and their interaction effects, if any (RQ4).

Thirty-three undergraduate and graduate students were recruited through purposive sampling, and were asked to record one-week diaries about their real-life recommendation seeking experiences under uncontrolled settings, followed by exit interviews. Answers to open- and close-ended questions from diaries and interview transcripts were collected and imported to NVivo12 for qualitative analysis and SPSS25 for statistical analysis. Content analyses were conducted for the recommendation needs and the trustworthiness characteristics. Linear regressions were adopted to investigate the influential factors and their interactions in the trustworthiness evaluation.

Functional (affective and cognitive) and temporal (long- and short-term) aspects were identified as the two main criteria of recommendation needs (RQ1). Cognitive needs were dominantly found, while affective needs were also critical in a considerable number of episodes. Prompt applicability and time affordances were noticeable in the characteristics of short- and long-term needs, respectively. The four cognitive factors did not statistically influence the trustworthiness evaluation (RQ2), while *Tie Strength* between the seekers and the recommenders did (RQ3). *Homophily (Status, Value, and Situation)* influenced the trustworthiness evaluation, and its recognition made the recommendations be perceived to be more useful, persuasive, and emotionally relieving (RQ3). While no statistical interactions between any of the factors existed in the main and interaction effects model, the interaction-only model showed that the seekers' *Propensity to Trust* and their *Tie Strength* with the recommenders influenced each other in the trustworthiness evaluation (RQ4). This study, in a "natural" setting, found, contrary to previous research conducted in "controlled" settings, that cognitive factors did not significantly affect the judgement of trustworthiness. The strong influence of

homophily on trustworthiness suggests that RSs should, at least in some instances, provide recommendations from non-homophilic recommenders.

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CHAPTER 1 INTRODUCTION

Information overload hinders people to search effectively and efficiently for useful information catering to their needs and helping decision-making (Bawden & Robinson, 2009; Klapp, 1986; Salvolainen, 2007a). In addition, people are cognitive misers or have a limited cognitive time to seek and review all available information; therefore, it can be difficult to obtain good quality and trustworthy information. In this dilemma, recommenders can reduce the burden of information seekers who have the insufficient personal experience of alternatives. As a technological means to support this kind of people's needs, recommender systems (RSs) have emerged to help them search more efficiently and make faster and better choices (Ricci, Rokach, Shapira, & Kantor, 2011) by offering personalized recommendations based on their explicit online behaviors and traces (Cho, Kwon, & Park, 2007; Garfinkel, Gopal, Tripathi, & Yin, 2006). The development of RSs initiated from a rather simple observation: individuals often rely on recommendations provided by others in making daily decisions (Shardanand & Maes, 1995).

In daily life, we frequently interact with recommendations by face-to-face interaction with people around us and/or by various web services and platforms. We often encounter recommended news articles from known members in our social circles, product recommendations from online shopping sites; movie or song suggestions from movie or music streaming services, ratings and user reviews from review platforms, and health advice from blogs or online communities, and so on. This filtered and/or personalized information helps us to expedite our decision processes, to obtain the quality of information, to select better choices, and/or to expand or narrow our ideas. The

current transformative development allows people to ask anonymous people for recommendations as well as to search through user-generated contents with respect to recommendations. Thus, many people can search for readily available recommendations in previous postings and answers in diverse websites (e.g., user review and rating platforms, online community threads, Facebook walls). However, due to inaccurate and irrelevant recommendations from various RSs, many people ignore them during information seeking or decision making processes. Despite the endeavor of technological support to offer proper recommendations, many information seekers still have to spend considerable time to solve their problems or to accomplish their tasks. A problem of personal preference prediction is not only because of technological limitations and limited observable data online but also because of a lack of understanding people's recommendation seeking behavior in their real life from the perspectives of recommendation recipients.

In these various recommendation-related situations, interesting questions to answer are why people seek recommendations, how people decide which recommendations to accept or reject, and how these recommendations affect their subsequent information seeking or decision making processes. What roles do social relations play in information seekers' selection of recommendations? What are the influential determinants when evaluating the trustworthiness of recommender and recommendations? When choosing between recommendation sources in their social networks or on the web, how do people prioritize the conflicting demands of obtaining useful, high-quality information and the wish to do so in a trustworthy and reliable manner?

The purpose of this study is to explore the conceptual picture of the relationships between the cognitive and social factors in active recommendation seeking behavior. Few studies provide initial insights into recommendation seeking behavior in both computer-mediated and face-to-face environments, and our theoretical knowledge of recommendation evaluation is limited. An empirical investigation is important to enhance our understanding of the determinants of recommendation evaluation and selection in the recent networked environments with comparison to our offline recommendation interactions. In the following sections, the definition of recommendation, the influence of social and cognitive factors on recommendations is briefly discussed and then, the trustworthiness of recommendations is introduced.

1.1 Recommendation as Secondhand Knowledge in Recommendation Seeking Behavior

This study considers people's behaviors in the face of recommendations. Everyday recommendation-related experiences are the context, in which personal recommendation acquisition takes place from the perspectives of recommendation recipients. Some definitions are needed before we go further.

Herein, a recommendation is second-hand knowledge (Wilson, 1983) or information filtered or experienced by algorithm or human. In this context, a recommendation is viewed as secondhand knowledge. In the development of cognitive authority theory, Wilson (1983) asserts that people construct knowledge in two different ways: based on their first-hand experience or on what they have learned secondhand from others. What people learn first-hand depends on the stock of ideas they bring to the

interpretation and understanding of their encounters with the world. People primarily depend on others for ideas as well as for information outside the range of direct experience (Wilson, 1983). This study conceptualizes recommendations as what they have gained secondhand; knowledge or information interpreted of experienced by others. It is viewed as a subset or narrow definition of information. Recommendation seeking behavior refers to the purposive seeking for recommendation as a consequence of a need to satisfy some goal. In the course of seeking, the individual may interact with machine-based (i.e., algorithmic) recommender systems or human-based systems (i.e., people in social circles) (adopted from Wilson, 2000). Recommendation seeking behavior is clearly defined as the mental acts and/or processes involved in incorporating recommendations (sought or received) into the recommendation recipient's existing or ongoing information seeking or decision-making process (adopted from Wilson, 2000). The mental acts and processes can involve the changes in the seeker's cognitive status or decision processes depending on various factors such as social relations. We will explore how people receive and evaluate recommendations with relation to cognitive and social factors. That is, we will delve into what are the roles of those factors in evaluating recommendations from people or systems during the process of information seeking, decision-making or problem-solving.

1.2 Cognitive Factors in Recommendation Seeking Behaviors

The term cognition is generally used to describe the intellectual or perceptual processes occurring within the mind when an individual analyses and interprets both the world around oneself and one's own thoughts and actions (Petri & Govern, 2004, p. 248).

In the field of information science (IS), cognitive constructivism approaches information processes by describing how information needs, seeking and the relevance criteria of individuals are affected by their current emotional and cognitive states, situations and work tasks (Talja, Tuominen, & Savolainen, 2006, p. 85). Cognitive constructivists in IS start from the assumption that the individual mind generates knowledge by creating knowledge structures and mental models which represent world and mediate (or filter) information. Constructivist theories in IS assume that the individual mind is the most important arena of knowledge creation.

Several researchers emphasize the role of cognitive factors in the information-seeking process. For instance, understanding of cognitive process is important in order to identify the key links to one's information seeking (Marchionini & Shneiderman, 1988). The process of information seeking is a cognitive activity that involves long-term and short-term memory, background knowledge, spatial cognition, and mental models, to name a few critical factors. Marchionini (1997) added that information seekers commonly rely on their mental models to guide them through different mental and physical activities that require predictable cognitive representations of the information objects and different domains of knowledge. Cognitive models are dynamic mental representations of the real world, and people construct cognitive models of a phenomenon in order to understand it. Also, the anomalous states of knowledge (ASK) model developed by Belkin (1978, 1984) identified the significance of situational and task-related factors for the development of ASK. Even more clearly, Ingwersen (1982, 1992) developed a model of information retrieval interaction that incorporates the socio-organizational environment and sees information seeking to be affected especially by the

nature of the work task to be accomplished by the individual information searcher. Later, Ingwersen (1999, pp. 4-16) argues that the holistic cognitive viewpoint, which is defined as individual searcher's perception of the current work task and situated context, moved from the individual cognitive view to a more socio-cognitive position.

1.3 Social Factors in Recommendation Seeking Behavior

In the modeling of information behavior, researchers have traditionally placed the main emphasis on its cognitive dimensions (Case, 2012, pp. 133-162) while the role of social factors such as social ties and homophily in the evaluation and use of information has been less paid attention. Meanwhile, the primary characteristics of a recommendation are interpersonal, bidirectional, and interactive between a recommender and a recommendation recipient. A question arises as to how social factors influence user's engagement of recommendations in daily life. In recent years, online social interactions in social media also are essential to recommendation acquisition as people share and ask their experience by freely interacting with other peer users. They rapidly spread information and opinions regarding personal experiences through their online social networks (Raacke & Bonds-Raacke, 2008). Researchers assume that recommendations from people within their social networks are more trustworthy, relevant and useful to users' interests and preferences. Arazy, Kumar, and Shapira (2010) surveyed 116 participants and concluded that information from social "relatives" has stronger impacts owing to higher trust. A few studies in marketing or business research have applied concepts pertaining to social relationships to understand traditional referral behavior in offline market environments (Brown & Reingen, 1987; Gilly, Graham,

Wolfenbarger, & Yale, 1998; Reingen & Kernan 1986). Given the unique social nature of recommendations, understanding the potential influence of social relationships developed in user's social milieu on recommendation-related communications could advance our knowledge of the underlying process of recommendation seeking and use behavior.

Social relation-based factors (i.e., hereafter, social factors) in this study refer to the relationship between a recommendation recipient and provider such as friends, family, peers, and acquaintances (e.g., group memberships) including anonymous persons (i.e., strangers); that is, social connections between two or more individuals. In the context of recommendation behavior, social relation variables are particularly important to better understand the underlying process of recommendation evaluation and use as these concepts provide insights into the properties of social milieu from which recommendation behavior arises. It can be represented by tie strength, duration of relationship, contact frequency, homophily, social types, etc. The roles of social relations on general recommendation seeking and the assignment of trustworthiness are understudied. It is important for RS developers to understand how people make choices and how the human information seeking or decision-making process can be supported.

1.4 Trustworthiness of Recommendations and Recommenders

Trustworthiness, an important factor of social relationships (Chow & Chan, 2008; Fukuyama, 1995) facilitates the exchange and use of information due to the increased perceived credibility of information when the partner as an information source is trusted in a social relationship (Robert, Dennis, & Ahuja, 2008). As a result, it is reasonable to

believe that trust in a personal source could also affect the nature and pattern of recommendation use behavior.

The concepts of trust and trustworthiness play a fundamental role in the process of human information interaction, as they determine the ultimate selection or rejection of the content, source, intent and meaning of the sought information (Chopra & Wallace, 2003; Kelton, Fleischmann & Wallace, 2008; Marsh & Dibben, 2003; Rieh, 2002; Rieh & Danielson, 2007). These concepts also function as a chief determinant in deciding whom we share information with, whom we accept information from, and how we assess the information gathered (Golbeck, 2009). In particular, trustworthiness affects online information-related behavior and steers the information seeking process in line with individual's tasks and needs (Marsh & Dibben, 2003). Trust is an underpinning in a person's relationship with humans, information, and/or technology; however, the constructs of trust and trustworthiness are hard to quantify, and describe. The importance of trustworthiness has grown in the field of human information behavior and information retrieval since the emergence of user participatory Web because of two complementary factors: (1) the source of information on the Web is relatively difficult to be precisely identified; and (2) complex algorithms, statistical machine learning, and artificial intelligence, make decisions on behalf of the users, with little oversight from the users themselves (Ginsca, Popescu, & Lupu, 2016).

In addition, social media have opened more opportunities for recommendation acquisition as it provides places for people's social networks and interaction. Users in social media can easily disseminate information in their minds, and share information about their experiences and opinions. Anyone can publicly publish what they know

without any curation processes. Marketers actively invest considerable resources in encouraging positive recommendations for their products and services, and people with specific intents try to purposively recommend their desired information. In this environment, it is difficult to evaluate and recognize which information is trustworthy, non-intentional, or non-commercial. Unlike past when professional gatekeepers prescreened publications, individual information users are burdened with assessing information credibility and controlling quality in digital media environment (Eysenbach, 2008; Metzger, 2007). Despite the huge potential of social media for facilitating recommendations for information seekers, research on how recommendations are evaluated and chosen in the online social environment and offline everyday life remains scant.

In sum, understanding individuals' recommendation seeking behavior is a crucial element underlying many activities of users' information seeking, problem-solving, and decision-making. However, it holds many challenges originating from the complexity of the human nature, social networks, individuals' interpretation of trustworthiness, and characteristics of seekers' situation. Therefore, in order to enhance the accuracy of recommendation for recommendation recipient's needs, it is important to understand why users accept or not accept some recommendations and how they evaluate and use recommendations. This study attempts to build and suggest a recommendation evaluation and use model with respect to social factors in decision making or problem-solving processes. To do so, it will explore various aspects of recommendation experiences in people's daily life with the focus of their social relations and trustworthiness evaluations of recommendations and recommenders by asking how they

seek recommendations, how they evaluate trustworthiness of recommendations they received, and how their social relations influence on their decision to accept or reject those recommendations. The findings from this study could then be applied to facilitate the effectiveness of recommendation systems. The next chapters bring this study to focus by first discussing findings in relevant works in various fields, and then by explaining influential factors in recommendation evaluation and use for this dissertation study.

CHAPTER 2 LITERATURE REVIEW

As mentioned in the introduction, recommendations can play an important role in expediting information seeking process or decision making by offering relevant information in the age of information overload. Recommender systems (RSs) have been developed to reduce a burden of huge amount of information and enhance information seeking experience by providing quality and personalized information. However, the gap exists between research of RSs and understanding of people's recommendation evaluation and use. This study explores everyday recommendation experiences as the context in which personal recommendation acquisition takes place. Some related concepts of recommendation behaviors can be found in the studies about traditional and electronic word of mouth (WOM), social capital theory, and secondhand knowledge in cognitive authority theory. Those constructs will help us explaining how people interact, evaluate, and use recommendations and recommenders. The rest of this section introduces the development and related fields of recommendation seeking and some influential factors in interaction with recommenders and recommendations.

2.1 Development of Various Recommender Systems

An RS is an information filtering engine or a program which attempts to recommend the most suitable items (information, products, or services) to particular users by predicting their tastes and interests in an item based on related information about the items, the users and the interactions between items and users (Bobadilla, Ortega, Hernando, & Gutierrez, 2013; Lu, Wu, Mao, Wang, & Zhang, 2015) such as rating behaviors, purchasing history, browsing patterns, etc. Various RS techniques have been

proposed since the mid-1990s, and various applications have been recently developed (Lu *et al.*, 2015). Over the past years, diverse personalization techniques have applied to RSs and gained much attention (Adomavicius, & Tuzhilin, 2005; Eirinaki, Gao, Varlamis, & Tserpes, 2018). Early research in RSs has grown out of information retrieval and filtering research (Goldberg, Nichols, Oki, & Terry, 1992), and RSs emerged as an independent research area in the mid-1990s when the rating structure was explicitly applied to recommendation problems (Adomavicius, & Tuzhilin, 2005). Commonly used recommendation techniques include collaborative filtering (CF) (Schafer, Frankowski, Herlocker, & Sen, 2007), content-based (CB), knowledge-based (KB), and hybrid techniques (Jannach, Zanker, Felfernig, & Friedrich, 2011). CF recommends other available items similar to the items a user has rated, purchased or viewed by calculating how similar the items they have viewed are to other users' activities. A CF recommender thus suggests items based on what others like. CF reflects a social aspect in that a system relates users through items regarding shared interests. CB filtering methods are based on a description of the item and a profile of the user's preferences (Adomavicius & Tuzhilin, 2005). These systems use keywords to describe the items and build a user profile to indicate the type of item he/she likes. Then these algorithms recommend items that are similar to those that a user liked in the past or present. KB systems offer items to users based on knowledge about the users, items and/or their relationships. This case-based reasoning method represents items as case and generates the recommendations by retrieving the most similar cases to the users' query or profile (Smyth, 2007). Hybrid recommender combines the best features of two or more recommendation techniques into one technique (Burke, 2007). However, each recommendation approach has advantages

and limitations. To improve limitations such as cold start issue and low accuracy, many advanced recommendation approaches have been proposed, such as social network-based recommender systems (He & Chu, 2010) and trust-based recommender systems (O'Donovan & Smyth, 2005).

In recent years, the dramatic growth of social networking tools in web-based systems resulted in applying social network analysis (SNA) to RSs (Lu *et al.*, 2015). To help improve user experience, RSs increasingly provide users with the ability to engage in social interaction with other users, such as online friending, making social comments, social tags, etc. These trends offer opportunities for making recommendations by utilizing users' social ties, especially for systems whose rating data is too sparse to conduct collaborative filtering (Lu *et al.*, 2015). Considering the real world situation in which one's decision to purchase is more likely to be influenced by suggestions from friends than by website advertising, a user's social network may be an important source if it exists in RSs (Lu *et al.*, 2015). However, in reality, friends and family are not necessarily the best sources as early studies showed that users often did not trust their personal friends as the best experts (e.g., McDonald, 2003).

The concept of trust (e.g., trust-base filtering) was adopted in order to increase the effectiveness of recommendations by identifying a recommendation provider's reputation or a user's trusted person in his/her network (O'Donovan & Smyth, 2005). For example, trust has been defined as how many correctly predicted recommendations a person has made in general (i.e., profile-level trust) or for a particular item (i.e., item-level trust) (O'Donovan & Smyth, 2005). Several trust-based methods (Massa & Avesani, 2004; O'Donovan & Smyth, 2005; Weng, Miao, & Goh, 2006) derive the neighbors' trust

explicitly or implicitly, and use it as an important criterion to select neighbors, which alleviates the recommender reliability problem. In a RS, the word “trust” is usually defined as “how well does Alice trust Bob concerning the specific product or taste” (Ben-Shimon, Tsikinovsky, Rokach, Meisles, Shani, & Naamani, 2007). Positive correlation between trust and user similarity in online communities was proved (Ziegler & Lausen, 2004). Series of studies have tried to integrate trust into RSs. These trust-based frameworks are usually based on analyses of the propagation mechanism of “the Web of trust” of users. In the trust metric module (Massa & Avesani, 2004) the undefined trust value was roughly predicted based on an assumption that “users closer in the trust network to the source user have higher trust value.” The term trust is used in various ways in trust-based RSs. Although researchers incorporate and combine various factors into recommendation algorithms, many users are still not satisfied with recommendations from those RSs due to inaccuracy, irrelevance, and ineffectiveness. RSs are developed without an agreed or integrated model or theory which explains recommendation use behavior. We question what gaps are between factors used in recommendation systems and people’s actual recommendation interaction and use in real everyday life.

2.2 Traditional and Electronic Word-of-Mouth

2.2.1 Traditional Word-of-Mouth (WOM)

The most relevant studies of recommendation behavior can be found in word-of-mouth research from the field of marketing or business. As a concept of recommendation in marketing research, traditional word-of-mouth (WOM) and electronic word-of-mouth (eWOM) have been extensively studied as advertising tools. WOM refers to the act of

exchanging marketing (e.g., product-related) information among consumers (Grewal, Cline, & Davies, 2003). WOM can be defined as “all informal communication directed at other consumers about the ownership, usage, or characteristics of particular goods and services or their seller” (Bass, 1969). While WOM has been traditionally spread among acquaintances through personal “contagions,” its value has also been recognized and used in practice. WOM is widely considered as major driver of new product diffusion for non-adopters (Hu, Pavlou, & Zhang, 2006). Also, WOM is typically characterized as oral, person-to-person communication between a receiver and a communicator in which the communicator delivers a non-commercial message (Arndt, 1967; Rogers, 1995). As consumers frequently use WOM when they seek information about brands, products, services, and organizations (Buttle, 1998; East, Hammond, & Lomax, 2008), WOM is steadily acknowledged as an important source of information that influences consumer product choices (e.g. Coleman, Katz, & Menzel, 1966; Engel, Kollat, & Blackwell, 1968; Herr, Kardes, & Kim, 1991; Smith, Menon, & Sivakumar, 2005; Witt & Bruce, 1972). Personal sources are generally perceived as more credible than marketers or commercial sources, WOM is often more effective than traditional mass media or advertising in changing consumers’ attitudes and behaviors (Brooks, 1957; East *et al.*, 2008).

The importance of WOM communication has long been a considerable topic to marketing researchers and practitioners for a number of reasons. WOM has been shown to have a significant impact on consumer choice (Katz & Lazarfeld, 1955; Engel, Blackwell, & Kegerreis, 1969; Arndt, 1967; Richins, 1983), as well as post-purchase product perceptions (Bone, 1995). The roles of WOM (Chu & Kim 2011, 2018) are as follows:

- Affecting consumers' product choices and purchase decisions (Bataineh, 2015; Cheng & Ho, 2015; Price & Feick 1984; Katz & Lazarsfeld, 1955; Sallam, 2014)
- Influencing the new product diffusion processes (e.g., Engel, Kegerreis, & Blackwel, 1969; Goldenberg, Libai, & Muller, 2001; Hennig-Thurau, Wiertz, & Feldhaus, 2015; Marchand, Hennig-Thurau, & Wiertz, 2017; Stephen, & Lehmann, 2016)
- Shaping consumers' pre-usage attitudes of a product or service (Herr, Kardes, & Kim, 1991; De Bruyn & Lilien, 2008)
- Shaping consumers' post-usage evaluations of a product or service (Bone, 1995)
- Determinant of the adoption of new products or services and of influencing the speed of innovation diffusion (Mahajan, Muller, & Srivastava 1990; Oliveira, Thomas, Baptista, & Campos, 2016; Rogers, 1995)

2.2.2 Electronic Word-of-Mouth (eWOM)

As consumers' interpersonal communication happens increasingly in the online spaces and new media technologies, the nature and effect of WOM taking place within online environments has gained rising attention from researchers in recent years (Chu & Kim, 2011, 2018; Ismagilova, Dwivedi, Slade, & Williams, 2017). The emergence of the Internet has enabled consumers to interact with one another quickly and conveniently and has established the phenomenon known as online interpersonal influence or eWOM (Brown, Broderick, & Lee, 2007; Dellarocas, 2003; Dwyer, 2007; Goldsmith & Horowitz, 2006; Wang, Cunningham, & Eastin, 2015). In recent years, the topic of the eWOM has surged interest in many disciplines, such as management information

systems, marketing, business, computer sciences, psychology, and economics. Several different definitions have been proposed for behaviors, and it can be defined as communication referring to “any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet” (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004, p. 39). Basically, eWOM refers to “the act of exchanging marketing information among consumers online” (Chu, 2011).

The anonymous and interactive nature of cyberspace enables consumers to freely give and seek opinions about the product experiences of peer consumers who are unknown to them, thereby affecting consumers’ brand choices and sales of many goods and services (Goldsmith & Horowitz, 2006; Schlosser, 2005). Moreover, the transmission of information on the Internet gives consumers unlimited access to a great amount of information and a variety of product and brand choices (Negroponte & Maes, 1996). Online consumers have the ability to make comparisons on price and quality of brands or services, and possess the opportunity to communicate with marketers as well as with other consumers (Negroponte & Maes, 1996). As a result, it has become apparent that consumers use the Internet to exchange product-related information and share brand experience in the same way they do offline (Goldsmith & Horowitz, 2006). Effects and roles of eWOM in previous works are as follows:

- Building consumer trust and cooperation in virtual communities through online communication channel (Fong & Burton 2006; Moran & Muzellec, 2017; Zhang, Benyoucef, & Zhao, 2016)

- Establishing relationships, exchanging product information, and developing e-commerce for consumers and marketers (Hagel & Armstrong, 1997; Kim, Choi, Qualls, & Han, 2008)
- Influential power of eWOM and online product recommendations on consumers' product-related decisions (Köcher, & Holzmüller, 2017; Kozinets, De Valck, Wojnicki, & Wilner, 2010; Senecal & Nantel, 2004)
- Critical effects on product success (e.g., sales) (Babić Rosario, Sotgiu, De Valck, & Bijmolt, 2016; Bao & Chang, 2016; Chevalier & Mayzlin, 2006; Godes & Mayzlin, 2004)
- Motivating consumers to articulate themselves via consumer-opinion platforms (Hennig-Thurau *et al.*, 2004; Hu & Kim, 2018; Yang, 2017)
- eWOM effects on political attitude and intentions to vote (Iyer, Yazdanparast, & Strutton, 2017; Jamal, Kizgin, Rana, Laroche, & Dwivedi, 2019)

Chu and Kim (2011) examined how social relationship factors relate to eWOM transmitted via online social websites. They developed and tested a conceptual model that identifies tie strength, homophily, trust, normative and informational interpersonal influence as an important antecedent to eWOM behavior in social network sites (SNSs). Their results confirm that tie strength, trust, normative and informational influence are positively associated with users' overall eWOM behavior, whereas homophily was negatively related with the eWOM behavior. Their study suggests that product-oriented eWOM in SNSs is a unique phenomenon with important social implications. Ebermann, Stanoevska-Slabeva and Wozniak (2011) analyzed influential factors of recommendation behavior in SNSs, and distinguished implicit and explicit recommendation behavior in

SNSs. They developed a theoretical model explaining why SNS users engage in implicit and explicit recommendation behavior. Their findings show a positive impact of reciprocity on both implicit and explicit recommendation behavior, a negative impact of fear of producing spam on implicit recommendation behavior, and a positive impact of both implicit recommendation behavior and the perceived value of the recommended product on explicit recommendation behavior.

The studies of WOM and eWOM share some similarities and differences regarding the focus of study, e.g., advertising effects, market sales, customer loyalty, or WOM spreading behaviors (Table 1).

Table 1
Similarities and Differences between WOM and eWOM

		WOM	eWOM
Similarities		<ul style="list-style-type: none"> ▪ Interpersonal communication ▪ Influence decision-making ▪ Bidirectional and interactive 	
Differences	Mode	<ul style="list-style-type: none"> ▪ Usually spoken, person-to-person ▪ Usually identified sources ▪ Consumers have lower control over WOM 	<ul style="list-style-type: none"> ▪ Through various online forms ▪ Both identified and unidentified sources ▪ Consumers have higher control over eWOM
	Scope	<ul style="list-style-type: none"> ▪ With geographical and time constraints ▪ One to one or in small groups 	<ul style="list-style-type: none"> ▪ Without geographical and time constraints ▪ One to one or one to many
	Speed	<ul style="list-style-type: none"> ▪ Slow 	<ul style="list-style-type: none"> ▪ Fast

Sources: Chu & Kim, 2011; Huete-Alcocer, 2017; Wang, Yeh, Chen, & Tsydypov, 2016

2.3 Social Capital Theory

Social capital is a collective resource and the strong interconnections between individuals which foster “sturdy norms of generalized reciprocity and encourage the emergence of social trust” (Coleman, 1988, 1990; Putnam, 1995, p. 66). On the other hand, Lin (2001) views social capital as an individual resource. His theory of social capital (2001) is rooted in the concepts of social network analysis, which provides methodological tools for investigating the relationships or ties between individuals. The network of relationships comprises the social networks (Johnson, 2009). Lin (2001, p. 19) defines social capital as “an investment in social relations by individuals through which they gain access to embedded resources to enhance expected returns of instrumental or expressive actions”. Therefore, social capital relates to the value realized through an individual’s social relationships and extrapolates to the value an organization realizes through the social relationships of a work group.

Social resources are the goods possessed by individuals in the network and can consist of intangible goods such as social status, research collaboration, and information as well as material goods (e.g., money or car). These goods are considered social resources because they are available to an individual through his or her social relationships. Lin’s theory (2001) explains how the quality of social resources available to an individual within his or her social network influences the success of achieving desired outcomes or goals (Johnson, 2009). Information science studies investigated social capital from several perspectives: individuals with face-to-face contact, individuals in member-initiated online communities and university departments. Regarding Chatman’s information poverty (1996, 2000), findings from past studies indicate that

social capital is related to education and income. On a different note, social capital theory complements Erdelez's (1997) information encountering, since social capital and social structure may explain passive acquisition of information. Johnson (2004) investigated the information behavior of a random group of Mongolian residents in terms of recognizing people with better resources than themselves and selecting them as information sources despite limited social contact, or weak ties. The social capital theory provided an effective explanatory tool for understanding the social factors affecting information behavior. Similarly, Wiklund (1998) considered the social and intellectual capital garnered within a group of doctoral students. From a consumer behavior perspective in marketing research, consumers' reliance on product recommendations and opinions from friends in their personal networks (i.e., reference groups) (Bearden & Etzel, 1982) can be interpreted as evidence of the effect of social capital. Accordingly, social capital may serve as an influential driver that affects information seekers' use of their social networks as a vehicle for recommendations.

Nahapiet and Ghoshal (1998) regarded social capital as an integrative framework for understanding information sharing in organizations. They suggested that information combination and exchange is facilitated when: (1) structural links or connections exist among individuals (structural capital); (2) individuals have the cognitive capability to understand and apply knowledge (cognitive capital); and (3) their relationships have strong and positive characteristics (relational capital). These forms of social capital constitute the combination and exchange of knowledge among individuals within a social structure. Moreover, Wasko and Faraj (2005) identified three key dimensions of social capital: cognitive, structural, and relational. Cognitive capital

consists of shared codes (Phang Kankanhalli, & Sabherwal, 2009), shared language, value, and vision (Chiu *et al.*, 2006; Sun *et al.*, 2012), user tenure (Wasko & Faraj, 2005), and expertise (Wasko & Faraj, 2005). Structural capital can be explained by network ties (Robert, Dennis & Ahuja, 2008), network configuration (i.e., centrality) (Wasko & Faraj, 2005), social interaction (Phang *et al.*, 2009). Relational capital was explored by trust, norms, identification (Chiu *et al.*, 2006), and obligations (Wasko & Faraj, 2005). Based on these three dimensions, Liu, Cheung, and Lee (2016) proposed and empirically test a comprehensive theoretical model for customer information sharing behavior. Their results showed that customer information sharing is influenced by both individual (i.e., reputation and the enjoyment of helping others) and social capital (i.e., out-degrees' post, in-degrees' feedback, customer expertise and reciprocity) factors.

2.4 Second-hand Knowledge and Cognitive Authority

Most of what we know we learned from the spoken or written word of others. We depend in endless practical ways on the technological fruits of the dispersed knowledge of others in virtually every moment of our lives (Fricker, 2006; Wilson, 1983). Fricker (2006, p. 592) argues that knowledge gained through trust in testimony is always and necessarily knowledge at second-hand. In the similar vein, Wilson (1983) states that we mostly depend on others for ideas, as well as for information about things outside the range of observation or direct experience (i.e., first-hand experience) (p. 10). Much of what we think about the world is what we have second hand from others. The phrase second hand is especially appropriate in suggesting second best, not so good as first hand—for in an obvious way, finding out by being told (i.e., second hand) differs from

finding out by seeing or hearing or living through an experience (i.e., first hand) (Wilson, 1983, p. 10). Then, Wilson (1983, p. 10) articulates that information needs and knowledge gap lead us to seek second-hand-knowledge, and we are led to those whom we think know something we do not know; that is, cognitive authority. Wilson (1983) proposed a theory about cognitive authority that explains the nature of the authority that people grant to an entity that has knowledge about a particular topic. The cognitive authority represents the influence that an entity can cause on another individual in order to define “who knows what about what.”

Cognitive authority is conceptualized from social epistemology by Wilson (1983) and defined as “influence on one’s thoughts that one would consciously recognize as proper” (p. 15). Cognitive authority is “legitimate influence,” and clearly related to credibility (Wilson, 1983). He points out that “the authority’s influence on us is thought proper because he is thought credible, worthy of belief” (p. 15). Two main ingredients are competence and trustworthiness. The potential pool of cognitive authorities on which we might draw consists of people who we think credible (p. 16). The cognitive authorities are clearly among those we think of as credible sources. The fundamental concept of Wilson’s cognitive authority is that people construct knowledge in two different ways: based on their “first-hand experience” or on what they have learned “second-hand” from others. What people learn first-hand depends on the stock of ideas they bring to the interpretation and understanding of their encounters with the world. People primarily depend on others for ideas as well as for information outside the range of direct experience. Unlike “first-hand knowledge,” acquired from one’s own experience, Wilson’s theory is related to the “second-hand knowledge” acquisition

process, in which a person uses an entity that has knowledge in order to obtain information on a particular subject. Given that we ourselves are not knowledgeable on the subject, Wilson raises a question, “how can we choose among them, or how can we defend our choice once made?” (p. 21).

Wilson (1983) argues that all that people know of the world beyond narrow range of their own lives is what others have told them. However, people do not count all hearsay as equally reliable; only those who are deemed to “know what they are talking about” become cognitive authorities. Wilson coined the term cognitive authority to explain the kind of authority that influences thoughts that people would consciously recognized being proper. Rieh (2000, 2002) employs this theory to examine the concept of quality and authority in the Web from the perspective of information-seeking behavior. Her study found that information seekers in the Web judge quality and authority primarily based on their knowledge such as domain and system knowledge, in addition to characteristics of sources such as URLs, reputations and credentials and characteristics of information objects such as type, title, presentation and so on. The participants evaluated source authority by their own experience, other people’s recommendations, or something that they have heard. Other people who apparently serve as cognitive authorities meant friends, colleague, doctors, or academics, and so on. Rieh (2000, 2002) finds that evaluation of cognitive authority is subjective, relative, and situational rather than objective, absolute, and universally recognizable. In a study emphasizing the impact of social practices and interactions on cognitive authority in discourse analysis, McKenzie (2003a, 2003b) points out that it is important to understand people’s judgments of

cognitive authority and bases for such judgment not on the level of verbal expressions but on the deeper cognitive levels.

Through the concept of cognitive authority, information relevance and quality have been related to the expertise and skill of those who publish and share information on the Web (Côgo, Silva, & Pereira, 2012). In a recommender system, the users themselves hold the process of recommendation evaluation and selection. This approach makes the selection or rejection of information directly dependent on who carried it out. By their decision, users reduce uncertainty and solve a problem efficiently; thus, getting better decision making through recommendations depends on the experiences, knowledge and skills of users who are performing information seeking process, raising the issue of identifying the cognitive authority of the sources of information or recommendations. Cognitive authority determines “who knows what about what” (Wilson, 1983), being related to the influence caused by someone in the way of thinking of an individual, because this individual judges him worthy of credit and trust.

The process of recommendation evaluation takes into account some relevant aspects of the Wilson’s (1983, pp. 13-14) cognitive authority theory, as follows:

a) Cognitive authority always involves at least two entities: The authority (i.e., an individual, a book, and an institution) and the individual who recognizes that authority: it depends on the recognition by someone, as a person can have great knowledge about a certain subject but, nevertheless, s/he may not be recognized by others as a cognitive authority.

b) Cognitive authority is always related to some area of interest: An entity can be considered an authority on certain subjects, while on others there is not the same level of recognition.

c) Cognitive authority is degrees of recognition: An entity can be recognized with great or little cognitive authority.

d) Cognitive authority is a kind of influence: An entity's thought can be influenced by cognitive authority.

Based on the concepts of cultural tools and cognitive authority, Mansour and Franke (2017) empirically explored how a group of mothers in Facebook evaluates sources and the credibility of information provided in the group. The Facebook group was characterized by a combination of familiar and unfamiliar others, of the sharing and seeking of information from different domains and of first- and second-hand knowledge. The participants employed various cultural tools to assess credibility in this mixture of knowledge domains and information sources (Mansour & Franke, 2017). Within the context of social media environments, Dalmer (2017) argued that people place greater emphasis on social attributes such as intragroup interaction, openness, relationships, and trust than on the technical characteristics of online sources. Bonnici (2016) applied Granovetter's theory of the strength of weak ties (1973) to argue that information seekers may perceive cognitive authority in others even "when personal ties between author and reader are weak to non-existent" (p. 1). Cognitive authority is highly contextual and divorceable from information credibility or accuracy provided that the information in question meets the standards and expectations of the group in which it operates (Bonnici, 2016). Ma and Stahl (2017) employed a multimodal critical discourse analysis through

the lenses of reductionist thinking and cognitive authority. Their findings showed that parental information seeking and sharing worked to create an isolated, sentimentalized information context favoring immediacy and emotional impact over scientific research and statistical evidence. Because participants shared fundamental beliefs and goals around vaccines, group members held cognitive authority despite the lack of expertise or evidentiary support in their postings (Ma & Stahl, 2017).

2.5 Trustworthiness of Recommendations and Recommenders

2.5.1 The Concepts of Trust

Trust refers to a positive belief, disposition, and behavior about the perceived reliability of, dependability of, and confidence in a person, object, or process, associated with the acceptance of risk and vulnerability (Rieh & Danielson, 2007, Tseng & Fogg, 1999). For instance, trust is associated with reliance on a computer system designed to keep track of financial transactions while credibility means to “trust the information”, “accept the advice”, and “believe the output” (Tseng & Fogg, 1999, p. 41; Rieh & Danielson, 2007, p. 314). The concept of trust embraces a relationship between a person, an object, and a condition (i.e., the acceptance of risk and vulnerability) of the trustor (i.e., a person who is trusting). According to various studies in many disciplines, trust is a multi-dimensional and complex as well as a psychological and dynamic. For instance, the multidimensional meanings of trust are suggested as despair; social conformity; cooperation; impulsiveness; virtue; predictability; faith; risk taking; and confidence (Marsh & Dibben, 2003, p. 470). Thus, we should shed light on trust in various ways, and develop an organized or psychological basis to prove which attributes as information

sources are associated with a trusting behavior in human information interaction during recommendation (or information in general) seeking process.

Generally, the trusting behavior is depending on not only one's expectation but also risk taking as another factor (Golbeck, 2013). When trusting someone, one should decide how much risk s/he is willing to take. For instance, if a movie recommended by one's friend turned out to be bad, she will just end up with a waste of small money. On the other hand, choosing an unskillful healthcare provider recommended by one's acquaintance might result in deteriorating a health condition for her lifetime. An intuitive definition of trust can be included as follows: "A person trusts another if she is willing to take a risk based on her expectation that the trusted person's actions will lead to a positive outcome" (Deutsch, 1962; Golbeck, 2013, p. 77; Kelton *et al.*, 2008; Rousseau, Sitkin, Burt, & Camerer, 1998, p. 395). Similarly, Rousseau *et al.* (1998) refer trust to "a psychological state comprising the intention to accept vulnerability, based upon positive expectations of the intentions or behavior of another" (p. 395). In these definitions, we can extract three factors of trusting behavior: vulnerability, risk, and positive expectations of the person we trust. Likewise, Sztompka (1999) defined trust as "a bet about the future contingent actions of others" (p. 25). The bet resembles the idea of vulnerability and risk-taking, and the future actions of others are related with the concept of expectation.

Trust is composed of attitudes or intention on the part of an information seeker (Sharp, Thwaites, Curtis, & Miller, 2013), and these attitudes come from two facets: "confidence in positive outcomes" and "willingness to modify one's behavior in expectation of those outcomes" (Kelton *et al.*, 2007, p. 368). Confidence is belief that

trusting a recommendation giver results in positive outcomes and the recommendation is reliable and valid. It is the basis of trust in an automated agent, incorporated in information quality criteria such as reliability and validity. Willingness to act on this confidence implies that the recommendation seeker has a free will to accept or refuse the recommendation (Kelton *et al.*, 2008, p. 368).

2.5.2 The Concepts of Trustworthiness

While trust is the behavior, attitude or intention of the trustor (i.e., person doing the trusting), trustworthiness is the characteristics of information and the trustee (i.e., person being trusted) upon which the trustor's intentions are built. Intentions of both trustor and trustee play main roles in the trusting behavior, and are one of main factors in information use and information seeking process (Sharp *et al.*, 2013; Kelton *et al.*, 2008). Trustworthiness and expertise (i.e., perceived knowledge, skill, and experience) are two main factors in the evaluation of information credibility (Fogg & Tseng, 1999; Rieh, 2002). Similarly, Wilson (1983) argues that the influence on us is thought proper because the information provider is thought credible, worthy of belief (p. 15). Then, he proposes two components of credibility: (1) competence and (2) trustworthiness.

The perceived trustworthiness is assessed by four elements: (1) competence (accuracy, currency, coverage, and believability), (2) positive intentions (objectivity), (3) ethics (validity), and (4) predictability (stability). Trust is directly influenced by the perceived trustworthiness of the referent, as well as several external influences on trust (Kelton *et al.*, 2008). The three characteristics of trustworthiness include (1) ability (i.e., trustor's perception of the trustee's knowledge, skills and competencies); (2) benevolence

(i.e., the extent to which a trustor believes that a trustee will act in the best interest of the trustor); and (3) integrity (i.e., the extent to which the trustor perceives the trustee as acting in accordance with a set of values and norms shared with, or acceptable to, the trustor) (Arazy *et al.*, 2010; Kelton *et al.*, 2008; Mayer, Davis, & Schoorman, 1995). These researchers commonly explain trustee's intention and expertise as a basis of trustworthiness. Trusting a recommendation means that the recommender is both well-intended and knowledgeable.

Trustworthiness is defined as well-intentioned and unbiased content.

Trustworthiness refers to “*the perceived likelihood that a particular trustee will uphold one's trust*” (Kelton *et al.*, 2008, p. 367). This definition is almost identical as the definition of credibility (i.e., a perceived quality of a source, which may or may not result in associated trusting behavior) and trustworthiness and credibility are synonymous terms. In an empirical study, Cunningham and Johnson (2016) confirmed that trustworthiness assessment was based on the information usefulness and credibility as well as identifying the factors relating to information quality and website design that helped to form the judgments of trust in online health information. Particularly, indicators of information credibility were measured in two aspects: a) perceived absence of bias, distortion and deception, and b) perception of accuracy, as from comprehensibility and triangulation (Cunningham & Johnson, 2016).

2.5.3 The Concepts of Credibility

Historically, trust has been a core construction in many conceptualizations of credibility (Hovland, Janis, & Kelley, 1953). The two terms, trust and credibility, have

often used interchangeably and showed some similarities and differences in previous research. Credibility is considered as believability, a psychological construct (Hovland *et al.*, 1953, Tseng & Fogg, 1999). Credibility refers to “a perceived quality of a source, which may or may not result in associated trusting behavior” (Rieh & Danielson, 2007, p. 314). The notion of credibility is embedded as an important ascription of information quality (Rieh & Belkin, 1998; Rieh & Danielson, 2007), and the quality of a source can affect people’s trusting behavior. Quality is described as reliability and validity in the value-added model of information systems and defined as “a user criterion which has to do with excellence or in some cases truthfulness in labeling” and identified five values included in the definition of quality: accuracy, comprehensiveness, currency, reliability, and validity (Tylor, 1986, p. 62, p. 70). Also, other researchers (Rieh, 2002; Rieh & Danielson, 2007; Scholz-Crane, 1998; Wang & Soergel, 1998) identified that the notion of quality is related to the judgment of information credibility. They explored the aspects of credibility with relation to the concept of information and/or source quality and found that credibility is a multifaceted concept (O’Keefe, 2002; Metzger, 2007).

Credibility assessments of sources and information are fundamentally interlinked and influence one another (Slater & Rouner, 1996); that is, credible sources are seen as likely to produce credible messages and credible messages are seen as likely to have originated from credible sources (Fragale & Heath, 2004). In a heuristic viewpoint, four types of credibility are proposed to assess information systems (in particular, interface of website): (1) presumed, (2) reputed, (3) surface, and (4) experienced credibility (Fogg, 2003, Fogg & Tseng, 1999, Tseng & Fogg, 1999). Presumed credibility is based on general assumptions in the user’s mind, how much the perceiver believes someone or

something (e.g., a domain name that ends with .org; friends are better than sales person) while reputed credibility is based on third-party endorsement, reports, or referrals (e.g., prestigious awards, official titles, and/or third party reports (endorsement)). Surface credibility refers to simple inspection and first impressions (e.g., a site looks professionally designed, the cover of a book, on the type of language people use). Experienced credibility is based on first-hand experience as people interact over time, their expertise and trustworthiness can be assessed (e.g., a site that has consistently provided accurate information over the past year); associated with interaction with the world.

2.5.4 Preconditions of Trust

Three prerequisites of trust are (1) uncertainty, (2) vulnerability, and (3) dependence (Kelton *et al.*, 2008). Studies in LIS show that uncertainty (Kuhlthau, 1993) or anomalous status of knowledge (Belkin, 1978) leads users to information seeking process. Uncertainty or knowledge gap arises from a lack of information (Giddens, 1990; Luhmann, 1979). Trust was viewed as a cognitive factor to reduce one's uncertainty in her situation (Kelton *et al.*, 2008; Ring & van de Ven, 1992). Trusting behavior occurs when a person encounters difficulties or perceives an ambiguous situation for a solution. The result of choices is unsure, and whether the result is good or not depends on the action of another person (Golbeck. 2013, p. 76; Deutsch, 1962; Golembiewski & McConkie, 1975).

In literature, the concept of risk frequently includes uncertainty and vulnerability (Kelton *et al.*, 2008; Luhmann, 1988; Seligman, 1997) and trust is formed because of the

existence of risk (Luhmann, 1988; Seligman, 1997; Sheppard & Sherman, 1998). Trust can be defined as “the extent to which one party is willing to depend on the other party in a given situation with a feeling of relative security, even though negative consequences are possible” (McKnight & Chervany, 1996, p. 27). This definition recognizes that risks potentially exist—that trust or distrust emerges from the “negative consequences” of risk. Particularly, engaging in online transactions evokes feelings of risk for consumers (Gefen, 2000; Jarvenpaa, Tractinsky, & Saarinen, 1999; McKnight & Chervany, 2002) due to uncertainty from the lack of face-to-face interactions. Kelton and colleagues incorporate the concept of risk into the vulnerability in their model. All three of the preconditions must be satisfied (necessary condition) so that the question of trust becomes relevant (Kelton *et al.*, 2008, p. 366) in the information user’s context or situation. Dependence infers an assumption so that trusting behavior happens, when the receiver has “*a particular need to fulfill*”, and when the recommender owns “*the potential to satisfy this need*” (Kelton *et al.*, 2008, p. 366). In other words, a user has an information need and the recommender has an ability to help the user’s need. The notion of dependence highlights that the receiver can freely choose either to accept or to refuse information from the recommender (Kelton *et al.*, 2008). If the receiver is vulnerable to suffering a loss when the trust is betrayed, acceptance of risk and utility for risk are inherent in trust (Kelton *et al.*, 2008, p. 365). Their proposed conceptual models are as follows: an integrated model of trust (Figure 1) and an integrated model of trust in information (Figure 2).

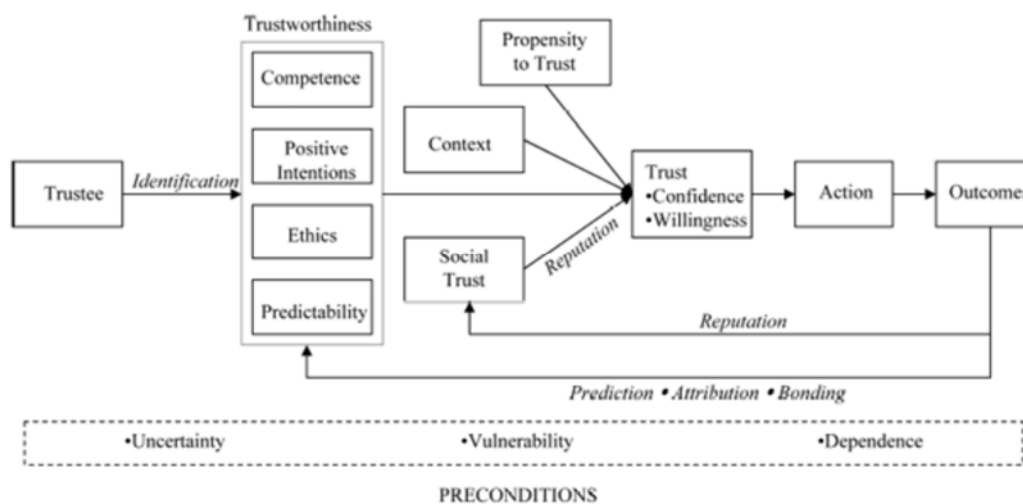


Figure 1 Integrated model of trust (Kelton *et al.*, 2008)

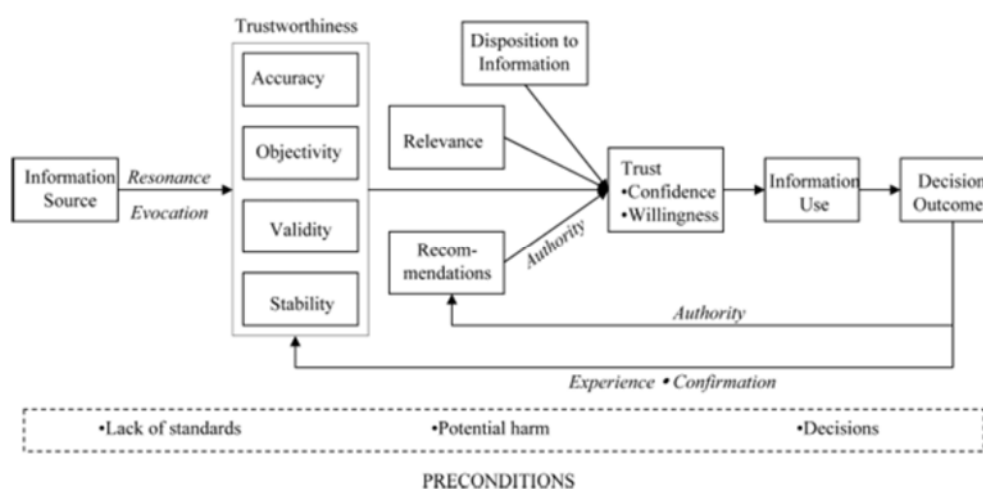


Figure 2 Integrated model of trust in information (Kelton *et al.*, 2008)

Similar to ideas in the study of Kelton *et al.* (2008), Hupcey, Penrod, Morse, and Mitcham (2001) also suggest preconditions of trust. Drawing upon the literature of several disciplines, Hupcey *et al.* (2001) propose a three-component model that contains (1) antecedents: a need which cannot be met without help from another; prior knowledge and/ or experience of the other, and assessment of risk; (2) attributes composed of

dependency upon another to meet the need, choice or willingness to take some risk; expectation that the trusted individual will behave in a certain way; focus upon the behavior related to the need and testing the trustworthiness of the individual; and (3) boundaries when trust ceases to exist if there is a perception of no choice or the risks outweigh the benefits.

Formal socio-cognitive models of trust have been proposed (Castelfranchi & Falcone, 1998) with equations that attempt to evaluate the various factors that influence trusting relationships, such as the degree of delegation between the two parties, the motivations, risks, and goals shared by the parties to establish the need for a relationship, and properties which can be evaluated to establish their reputations. The role of the environment and experience also influence how trust may be assessed within groups, although no clear means of assessing the impact of experience is given. The socio-cognitive theory of trust (Castelfranchi & Falcone, 2001) represents a considerable synthesis of the literature; however, the equations and premises contain many assumptions which are not based on empirical evidence. Furthermore, the predictions of the model have not been validated in case studies or experiments or other empirical studies like the models of Kelton *et al.* (2008).

CHAPTER 3 THEORETICAL FRAMEWORK AND MODEL

We assume that many situations of recommendation need are associated with the necessity of other's experience, opinions, ideas, thoughts, etc.; that is, second-hand knowledge (Wilson, 1983). Studies in human information behavior have neither solely shed light on recommendation behavior nor described or included recommendation interaction in information seeking processes from the perspectives of recommendation seekers. To the best of my knowledge, no agreed framework or model exists in the development of RSs in past works either. This chapter attempts to suggest a framework for the role of cognitive and social factors in the trustworthiness evaluation of recommendation and recommenders from the viewpoint of recommendation recipients (i.e., recommendation seekers). Given the unique social nature of recommendation seeking behavior, social relations and trustworthiness are interesting factors to be explored. Also, to understand how people evaluate recommended entities will be helpful in order to advance the model of information in a broad scope and to better design a RS in a narrow scope. The process of assessing and using recommended information is somewhat obscure because much recommendation from an online space is anonymous and lack of cues to evaluate the recommenders resulted in trust issues. The following section begins with the conceptualization of recommendation behavior and the definition of recommendation for this study. Then, key and relevant constructs are reviewed to develop the conceptual framework for the present study.

3.1 Defining Recommendation Seeking Behavior

3.1.1 Conceptual Space of Recommendation Seeking Behavior

As a broader conceptual approach, recommendation behavior is introduced first. What constitutes the core of recommendation behavior has been understudied. Meanwhile, a similar concept of a recommendation; that is, WOM, has been extensively studied in the marketing and business research. Researchers have investigated how people interact and use both WOM and eWOM with relation to market sales and consumer behavior, and how consumers communicate with other peer consumers about their experiences and opinions about products and services. Most studies in WOM and eWOM, researchers are focusing on information transferring from the perspectives of consumers' recommendation providing. In order to support the better development of RSs or information filtering systems, recommendation behavior needs to find its place in models of information behavior. What are the distinguishable aspects of this form of information behavior? What is its conceptual space within the broader field? In this section, recommendation interaction is mapped within a theoretical space of information behavior and defined through a series of diagrams.

Wilson (1997) identifies two types of information seeking such as searching and acquisition (Aaker, Batra, & Myers, 1992). Two acquisition behaviors are passive attention and passive search while two searching behaviors are active search and ongoing search (Figure 3; Wilson, 1997, p. 562). Passive search signifies the occasions of passive attention such as listening to the radio or watching television programs when one type of search (or other behavior) results in the acquisition of information that happens to be relevant to the individual (Wilson, 1997, p. 562). In some sense, recommendation

behavior shares some conceptual parts of passive search because the current technology enables users come across delivered recommendations by RSs or friends' messages without actively notifying them about their specific needs. On the other hand, passive attention is less likely to be applied to the cases of recommendation interactions because recommendation behavior is mostly triggered by attentive information needs in the course of information seeking actions or decision making processes. Recommendation is a piece of information which is filtered by communication and/or interaction with human or systems (i.e., second-hand knowledge) rather than just hearing from somewhere unintentionally. Thus, a recommendation is usually perceived under the active attention in the course of users' action or mental processes.

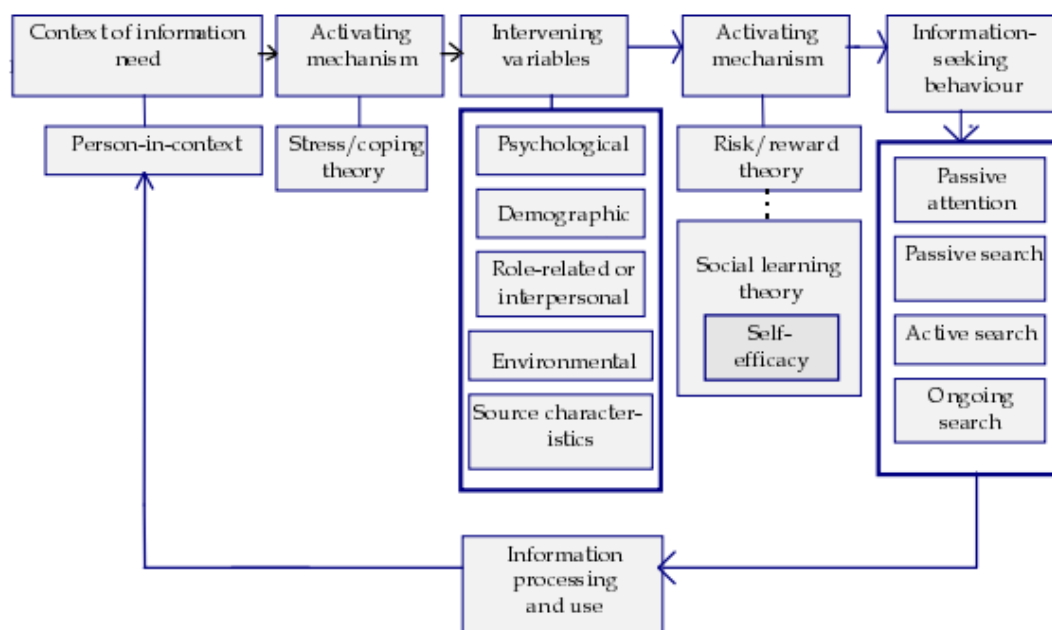


Figure 3 Information behavior model (excerpt from Wilson, 1997, 2000)

Information behavior can be described as “the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use” (Wilson, 2000, p. 49). This broad term includes face-to-face communication, as well as a more passive reception of information with no intention to “act on the information given” (Wilson, 2000, p. 49). However, most research considers information users as active information searchers, and overlooked passive search while recommendation communication can include passive behavior since users often intend to take a short cut to find relevant information by others or systems rather than to search through information-overloaded web. Information behavior implies a wider term that includes activities other than purposive information seeking. Here, recommendation behavior is subdivided and adopted from the definition of Wilson’s information behavior. It consists of actively-seeking or asking recommendations as well as passively-receiving recommendations. In this study, *Recommendation Behavior* is defined as all actions of human behavior with respect to giving, receiving, asking, and encountering recommendations, including both active and passive information seeking and use.

Recommendation behavior can be considered as a subset of information behavior and shares a part of information seeking and searching area. In Wilson’s (1997) nested information model (Figure 4), the outermost circle indicates the area of information behavior comprised of information seeking and searching behavior. Then, information seeking behavior includes searching behavior which is situated in the innermost circle of the model. However, this framework is limited to explain other types of human information behaviors.

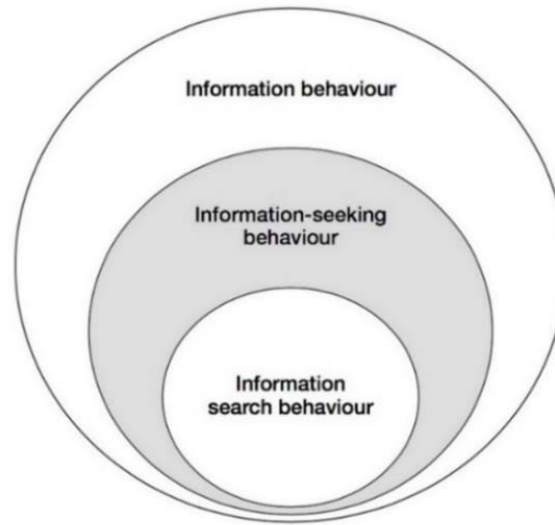


Figure 4 Nested model of information behavior (Wilson, 1999)

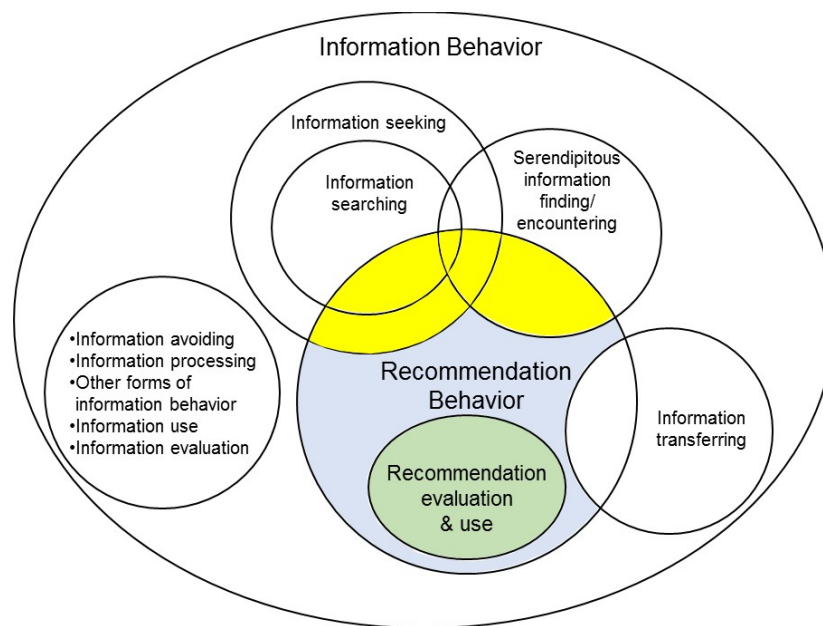


Figure 5 Conceptual space of recommendation behavior. Extended from Wilson (1999) and Agarwal (2015).

Agarwal (2015) extended Wilson's (1999) framework in his study of serendipitous information finding. Agarwal (2015) placed serendipitous information

discovery within information behavior, and added other information behavior such as information avoiding, information processing, information use and other forms of information behavior. These concepts are mapped distinct from the concept of purposive information seeking, but serendipitous information encountering partially overlaps with information seeking and searching (Agarwal, 2015). By adding recommendation behavior, this dissertation extended Agarwal's (2015) serendipity conceptual space framework within information behavior (Figure 5).

In Figure 5, recommendation behavior is a part of information behavior. It overlaps with other subsets of information behaviors such as information seeking, searching, encountering, and transferring. Recommendation behavior includes recommendation evaluation and use as well. Serendipitous information encountering can be defined as accidental or unexpected findings of information in any situation where an actor or user is not necessarily seeking or looking for information (Agarwal, 2015). Some incidents in recommendation interaction behavior can be associated with serendipitous information finding or active recommendation-seeking. For instance, many people ask for a recommendation in person and/or online for various reasons. In this case, people are involved in a kind of active searching with a hope of finding information which can possibly cater to their information needs. Also, sometimes people around us just give recommendations, and we accidentally realize those received information useful or beneficial for our problems. In recommendation behavior, serendipity exists as well. The meanings of recommendations in this study are further discussed in the following before the core constructs in the theoretical model of this study are explored.

3.1.2 Definitions and Characteristics of Recommendation

A recommendation is a sub-concept of information. What essentially differentiate recommendation behavior from other information behaviors are the characteristics of information with which people interact. A recommendation is an entity with which users interact, and one of the units of analysis in this study, which can be defined as a second-hand knowledge, testimony, or information filtered by others (Figure 6). A recommendation refers to a form of advice with respect to the course of information seeking, an action or a decision making. People receive recommendations either through directly asking, or are offered without having elicited them from another person/entity at the moment. The course of recommendation acquisition is narrower in scope than that of information seeking. A recommendation can be a piece of suggested information that you receive or encounter from algorithmic systems (i.e., machine-generated recommendations), or from people around you (i.e., human-based recommendation) via either direct in-person or technology-mediated communication, such as texting, emails, social media, or websites. Recommendation is characterized as follows:

- A subset of information
- A form of advice with respect to the course of an action or a decision making
- Second-hand knowledge that is filtered or interpreted by others or systems
- A kind of testimonial information
- Suggestion or proposal as to the best course of action, especially one put forward by an authoritative body (source: Google dictionary)

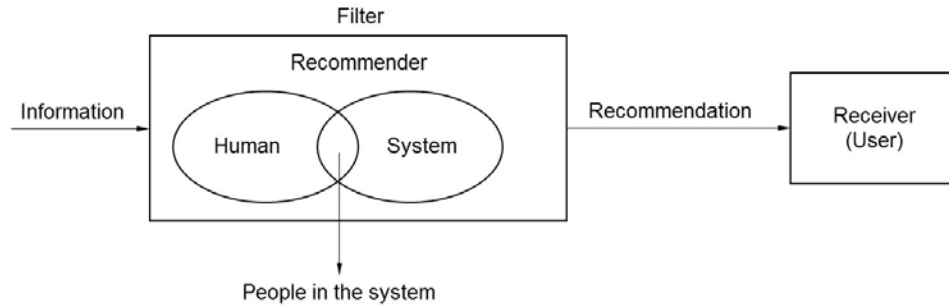


Figure 6 Relationship between information and recommendation

People often need recommendations in order to help their information seeking, problem solving, or decision making because they do not have enough knowledge about a certain topic (i.e., knowledge gap) and/or would be faced with too much information by searching in order to get a proper answer to solve their difficulties. People can acquire diverse recommendations from various sources as per their requests, by active search, by passive delivery, or sometimes without asking for one. Recommendations can be a piece of pushed or automatically delivered information by people or systems. For instance, we receive recommended news articles from friends, family, or acquaintances by email, phone, or texting, or from news feeds, etc. People also obtain recommended products or services by peer users in various websites during their shopping or visits. Also, bloggers often recommend certain products after using them, and their advice might be related to our situation. We often actively request recommendations such as asking a restaurant server about popular dishes. As another venue for recommendation acquisition, social Q&A sites are often used. People can ask for recommendations as well as search through postings in the past. Generally, pushed information by recommender systems has been considered as recommendations.

Herein, pulled information from user-generated contents (i.e., user reviews) and user ratings is considered as recommendations in addition to actively-asked for suggestions. Furthermore, encountered recommendations from online and offline social networks will be considered.

3.2 Conceptual Model of Recommendation Seeking

In order to build a recommendation seeking behavior model, this study explores various aspects of recommendation experiences in recommendation receivers' everyday life with the focus of their social relations and trustworthiness evaluation. Social relations identified by homophily, and social ties in user's social milieu will be useful to identify people with similar interests and preferences for recommendations. We assume that recommendation recipients' perceived social relations are associated with the trustworthiness evaluation of recommendations. In the following section, a theoretical model explains how recommendation recipients' social relations are associated with trustworthiness of recommendations and recommenders. The study will focus on the role of social relations and cognitive factors in the evaluation of trustworthiness in the decision process of accepting or rejecting a recommendation; that is, how people perceive, interpret, and evaluate their problems and social relations and then how they assess the trustworthiness of recommendations and recommenders with respect to those social relations and cognitive factors such as propensity to trust, task perception, homophily, tie strength, and cognitive authority.

A decision making process of a recommendation acceptance is comprised of: (a) people's perception of task (or problem at hand) in their recommendation needs, that is,

task evaluation in terms of risk and uncertainty, the duration of the issue they have had, topic familiarity; (b) perceived trustworthiness of recommendation and recommender; and (c) an acceptance or rejection decision of recommendation(s) they received. Herein, social relation-based factors (i.e., hereafter, social factors) consist of homophily and social tie, which refer to the relationship between a recommendation provider and recipient such as friend, family, acquaintances, or anonymous person, etc. At the social level, trust can be inferred from a relationship between the trustor (i.e., recommendation recipient) and the trustee (i.e., recommendation giver); that is, the relationship between a recommendation recipient and a provider such as friends, family, peers, and acquaintances (e.g., group members), or anonymous person. It can be represented by perceived social tie (e.g., tie strength, closeness, and contact frequency), perceived homophily, etc. Cognitive factors are viewed as cognitive states of a recommendation seeker such as the perception of task (i.e., degree of risk or uncertainty), pre-knowledge (i.e., task familiarity) and psychological states (i.e., uncertainty) during recipients' seeking and evaluation processes.

Intrinsically, a recommendation is a product of an interactive social process. At least, two people (e.g., provider-receiver) are involved and they communicate to understand the recipient's situation in order to give a personalized information. This social phenomenon results in the perception of trust between people. Thus, a model of a recommendation seeking behavior must include how social relations among people work on the degrees of the trustworthiness of recommendations.

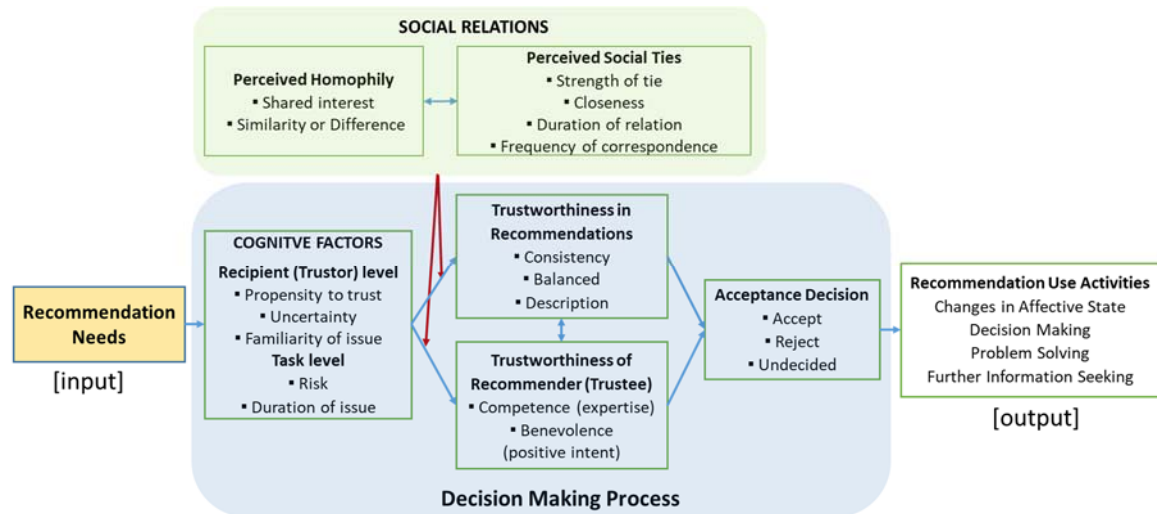


Figure 7 Initial conceptual model of recommendation seeking behavior. In this study, recommendation needs, social relations, cognitive factors, and trustworthiness will be addressed.

Figure 7 suggests a conceptual model for several basic elements that constitute the understanding of judgment processes and their relationship in terms of trustworthiness of recommendations and their sources. It describes how the social factors are associated with the user's cognitive factors in assessing the trustworthiness of recommendation and recommenders. Also, it shows how a seeker's cognitive factors are influencing the judgment of trustworthiness in recommendations and their sources; and then, subsequently how this acceptance or rejection of recommendations affects recommendation receiver's decision making or information seeking process. In particular, this model synthesizes theoretical issues related to the following research areas: (1) relationship between cognitive factors and social relations, and their influence on the trustworthiness evaluation of recommenders and recommendations; and (2) the role of cognitive factors during the assessment of trustworthiness in recommendations and recommenders.

3.2.1 Recommendation Needs

Notion. Information need in many existing studies is characterized as an invisible and intangible entity (Poole, 1985; Wilson, 1981). It often refers to a cause of information seeking (Case 2012; Ikoja-Odongo & Mostert, 2006; Savolainen, 2017) or an “inner motivational state” (Grunig, 1989, p. 209), such as wanting, believing, doubting, fearing, or expecting (Liebenau & Backhouse, 1990; Searle, 1983), which leads to information seeking and evaluation actions. Information need is also viewed as a driver of engaging in the motivational cognitive and/or affective processes of (a) seeking answers through the articulation process of unconscious and conscious needs (Taylor, 1968), (b) reducing uncertainty to alleviate negative emotions such as anxiety (Beheshti *et al.*, 2015; Cole, 2012; Hyldegard, 2009; Kuhlthau, 1999), and (c) making sense to bridge knowledge gap (Dervin, 1998). In line with these notions, in this dissertation study, recommendation need is considered as a motivator, which makes people engage in recommendation seeking actions during a goal-directed process such as decision making or problem solving.

Rationale. In information seeking studies, information need is considered to be affectively and/or cognitively influential on information seeking processes. For instance, an empirically controlled study (Lu & Yuan, 2011) viewed information need as a contingency factor to examine an information seeker’s simultaneous consideration of information quality and source accessibility. Their results showed that (a) low- and high-information-need individuals preferred information source quality over accessibility, while medium-information-need individuals preferred accessibility over quality; and (b) individuals are more likely to choose relational over non-relational sources as

information need increases. Some conceptual studies (Chopra & Wallace, 2003; Kelton *et al.*, 2007) argued that individual's perceptions of information needs, which form the prerequisites (uncertainty, vulnerability, and dependence) of trust, are crucial in their information trust behavior, and can affect how the individual ensures the quality of information and senses the potential harm that may result from the use of faulty information. An individual seeking information demonstrates the belief that the information possesses the potential to satisfy the information needs, for instance, evidentiary support for a decision-making process, facts to supplement personal knowledge, and reference material for one's own writings. (Kelton *et al.*, 2007). These study results indicate that information needs shape the information seeker's behaviors and seeking processes. Similarly, in this study, recommendation need (i.e., the motivation of recommendation seeking) is considered to be influential on the recommendation seeker's selections of recommenders and/or the evaluations of recommendations. Depending on recommendation needs, the recommendation seekers might bring their own preferences or interests to recommendation seeking, evaluation, and consumption.

3.2.2 Cognitive Factors in Recommendation Seeking Behavior

Cognitive phenomena are associated with attention, memory, and activities such as producing and understanding language, learning, reasoning, analyzing, concluding, planning, evaluating, problem solving and decision-making (Sternberg, 2009). Cognitive factors in human information behavior refer to thought processes and mental states involved in information seeking activities such as the acquisition, organization,

evaluation, and use of information (Bandura, 1986). In the context of recommendation seeking behavior, it is possible that such cognitive factors can affect identifying and selecting potential recommenders, and evaluating recommendations. This study considers propensity to trust, pre-knowledge, uncertainty, and risk as cognitive factors.

Propensity to Trust. This personal disposition refers to an individual's general willingness to trust others (Gill, Boies, Finegan, & McNally, 2005). The propensity to trust corresponds to the skepticism with which a person tends to approach new information (Chopra & Wallace, 2003). Individuals determine the trustworthiness of others based on their beliefs in the trustee's ability (i.e., knowledge, skill, and competencies), benevolence (i.e., the extent to which a trustor believes that a trustee will act in the best interest of the trustor), and integrity (i.e., the extent to which the trustor perceives the trustee as acting in accord with a set of principles that the trustor finds acceptable (Mayer *et al.*, 1995). This construct represents a stable individual difference (Gill *et al.*, 2005). To consider the characteristics of the recommendation seekers helps understand more clearly the relationship between two specific individuals and the reasons why an individual might choose to trust another. This disposition may be more accurately conceptualized as an antecedent in recommendation seeking behavior. Also, one's propensity to trust, or dispositional trust, serves as a starting point, upon which more case-specific trustworthiness evaluation (Merritt & Ilgen, 2008). Some researchers in e-commerce studies showed that a propensity to trust has an influence on trust in low-risk situation, whereas propensity to distrust influences trust in high-risk situations (McKnight, Kacmar, & Choudhury, 2004).

Uncertainty. The concept of uncertainty is understood and applied in various ways in different fields. Within the context of information science it may relate to a number of different aspects of a user's engagement with an information system. For instance, in the model of Shannon and Weaver (1949) uncertainty is inversely related to the amount of information received in a communication system. According to uncertainty reduction theory, this construct can be defined as lack of predictability regarding a situation, individual, or behavior, and positively associated with information seeking (Berger & Calabrese, 1974) because uncertainty arises from a lack of information (Giddens, 1990; Kuhlthau, 1993; Luhmann, 1979). The idea of uncertainty underlies many aspects of information seeking and searching, lack of understanding, a gap in meaning, or a limited construct initiates the process of information seeing (Belkin, 1980; Dervin, 1998; Kuhlthau, 1993). As a basic principle for information seeking, uncertainty refers to "...a cognitive state which commonly causes affective symptoms of anxiety and lack of confidence" (Kuhlthau, 1993, p. 347). While studies in LIS consider this factor as an information seeker's motivator leading to information seeking process (Belkin, 1978; Kuhlthau, 1993), trust researchers suggest it as one of prerequisites for the trusting behavior (Chopra & Wallace, 2003; Kelton et al, 2007) since trust occurs when a person encounters difficulties or perceives an ambiguous situation for a solution.

Risk. In a similar vein as the construct of uncertainty, personal risk assessments play a role as a precondition in developing trust and trustworthiness of information. This concept can be viewed as vulnerability to a potential loss if the outcomes are undesirable (Chopra & Wallace, 2003; Kelton *et al.*, 2007). Trust-related behavior connotes that one gives another person a fiduciary obligation by acting such that the other could betray

them (Barber, 1983). Thus, trust-related behavior implies acceptance of risk, just as Mayer *et al.* (1995) argued. Trust disappears if there is a perception of no choice or the risks outweigh the benefits (Hupcey, Penrod, Morse, & Mitcham, 2001). Acceptance of risk (Sheppard & Sherman, 1998) and utility of risk (Corazzini, 1977) are inherent since the recommendation seeker can be vulnerable to suffer a loss when his/her trust is betrayed (Chopra & Wallace, 2003; Doney & Cannon, 1997; Kelton *et al.*, 2008, p. 365) by a malicious recommendation or a recommendation with the recommender's bad intention. Different types and levels of risks (e.g., risk of health deterioration in health recommendation seeking, risk of money loss in stock investment recommendations, or risk of watching a bad movie recommended by RSs) can appear according to different types of recommendations; thus, risks affect motivation, and the whole trustworthiness assessment process (Bart, Shankar, Sultan & Urban, 2005; Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010; Metzger, 2007). Perceived risk plays a critical role in associated decision-making (Chen, 2010). This study considers perceived risk as the degree to which one, at the initiation stage of recommendation seeking, perceives consequences associated with his/her actions according to the acceptance of recommendation received.

Topic Familiarity. This concept is one of the dimensions of prior knowledge, which is interpreted as uni- or multi-dimensional cognitive measures such as familiarity (Alba & Hutchinson, 1987; Johnson & Russo, 1984; Khosrowjerdi & Iranshahi, 2011); expertise (Alba & Hutchinson, 1987; Mitchell & Dacin, 1996), product experience (Wright & Lynch, 1995), or past experience (Marks & Olson, 1981; Khosrowjerdi & Iranshahi, 2011) of information seekers. This notion can be described as awareness or

perception of the product or service and does not always come from actual experience (Srull, 1983). For instance, individuals who have little prior knowledge do more extensive information searching than those with higher levels of prior knowledge, since they do not have standards for evaluating information (Alba & Hutchinson, 1987). Furthermore, in the evaluation of information, what the seeker already knows about the topic or related topics can be influential in that he/she may be more likely to choose a recommendation which is consistent with his/her pre-knowledge. However, if prior knowledge is full of misconceptions, or conflicts with new information, the acceptance of the recommendation can be negative. This study deems familiarity of problem at hand as prior knowledge which can hinder or facilitate recommendation seeking and evaluation processes.

3.2.3 Social Factors in Recommendation Seeking Behavior

Social relations are defined as social connections or networks between two or more individuals. In the context of recommendation behavior, social relation variables are particularly important to better understand the underlying process of recommendation evaluation and use as these concepts provide insights into the properties of social milieu from which recommendation behavior arises. Drawing on Lin's (2000) discussion of social capital theory, a social network is one of the important dimensions of social capital which is defined as "a set of individuals ("nodes") and the relationships between them ("ties")" (Stephen & Lehmann, 2008, p. 85).

Social Ties. The resources of social capital such as information can be shared or exchanged through social ties, which vary in terms of their strength (Stephen &

Lehmann, 2008). Granovetter (1973) first introduced the concept of tie strength as a characteristic of relationships ranging from weak ties to strong ties at the other.

According to Granovetter (1973), tie strength is defined as “the potency of the bond between members of a network.” Strong ties such as family and friends form stronger and closer relationships that are within an individual’s personal network and are able to provide material and emotional support (Goldenberg *et al.*, 2001; Pigg & Crank, 2004).

Weak ties, on the other hand, are often among weaker and less personal social relationships that are composed of a wide set of acquaintances and colleagues with different cultural and social backgrounds (Goldenberg *et al.*, 2001; Pigg & Crank, 2004). Recently, a few studies have found that two types of social capital, bridging and bonding social capital, are both sustained on or via SNSs (Choi, Kim, Sung, & Sohn, 2008; Donath, 2007). While bridging social capital focuses on the values created by heterogeneous groups and is related to “weak ties,” bonding social capital is formed through socially homogeneous groups and is closely associated with “strong ties” (e.g., Granovetter, 1982; Haythornthwaite, 2000, 2005). Online spaces allow recommendation users to connect with both closer personal contacts such as family members and close friends (strong ties) and less personal contacts that include acquaintances and colleagues (weak ties). In addition, current networked web environment also allows recommendation users to interact with strangers or anonymous people (i.e., people with no ties). These two types of personal contacts and other types of interpersonal interaction may lead to recommendation behavior in user’s actual social milieu.

Both strong and weak ties may impact the recipient’s decision making (Levin & Cross, 2004). Three constituent dimensions are frequency, duration, and closeness

(Marsden & Campbell, 1984). Based on the work of Granovetter (1973) and two items used by Hansen (1999) in his study for inter-unit tie weakness (i.e., one for interaction frequency and another for closeness), Levin and Cross (2004) developed their measure for tie strength in the study of knowledge workers in a pharmaceutical company. Since the three measures used different scales, Levin and Cross (2004) normalized each of them before creating the overall variable for tie strength. In order to measure tie strength, Levin, Walter, and Murnighan (2011) suggested that emotion-based (or closeness) measures were, at the very least, as important as the commonly used interaction and communication frequency measures. Taking this into account, an item relating to the closeness should be introduced to increase reliability.

Homophily. Another determinant important in the influence of users' social interaction in recommendation evaluation and use is homophily. It refers to the degree to which individuals who interact are congruent or similar on certain attributes, such as demographic variables (Rogers & Bhowmik, 1970), and perceptual similarity of beliefs, values, experience, and lifestyle (Gilly *et al.*, 1998). The principle of homophily structures network ties of every type, including marriage, friendship, work, advice, support, information transfer, exchange, co-membership, and other types of relationships (McPherson, Smith-Lovin, & Cook, 2000). People's personal networks are homogenous with regard to many sociodemographic, behavioral, and interpersonal characteristics (McPherson *et al.*, 2000). Homophily limits people's social worlds in a way that has powerful implications for the information they receive, the attitudes they form, and the interactions they experience (McPherson *et al.*, 2000). Homophily in race and ethnicity creates the strongest divides in our personal environments, with age, religion, education,

occupation, and gender following in roughly that order (McPherson *et al.*, 2000).

Geographic propinquity, families, organizations, and isomorphic positions in social systems all create contexts in which homophilous relations form. Ties between non-similar individuals also dissolve at a higher rate, which sets the stage for the formation of niches (localized positions) within social space (McPherson *et al.*, 2000).

With frequent and stable interactions, similar individuals have greater access to each other due to propinquity and convenience (Gilly *et al.*, 1998). Because individuals tend to socialize with those who share similar characteristics, often termed social homophily (Mouw, 2006), interpersonal communications are more likely to occur between two individuals who are alike, that is, homophilous (Lazarsfeld & Merton, 1954). As a result, the exchange of information most frequently occurs between a communicator and a receiver who are similar with respect to certain attributes (Rogers & Bhowmik, 1970). In the communication process, both sources and receivers behave based on their perceived characteristics of each other and the message being delivered (Rogers & Bhowmik, 1970). A receiver's perception of the communication situation, including the degree of similarity, influences the persuasive effect of a message on a receiver's attitude and behavior (Rogers & Bhowmik, 1970). As a homophilous source is more likely to be perceived as credible, trustworthy, and reliable, the effectiveness of communication from a homophilous source may be greater (Rogers & Bhowmik, 1970). In the case of online recommendation interactions, recommendation receivers may have more opportunity to interact with others both who are demographically similar and with those quite different, which could influence the nature and extent of recommendation communications.

3.2.4 Trustworthiness of Recommendations and Recommenders

Trust in recommendation seeking. Trust in users' social interaction (both online and offline) is a kind of cognitive factors which is generated from or affected by social relationship variables that is conceptualized as an important factor influencing recommendation receivers' willingness to engage in recommendations, in particular, social interaction with anonymous people or strangers (i.e., interpersonal integration without social ties). Trust has long been recognized as an important construct in communication and social relationships and has been defined and conceptualized in many different ways in existing literature (Couch & Jones, 1997; Gabarro, 1978). In general, trust can be viewed as an enduring attitude or trait (Deutsch, 1958; Rotter 1967), a behavioral intention or behavior which involves vulnerability and uncertainty of the trustor (Chow & Chan, 2008; Coleman, 1990; Deutsch, 1958; Giffin, 1967; Schlenker, Helm, & Tedeschi, 1973), or a transitory situational variable (Driscoll, 1978; Kee & Knox, 1970). Moorman, Deshpande, and Zaltman (1993), for example, define trust as "a willingness to rely on an exchange partner in whom one has confidence (p. 82)." This confidence comes from the partner's expertise, reliability, and trustworthiness (Moorman *et al.*, 1993). In other words, trust focuses on confidence in the behavior of the partner or an ability to predict his or her behavior (Carroll, Barnes, Scornavacca, & Fletcher, 2007; Gundlach & Murphy, 1993). From this perspective, trust or interpersonal trust is viewed as an enduring and generalized attitude, belief, or expectancy possessed by an individual or a group in interpersonal relations that the statement or promise of another individual or group can be relied upon (Blau, 1964; Carroll *et al.*, 2007; Giffin, 1967; Rotter 1967;

Schurr & Ozanne, 1985). Likewise, compared to anonymously reading comments via other online recommendation or eWOM formats (e.g., product review sites and forums), connections through SNSs are embedded in recommendation seekers' own networks. Thus, SNSs may be perceived as more credible and trustworthy than anonymous sources or marketers (Chu, 2009). Perceived trust in recommendation receivers' interpersonal interactions within their social networks is predicted to influence their willingness to engage in recommendations.

Trustworthiness of Recommendations. In order to evaluate the trustworthiness of recommendations, consistency and believability (Kelton *et al.*, 2008) can be developed from the interaction with recommenders or sources and consequently result in users' post-conditions. Then, the users' post cognitive states will subsequently affect information seeking behavior or decision making. Trust in information may develop through a process of prediction if one has prior experience with an information source (Kelton *et al.*, 2008). The prediction through experiences (e.g., firsthand knowledge, pre-knowledge) is the simplest strategy for information evaluation, that is, obtaining information from known and trusted sources (Wachbroit, 2000). The perceived trustworthiness of recommendations can be evaluated in terms of its consistency and believability which capture the aspects of the trustworthiness in the context of recommendation evaluation.

Consistency is associated with "experienced credibility" which is based on firsthand experience as people interact over time, and their expertise and trustworthiness has been assessed (e.g., a site that has consistently provided accurate information over the past year); associated with interaction with the world (Fogg, 2003, Fogg & Tseng, 1999,

Tseng & Fogg, 1999). Consistency of recommendation can be divided into two dimensions: internal consistency and external consistency. Internal consistency of recommendation is identified by how the recommendation is in line with the recommendation receivers' pre-knowledge and belief. The process of identification reflects the degree to which the information contained within a source conforms to the user's own identity, goals, and values. Thus, trust is enhanced if the user resonates with the style, arguments, or objectives presented in information. On the other hand, external consistency refers to how recommendation is similar with many other people's ideas. In the context of trust in recommendation, the process of attribution is implemented by confirmation by comparing information across multiple sources (Rieh & Belkin, 1998; Wachbroit, 2000; Wilkinson, Bennett, & Oliver, 1997). The common sense rationale behind this strategy is that information confirmed by multiple sources is likely to be of higher trustworthiness. In theoretical terms, repeated experience with information (i.e., facts confirmed by multiple sites) is generalized to ascribe positive attributes to that information (i.e., criteria of information quality).

Believability is one of various criteria identified in information quality research, and is applicable to the evaluation of recommendation trustworthiness. Several criteria of information quality refer to the competence of information, including accuracy, currency, coverage, and believability (Alexander & Tate, 1999; Marchand, 1990; Olaisen, 1990; Rieh & Belkin, 1998; Strong, Lee, & Wang, 1997; Wilkinson *et al.*, 1997). Accuracy refers to the extent to which information is free from error. Currency is the degree to which the information is up-to-date rather than obsolete. Coverage refers to the

completeness of the information, and believability reflects the extent to which the information appears to be plausible.

Trustworthiness of Recommenders (or Sources). Trustworthiness of recommenders indicates that the user's perception of source credibility; that is, how trustworthy the recommendation recipient judges the recommender. Researchers agree that trustworthiness perception results from evaluating multiple dimensions simultaneously (Fogg, Marshall, Laraki, Osipovich, Varma, Fang, & Treinen, 2001). Mayer *et al.* (1995) attempt to measure trust factors with respect to the characteristics of the trustor (i.e., the trusting party; propensity to trust) and the perceived characteristics of the trustee (i.e., the party to be trusted; ability, benevolence, and integrity). Although the number of dimensions that contribute to trustworthiness evaluations is still an open problem, the three key components of credibility are commonly identified as: (1) competence (ability, expertise), (2) benevolence (good will/intention), and (3) integrity (truthfulness). Using Mayer *et al.*'s (1995) distinction, an assessment of source's factors of perceived trustworthiness (i.e., the three components of credibility) will allow this study to explore the relationship of collective or overall trustworthiness (i.e., the sum of the three perceived trustworthiness factors) and each of the individual trustworthiness factors against other variables.

Benevolence-based trustworthiness refers to positive or good intention of recommenders. Based on several studies (Mayer & Davis, 1999; Levin, Whitener, & Cross, 2006; Johnson, Cullen, Sakano, & Takenouchi, 1996) perceived benevolence-based trustworthiness in a recommender can be defined in various ways. Mayer and Davis (1999) explain benevolence as the extent to which employees believe that their

manager cared about their interests and acted in an altruistic manner toward them. They define benevolence as follows: (1) how concerned about one's welfare; (2) how important one's needs and desires are to a source; (3) no harm and not knowingly doing anything to a user; (4) how hard a person really looks out for what is important to one; and (5) how actively a source will go out of his or her way to help one. Also, other researchers have used similar constructs for trust. For example, in the study of relationship length and trust, Levin *et al.*, (2006) measured perceived trustworthiness as a "perception of trustworthiness in terms of benevolence" (p. 1166). To measure the perceived trustworthiness between a recommendation giver and receiver, we can investigate (6) that a recommender would always look out for my interests; (7) a recommender would go out of his or her way to make sure a recommendation receiver is not damaged or harmed in this relationship; and (8) how much the receiver feels about a recommender's care regarding his/her needs. In addition, Johnson, Cullen, Sakano, and Takenouchi (1996) also recognized benevolence-based trust in their research on trust between international strategic alliances of firms, by dividing trust into twofold, credibility and benevolence. Adapted from a study (Ganesan, 1994), benevolence can be measured by whether one feel like the source is on one's side (Johnson *et al.*, 1996).

The notion of credibility also refers explicitly to the competence or expertise of the information sources (Olaisen, 1990; Tseng & Fogg, 1999). Competence of recommendation source refers to the recommender's expertise or ability (e.g., perceived knowledge, skill, and experience) regarding the areas of recommendation receiver's needs.

On the other hand, cognitive authority is conceptualized from social epistemology and defined as “influence on one’s thoughts that one would consciously recognize as proper” (Wilson, 1983, p. 15). It is “legitimate influence” and clearly related to credibility (Wilson, 1983). The potential pool of cognitive authorities on which we might draw consists of people we think credible (p. 16); that is, cognitive authorities are clearly among those we think of as credible sources.

3.3 Research Objectives

Studies of information behavior (IB) have focused on what are information seeker’s needs, how users seek or search information, how they evaluate and use that sought information, and what are the barriers or influential factors in conducting such processes. One of the dominant assumptions in IB research is that information users are actively involved in seeking and searching. IB studies pay little attention to how people interact with recommendations or pushed information. While some researchers view information users as active searchers for their information needs (Wilson, 1997), current users expose to much amount of pushed or encountered information which is delivered by computer-mediated communication with family and friends, recommender systems, information filtering systems, or pre-set alert systems (e.g., Google Alerts). The current technology mediates users for easy access to recommendations via SNSs or participatory websites, and affords for a user to engage in easier passive search; thus, they have more opportunities to have recommended information. The understudied area is how users react and behave during the information seeking or decision making processes when recommendations (i.e., pushed, filtered, or automatically-delivered information) are

given. Little is known about the drivers of recommendation needs or influential factors of users' recommendation evaluation and use in both face-to-face and computer-mediated environments. Despite the growing popularity of recommender systems on e-commerce websites and users' recommendation interactions in various websites, most existing research has been heavily conducted from system-oriented viewpoints in developing recommender systems. Also, referral behaviors are largely studied in marketing and consumer research, as WOM and eWOM focusing on how consumers transmit product-related information.

This aforementioned surroundings presents two research gaps. Firstly, the critical gap exists in that there is limited work on recommendation behavior in the context of IB research, especially regarding social relationships and trustworthiness in recommendations behavior in everyday life (Chu & Kim, 2011; Wang & Rodgers, 2010). The second gap lies in the questions of which recommendations are more likely to be accepted by users, and what social relationships play a role in the evaluation of trustworthiness as well as in the course of users' actions from the perspective of recommendation receivers instead of viewing them as marketing tools or a vehicle for advertising products. Little literature deals with what expectations users have from recommendations by networked peers and users rather than just information; how they evaluate trustworthiness of recommenders and recommendations; and how they decided to accept. These identified gaps represent fruitful opportunities for research. The literature on recommendation behavior is surprisingly limited in the field of information science. We need to be constructed a general model or theory through the lens of information science or IB research.

Under these circumstances, this study aims to construct a model or framework explaining human recommendation behavior with respect to social relationships and trustworthiness of recommendations to help researchers developing recommender systems. To achieve this goal, the objective of this proposed study is mainly twofold. One is to identify the function of social factors in people's cognitive processes of evaluating the trustworthiness of recommendations. This study attempts to identify how they evaluate and use recommendations through recommendation receivers' social relationships by investigating how they seek, ask, or encounter recommendations. The second objective is to relate those social aspects to how recommendation users perceive and evaluate the trustworthiness of recommenders and recommendations. To identify this correlation, we will explore the dimensions of recommendation trustworthiness when users evaluate and select recommendations to solve their issues. Data sets are collected by an introductory interview with a demographic survey, a diary study and post-diary interview in order to observe how people actually interact with recommendations in everyday life within both web and face-to-face environments from the perspectives of recommendation recipients.

3.4 Research Questions

The purpose of this study is to explore how social factors are associated with their judgment of trustworthiness in recommendations and sources (i.e., recommenders or human resources) in the recommendation seeker's cognitive factors in task evaluation during his/her decision making, problem solving, or information seeking courses. Friends and family are not necessarily the best sources for a recommendation. Early

studies show that users often do not trust that their personal friends were the best experts (McDonald, 2003). Understanding of how social relations affect the evaluation of trustworthiness leads us to answer if a recommendation from a family member, friend or acquaintance is actually more powerful than a recommendation from a third party or complete strangers. Can social relations improve the exploratory power of a model predicting the acceptance rate of recommendation, compared to profile data and liking score alone? The overarching research question is: what influences the trustworthiness of recommenders and recommendations during the information seeking, problem solving, or decision making processes (resolving difficulties)? Results will include a model that shows which factors are influential while recommendation seekers engage in a situation of seeking recommendations in order to accomplish their tasks or resolve their difficulties. The conceptual model (Figure 7) depicts how significant factors are interrelated in the process of evaluating the trustworthiness of recommenders and recommendations. RQ1 will identify how a problem at hand and a user's state (i.e., cognitive factors) initiate recommendation needs. RQ2 explores the cognitive and other influential factors which influence on the trustworthiness assessment of recommendations and recommenders. RQ3 seeks an answer for the role of social factors in this process. To elaborate the understanding of recommendation seeking behavior as described in Figure 7, the specific research questions (RQs) are as follows:

RQ1. [*Recommendation Need*] Why do recommendation recipients engage in recommendation seeking behavior?

RQ2. *[Cognitive factors in the trustworthiness evaluation]* Do the recipients' cognitive factors affect their assessing the trustworthiness of recommendation and recommenders?

RQ3. *[Social factors in the trustworthiness evaluation]* Do their social factors influence on evaluating trustworthiness of recommendation and recommenders?

RQ4. *[Interaction Effects]* Are there interaction effects between social factors and cognitive factors in the evaluation of trustworthiness? If yes, what are they?

The next section will present several potential research methods used in previous works in order to identify appropriate methods and possibilities for answering the above RQs. Based on the review of various methods, a research method is identified and conducted for the data collection.

CHAPTER 4 DATA COLLECTION

Fundamental to any research project are questions of what to measure and how. Researchers should first think about what they intend to measure, what kind of data needs to be collected, and how the data will be used to meet the research goals. As with any research project, the researcher should start by writing down the research questions that she/he hopes to answer. Next, the researcher must determine what data are needed in order to answer those questions (Olson & Kellogg, 2014). The following review will present the various approaches that could be useful and insightful for this study. This section will also compare the advantages and disadvantages of various approaches. In doing so, proper methods for data collection and analysis for this dissertation study are identified, and planned what types of data are collected via certain methods. Finally, the research methods of this research including the recruitment of participants are introduced.

4.1 Methods in Previous Work

To identify proper methods for collecting and analyzing data, and to investigate what types of data can be collected via certain methods, the various methods researchers used to attain similar types of data were investigated by reviewing some key previous works in credibility or trustworthiness related research, with a special focus on their methods.

4.1.1 Semi-structured Interview

In a structured interview, a series of pre-established questions is asked with a limited set of response categories while unstructured interview consists of open-ended

ethnographic interview questions (Fontana & Frey, 1994). Semi-structured interviewing stands between these two types of interview in which the interviewer directs the interaction and inquiry in a “somewhat” structured way.

Several studies about the evaluation of credibility used semi-structured interviews in collecting data, so that researchers asked participants predetermined yet open ended questions (Krathwohl, 1997). For example, Jeon and Rieh (2014) conducted a quasi-field study in order to obtain data drawn from participants’ experiences in the context of their daily lives. Data were collected through a background questionnaire, interviews, and a post-interview questionnaire from twenty one undergraduates who used Yahoo! Answers. In particular, semi-structured in-person interviews served as the primary source of data collection, gathering data about participants’ overall experience using Yahoo! Answers for this study and their question asking and answer evaluation process in each episode. St. Jean, Rieh, Yang, and Kim (2011) collected data via phone interviews. Participants were first asked to talk about their online content contribution activities in general, and then shared their experiences regarding the processes they use to assess and establish credibility when they contribute content online. McKenzie (2003a, 2003b) interviewed nineteen pregnant women, followed by seventeen semi-structured follow-up interviews in order to understand the basis upon which an individual decides whether or not a particular information source is authoritative. She examined “discursive action” by analyzing information seekers’ descriptions of the authority of information sources in the context of pregnancy (p. 261). Wiltmire (2004) interviewed 15 first-year undergraduates, and examined the relationship between students’ epistemological beliefs and reflective judgments on the one hand and how they searched for information in digital

environments on the other. Based on their Measures of Epistemological Reflection (MERs) scores, the fifteen undergraduates were divided into two groups: absolute believers and transitional believers.

The semi-structured interview is often conjoined with other methods. For instance, Rieh (2000) designed the post-search interview to elicit verbal reports by asking specific questions of subjects about their decisions and judgments during the searches. In addition, exit interviews are common after diary, lab-based search task, or other methods and are performed with each study subject to collect data about their understanding, perceptions, and credibility assessments in general.

4.1.2 Survey

Survey is a method of gathering information by asking questions to a subset of people, the results of which can be generalized to the wider target population (Muller, Sedley, & Ferrall-Nunge, 2014). Surveys include the use of a questionnaire—an instrument specifically designed to elicit information that will be useful for analysis (Babbie, 2007). This method is inexpensive and easy to deploy and can obtain data from larger population; thus, it is useful in collecting data that can be generalized. Also, it is useful in collecting background information about participants and how known factors are used. It can be used to initially identify high-level insights that can be followed by in-depth research through more qualitative (meaning smaller sample) methods. Drawbacks of this method are as follows. It does not allow for observation of the respondents' context or follow-up questions. Participants need to recall their experiences when responding to questions. It is difficult to gather in-depth information and cannot collect

unexpected or unpredicted data, data that provide detailed interpretation, and data about idiosyncratic behaviors. When conducting research into precise behaviors, underlying motivations, and the usability of systems, then other research methods may be more appropriate or needed as a complement.

Some studies used quantitative research methods that involve surveying a large number of participants by using questionnaires. For example, Flanagin and Metzger (2000) surveyed 1,041 undergraduate students recruited from communication classes and non-college-age respondents by a "snowball" technique. The respondents were asked about whether they verified Internet information and how they perceive media credibility. In another study, Flanagin and Metzger (2003) employed web-based survey with experimental screens with stimuli presentation. One randomly selected screenshot of a webpage constructed for the study from the fictitious site boxofficepicks.com was presented to each participant, followed by questions about the web page they viewed. Fogg, Soohoo, Danielson, Marable, Stanford, & Tauber (2003) studied responses from 2,684 people evaluated the credibility of two live Web sites on a similar topic (such as health sites) via survey method. McKnight and Kacmar (2006) collected data from the surveys of 571 students using questionnaires with seven point Likert scale. Data collection took place in three phases, in order to provide a test that examines how the factors work over time. While Phase 1 measured the dispositional and control variables, Phase 2 (introductory stage) measured the first impression variables. Phase 3 surveyed the two dependent variables (exploratory stage, after the site was seen). Johnson and Kaye (2015) conducted online survey posted on the Human Intelligence Task page in Amazon's Mechanical Turk (MTurk), crowdsourcing site during the two-week period in

order to assess levels of reliance and motivations for using blogs, Facebook and Twitter for political information.

Traditionally, surveys have been administered via mail, telephone, or in person. The Internet has become a popular mode for surveys due to low cost of gathering data, ease and speed of survey administration, and its broadening reach across a variety of populations worldwide (Muller *et al.*, 2014). Surveys are good for large sample sizes to find out average behaviors. However, if we want to study precise behaviors and underlying motivations, other research methods may be more appropriate or needed as a compliment. Survey research may be especially beneficial when used in conjunction with other research methods. Surveys can follow previous qualitative studies to help quantify specific observations.

4.1.3 Behavioral Logs

Behavioral logs are traces of human behavior seen through the lenses of sensors that capture and record user activity, including behavior ranging from low-level keystrokes to rich audio and video recordings (Dumais, Jeffries, Russell, Tang, & Teevan, 2014). In recent years, the rise of centralized, web-based computing has made it possible to capture human interactions with web services on a scale previously unimaginable. Large-scale log data has enabled HCI researchers to (1) observe how information diffuses through social networks in near real-time during crisis situations (Starbird & Palen, 2010); (2) characterize how people revisit web pages over time (Adar, Teevan, & Dumais, 2008); and (3) compare how different interfaces for supporting email

organization influence initial uptake and sustained use (Dumais, Cutrell, Cadiz, Jancke, Sarin, & Robbins, 2003; Rodden & Leggett, 2010).

Log studies collect the most natural observations of people as they use systems in whatever ways they typically do, uninfluenced by experimenters or observers. To understand what HCI researchers can learn from behavioral logs, it is useful to compare them with other types of data (Table 2). The two dimensions represented in the table are: (1) whether the studies are observational or experimental, and (2) the naturalness, depth and scale of the resulting data (Dumais *et al.*, 2014). Because of the way log data is gathered, much less is known about the people being observed, their intentions or goals, or the contexts in which the observed behaviors occur. Observational log studies allow researchers to form an abstract picture of behavior with existing systems, whereas experimental log studies enable comparison of two or more systems.

Table 2
Different Types of User Data in HCI Research

Kinds of Studies	Observational	Experimental
Lab Studies Controlled interpretation of behavior with detailed instrumentation	In-lab behavior observations	In-lab controlled tasks, comparison of systems
Field Studies In the wild, ability to probe for detail	Ethnography, case studies, panels (e.g., Nielsen)	Clinical trials and field tests
Log Studies In the wild, little explicit feedback but lots of implicit signals	Logs from a single system	A/B testing of alternative systems or algorithms

Source: Olson & Kellogg, 2014

Rieh (2000) collected data by capturing search logs with ScreenCam and recoding verbal protocol while users engage in lab-based search tasks, and also background questionnaire and post-interview were given. *Search logs* were collected for two purposes: 1) to save logs for direct analyses in terms of Web pages that the subjects looked at and actions that they took in the Web; and 2) to utilize search logs during post-search interviews. The logs helped participants to remember the actions during the searches, as well as enabled the interviewer to pause and play the screen any time so that the participants could answer the questions in length while the interviewer was holding the screen. *Think-aloud* data were collected as the subjects verbalized their thoughts as they performed a task. This verbal protocol increases the amount of behavior that can be observed compared to the same subject working under silent conditions. Therefore, think-aloud data made it possible to relate subjects' cognitive processes and experiences to observable behaviors directly. The *post-search interview* was designed to elicit verbal reports by asking specific questions of subjects about their decisions and judgments. Although an established set of questions was used, there was variation in which the response may be probed.

For this dissertation study, observational log studies could be useful to observe how people's social relations affect recommendation seeking and uses in social media because experimental log studies are better to understand how people react to different user experiences and typically used to run an in situ experiment design to compare behavior across different system variants. Most analyses of log data collected through observational studies provide a descriptive overview of human behavior. Simply observing behavior at scale provides insights about how people interact with existing

systems and services, often revealing surprises. Even when the log data is very rich, we should not rely solely on logs to understand user behavior. Converging methods can help confirm and provide insight into what is learned from log data. Complements to log analysis include usability studies, eye tracking studies, field studies, diary studies, retrospective analysis, and surveys (Dumais *et al.*, 2014).

4.1.4 Experimental Research

Experimental research aims to show how the manipulation of one variable of interest has a direct causal influence on another variable of interest (Cook & Campbell, 1979). Basically, experiments involve 1) taking an action and 2) observing the consequences of that action. Experiments are more appropriate for some topics and research purposes than others. Experiments are especially appropriate for hypothesis testing, and well suited to research projects involving relatively limited and well-defined concepts and propositions (Babbie, 2007).

This method focuses on the identification of causal relationships of the form “X is responsible for Y” (Rosenthal & Rosnow, 2008). This can be contrasted with two other broad classes of methodologies: descriptive studies that aim to capture an accurate representation of what is happening and relational studies that intend to capture the relationship between two variables but not necessarily a causal direction (see Rosenthal & Rosnow, 2008, pp. 21–32).

Flanagin and Metzger (2003) conducted an online survey and collected data from a random sample of 1,207 participants who completed an experiment (18 experimental conditions) that manipulated the source, volume, and valence of online movie ratings in

order to test predictions derived from these perspectives. Panovich, Miller, and Karger (2012) conducted an experiment how friends, family, and acquaintances response to participants by posting questions on Facebook and analyzed responses to status message questions - questions that were asked through the status message feature of Facebook in order to evaluate the role of tie strength in question answers with respect to answer quality. This study collected information from 19 student participants to determine tie strength and answer quality. The researchers asked for feedback about responses participants received to questions they had asked. After conducting this data collection, they conducted survey portion (nine questions) of the study in the lab in order to conduct unstructured interviews with participants after the survey. Hu and Sundar (2010) conducted a 2 (message) \times 2 (original source) \times 5 (selecting source) between-subjects experiment conducted online to investigate the effects of online health information sources on users' perceived credibility of health information and behavioral intentions. A total of 555 undergraduate students were recruited and randomly assigned to one of the 20 experimental treatment conditions during a 12-day period. For this proposed study, experimental research could be useful to test the relationship between user's social relations and trust if different types of social relations are defined and tasks are formalized for comparisons.

4.1.5 Laboratory-Based Study

This method allows users to use a system with either controlled or uncontrolled tasks to understand how users interact with a technology and system. Tague-Sutcliffe (1992) explains that "laboratory test is one in which the sources of variability stemming

from users, databases, searchers, and search constraints are under the control of the experimenter” (p. 469). She also says that “[b]y contrast, an operational test is one in which one or more existing systems—with their own users, databases, searchers, and search constraints—are evaluated or compared” (p. 469). She notes that there is a range from laboratory tests, with all four components (users, databases, searchers, and search constraints), to tests in which only one is controlled. As Robertson (1981) illustrates, to answer a specific question, the research must be designed as a laboratory test to exclude any extraneous variations. On the other hand, in order to answer a question that is directly related to real problems in the design of retrieval systems, and to provide answers which will apply to real situations, a test must be conducted in an operational environment (Roberson, 1981). However, it is not always easy to characterize the research questions as either “specific” or “real situations.” Indeed, it is often the case that we are investigating a specific complex research problem which would apply to real situations. Park (1993) emphasizes that the “naturalistic inquiry approach” is appropriate in understanding how users make selection decisions in accepting or rejecting information produced by IR systems.

Wang and Soergel (1998) also used a think aloud method with 25 participants in developing a model of document selection. The participants were asked to think aloud while evaluating the information and making decisions to examine the cognitive processes underlying document selection (p. 119). The verbal protocol seems very useful in collecting data during the process, and especially when investigating the cognitive process of participants (Rieh, 2000; Van Someren, Barnard & Sandberg, 1994).

Rieh (2014) adopted lab-based search tasks in order to understand to what extent the amount of effort that people invest in credibility assessment differ depending on the type of online activity (information search vs. content creation). This lab-based study was designed to make comparisons of credibility assessment processes across two different information activity types (information search vs. content creation), across two different content types (traditional media content vs. user generated content), and across four different topics (health, news, products, and travel). This method enabled the researcher to control the variability of the tasks, time allotted, physical settings, and the initial websites where the subjects began each search task. In addition to the content creation task, participants completed the post-task questionnaire, background questionnaire, and exit interviews.

Kirkyla (2010) studied how users incorporate credibility when engaging in information seeking task on the Internet. The main components of this study were pre-search questionnaire, lab-based tasks, and post-interview. The pre-search questionnaire measured the level of personal relevance the individual places on the topics in the study. It was later connected to how the level of personal relevance that the subject attaches to a topic affects how she/he evaluates the credibility of information while attempting to complete an information seeking task in that area. A proxy server tracked and recorded the websites visited, while the participant completed a survey rating in terms of credibility judgment. The individuals were given ten minutes in order to complete each task; if after ten minutes the subject was still working on the task they were asked to stop. The two types of search tasks are: background and fact retrieval. Background tasks occur when users seek a general overview of a topic. Advice/opinion tasks are those tasks in

which a subject seeks input from an authoritative source for decision making purposes.

Fact retrieval includes those tasks in which a subject is seeking a specific piece of information that is both well-defined and indisputable as it was presented to them. After completing all search tasks the subjects were interviewed to explain what credibility means.

4.1.6 Retrospective Cued Recall

The think-aloud protocol (Ericsson & Simon, 1985) has participants talk while doing the behavior of interest. While this approach is often used, speaking aloud during the activity can introduce social, cognitive load, and attention aberrations, creating a somewhat unnatural behavioral response (Dickson, McLennan, & Omodei, 2000; Wilson, 1994). On the other hand, Ericsson (2006), in the retrospective cued recall (RCR) approach, the amount of time that passes between mental action and recollection of that action necessarily introduces artifacts of memory and post-event processing that interfere with accurate recall. Neither is perfect.

Retrospective analysis is methodology for conducting studies where the participant does their normal behavior without taking any disruptive action such as writing a diary entry, talking about their behavior, or responding to an interruption. It can be used to reconstruct participants' behaviors, rationales, affective reactions, and responses for events that have been recorded (Russell & Chi, 2014). Whenever the participant is later asked to recall (or explain) their earlier behavior when prompted by cues such as images taken during their behavior, videos of the event, eye tracking showing what they were looking at during the task, etc. This approach is remarkably

accurate when recollection cues and interview methods are well designed, even when there are fairly lengthy delays between action and recall (Russell & Chi, 2014).

For this recommendation seeking behavior study, this technique could be useful in conjunction with lab-based search task observation rather than think-aloud. After recording user's recommendation search tasks, a researcher can ask what was happening in a participant's mind during the user's recommendation seeking and evaluation process.

4.1.7 Social Network Analysis

Social network analysis (SNA) is the systematic study of collections of social relationships, which consist of social actors implicitly or explicitly connected to one another. It characterizes the world as composed of entities (e.g., people, organizations, artifacts, nodes, vertices) that are joined together by relationships (e.g., ties, associations, exchanges, memberships, links, edges). This method focuses on relational data about what transpires between entities in contrast to attribute data about individuals. For individuals, SNA is more about "who you know" than "what you know" or "who you are." At the group level, SNA illuminates how each person's individual connections aggregate to form emergent macrostructures like densely connected subgroups (Hansen & Smith, 2014).

While these questions vary considerably, they all share an emphasis on understanding social structures and how those structures influence outcomes of interest. SNA is designed to answer several types of specific questions as the categorized lists. For instance, at individual social actor level, network analysis can identify the most popular individuals, the most influence, bridge spanners between different subgroups,

disruptors in a network, social roles and other different types of social actors. At overall network structure level, many questions relate to the overall structure of complete networks, such as the network of all Facebook users or all employees of an organization. Instead of focusing on the position of individuals within the network, these questions focus on the overall distribution such as network density, the distribution of individual network properties or social roles (e.g., hubs, isolates), clusters, cliques, motifs (i.e., recurring network patterns), group efficiency, etc. (Hansen & Smith, 2014).

Haythornthwaite (1996) argues that actors' information opportunities are affected by (a) who they can make contact with, (b) what information that contacts can provide, and (c) what contacts exist in their network to who that information can be forwarded for a positive outcome. When SNA is applied to the study of information, relationships measure what kinds of information are exchanged between whom. Using social network techniques, these data can be used to indicate characteristics of positions held in a network and characteristics of the network structure. Positions in a network reveal who controls, facilitates, or inhibits the flow of information, and who has similar information needs or uses. Network structures reveal how information flows around the whole environment (Haythornthwaite, 1996).

4.1.8 Diary

Some researchers used diary studies, which enables capturing data in a natural setting. Activity diaries involve respondents keeping a detailed log of how they allocate their time during the day, often focusing on particular activities pertinent to the research being undertaken. One of the early decisions made when designing an activity diary

concerns whether to use an open format, allowing respondents to record activities and events in their own words, or to use a more structured format where all activities are pre-categorized. The next crucial stage of the design process involved deciding the period of recording the diary (Crosbie, 2006).

While developing the Information Seeking Process model, Kuhlthau (1983) collected data by using a diary study from 26 participants in order to record their actions, feelings, and thoughts about library search. In their diaries, they recorded what information resources they used as well as the procedures of finding those resources. In addition to the diaries, a questionnaire was used to investigate participants' perceptions of six areas of library use, and six participants were interviewed to examine each stage of the process. Rieh, Kim, Yang, and St. Jean (2010) conducted a diary survey that allowed researchers to capture information about whatever people were working on at each of various times because this study aimed to investigate the online activities that people conducted at various times throughout the day within their everyday context. Before collecting the survey data, a background questionnaire was asked for basic demographics, hours online, etc. Study participants received an email with a link to an online activity diary form five times a day over a period of three days. Rieh (2014) designed a diary study to capture a variety of online activities people engage in over time. The data set included 2,471 diaries submitted by 333 respondents who were recruited using a random sample of landline phone numbers in Michigan. The diary survey asked respondents to report all online activities in which they had engaged during the preceding three hours when they received a new email. In trust research, diary methods present an interesting opportunity to gather detailed, accurate and multi-faceted insights into social behavior,

cognitive and affective states as they occur within their natural settings. This approach allows events and experiences which shape individuals' perceptions of trust to be richly explored (Searle, 2012). The focus of diary methods is on collecting detailed descriptions about the events and experiences that make up respondents' lives. They involve the gathering of ongoing experiences as they occur in situ, focusing on "structured contemporaneous self-observation" (Reis & Gable, 2000, p. 190).

For this dissertation study, this diary method is suitable because participants can record their activities and interactions with recommenders in a natural setting. For the exploratory purpose, various aspects of data can be collected, which can enable us to identify any underlying factors in their behavior. Information behaviors can be motivated by needs to address real-life issues (Belkin, Oddy, & Brooks, 1982). Participants in this study will express that their actual needs to address noticeable problems in everyday life.

4.2 Summary of Reviewed Methods

In order to more easily determine proper methods which is more suitable to specific RQs and required data for each question, it is helpful to compare the advantages and disadvantage of each reviewed method in the previous section (Table 3). For instance, the survey method for this recommendation seeking study will be useful to access to large population and gather more generalizable data to understand the known factors, but it is difficult to collect in-depth interpretable or unexpected data from their activities. This study is exploratory rather than average behavior seeking, and all research questions aim to learn about possible factors for behaviors. This study suggests

using diary records and interview data as a qualitative approach for the descriptive and exploratory purposes.

Table 3
Advantages and Disadvantages of Various Research Methods

Research Method	Advantages	Disadvantages
Semi-structured interview	<ul style="list-style-type: none"> • Rich data • In-depth data about (1) reasons about decision/ behavior; (2) influential factors during processes • Flexible, suitable for exploring • Less intrusive 	<ul style="list-style-type: none"> • Hard to recall their experiences • Highly dependent on participants' verbalization skills • Difficult to observe processes • Small sample sizes
Survey	<ul style="list-style-type: none"> • Inexpensive and easy to deploy • Larger population • Generalizable data (average behavior) • Collect participants' background information (e.g., demographic) • Collect how known factors are used • Useful to initially identify high-level insights that can be followed by meaning smaller sample research • Get feedback on people's experiences with an application • Collect people's attitudes, perceptions, intents, and motivation toward an application in the context of usage • Quantitatively measure task success with specific parts of an application 	<ul style="list-style-type: none"> • Unable to observe of the respondents' context or to ask follow-up questions • Participants need to recall their experiences • Hard to gather in-depth information • Unable to collect (1) unexpected data; (2) detailed data for rich interpretation; and (3) data about idiosyncratic behaviors • Inappropriate for research about precise behaviors, underlying motivations, and the usability of systems

	<ul style="list-style-type: none"> • Capture people's awareness of certain systems, services, theories, or features • Compare people's attitude, experiences, etc. over time, and across dimensions 	
Behavioral logs (Dumais <i>et al.</i> , 2014)	<ul style="list-style-type: none"> • Rich data; insight into intent and rich, real world picture • Helped the subjects recall their judgment process vividly • Can capture the changes of behavior • Captures actual user behavior and not recalled behaviors or subjective impressions of interactions • Most natural observations of people as they typically use systems, uninfluenced by observers • Represent traces of naturalistic human behavior uninfluenced by observers • Can capture the changes of behavior • Easy to capture at scale—can easily include data from millions of people—even small differences that exist between populations can be observed • Large-scale logs—a good picture of unusual, important behavior • Detailed insight into individual information-seeking strategies • Large sample size, in a sense of coverage (long tail) & diversity 	<ul style="list-style-type: none"> • Non-random sampling • Uncontrolled tasks • Mostly, private, available only to individuals or service providers • Only reveal what people do with the tools they have • Absence of indication motivations, success, or satisfaction • No why—logs provide a good deal of information about what people are doing; but less about details (e.g., specific reasons of behaviors) • Privacy concerns • Difficult to collect demographics • Issues of data storage and cleaning with large-scale logs • Trade-off: number of users vs. time • More data: more intrusive and potential privacy concerns; also more useful for analysis and system improvement vs. less data: less intrusive, but less useful
Experimental research	<ul style="list-style-type: none"> • Controllable conditions and variables • Internal validity or the extent to which the experimental approach allows the researcher to minimize biases or systematic error 	<ul style="list-style-type: none"> • Fabricated setting • Risk of low external validity • Difficult to get permission depending on a kind of experiments

	<ul style="list-style-type: none"> • Good for identifying causal relationships • Allows for statistical and probabilistic statements • Face-to-face setting—more motivational to provide quality results • Opportunities to ask users follow-up questions such as intents, motivations • Precise control of the levels of the independent variable along with random assignment to isolate the effect of the independent variable upon a dependent variable • Use of quantitative data that can be analyzed using inferential statistics • Offer a systematic process to test theoretical propositions and advance theory • Replicable and extendable by others 	<ul style="list-style-type: none"> • Possibilities of legal and ethical hurdles (field) • If an important variable is not controlled for, there is a chance that any relationship found could be misattributed. • The risk of low external validity—a side effect of controlling for external factors is that it can sometimes lead to overly artificial laboratory settings. • Common mistake—to treat a lack of significance as proof that no difference exists. • It should be recognized that hypotheses are never really “proven” in an absolute sense. • Possible force-fit into situations (for a critique and response, see Lieberman, 2003; Zhai, 2003).
Laboratory-based test with tasks	<ul style="list-style-type: none"> • Opportunity to collect both concurrent and retrospective verbal data to observe users' judgement of information • Useful in collecting data about (1) decision making process; (2) cognitive process; and (3) influential factors to process • Face-to-face setting: participants may feel additional motivation to provide quality results due to the supervision • Opportunity to ask users follow-up questions such as intents, motivations 	<ul style="list-style-type: none"> • Highly dependent on participants' verbalization skills • Cognitive process are largely unconscious • Fabricated setting- people do not think aloud actually • Keep prompting participants • Interruption during searches (think-aloud) • Asynchronous behavior (search, then recall; retrospective recall)
Retrospective cued recall (or	<ul style="list-style-type: none"> • Rich data • No interruption during tasks 	<ul style="list-style-type: none"> • Asynchronous behavior (search, then recall)

post-talk protocol)	<ul style="list-style-type: none"> • Collect retrospective verbal data to observe users' judgement of information • Easy to recall by playing back searches • In-depth data about (1) reasons for certain decision/behavior during the process; and (2) influential factors in decision making • Accurate with well-designed recollection cues and interview 	
Social network analysis	<ul style="list-style-type: none"> • Can measure social ties and networks • Can be useful for identifying network dynamics and information flow • Helpful for identifying experts, potential collaborators in networks 	<ul style="list-style-type: none"> • Need additional data collection methods • Hard to have permissions to privacy data such as social relations
Diary	<ul style="list-style-type: none"> • Useful in collecting data in natural setting • Ability to observe changes over time • Easy to recall events • Natural setting 	<ul style="list-style-type: none"> • Easily forgetful to record • Difficult for a long period due to decline of participant motivation over time • Highly dependent on participants' skills and dedication levels • Biased user behavioral data due to user's recognition of continuous tracking and monitoring

4.3 Specific Research Methods

After reviewing and comparing various methods and examining RQs, which data need to be collected was identified in order to answer each RQ. Then potential methods are matched with corresponding RQs and data sets (Table 4):

Table 4
Required Data for RQs and Potential Methods

Related RQs	Data Needed	Detailed Data Required	Potential Methods
RQ1	Recommendation needs	Reasons for recommendation seeking behavior	<ul style="list-style-type: none"> ▪ Diary ▪ Interview
RQ2	Cognitive factors	Propensity to trust (innate trust tendency)	<ul style="list-style-type: none"> ▪ Survey questionnaire
RQ3, RQ4	Social factors	<p><i>Perceived Homophily:</i></p> <ul style="list-style-type: none"> ▪ Status homophily (1) Ascribed (i.e., age, gender, race/ethnicity data); and (2) Acquired (i.e., education, occupation) ▪ Value homophily or cognitive homophily (i.e., perceived similar interests, preference to users) <p><i>Perceived Social Ties:</i></p> <ul style="list-style-type: none"> ▪ Strength ▪ Closeness ▪ Frequency of correspondence ▪ Duration of relationship 	<ul style="list-style-type: none"> ▪ Survey questionnaire ▪ Diary ▪ Interview ▪ Behavioral logs
RQ2, RQ4	Cognitive factors– task evaluation	<ul style="list-style-type: none"> ▪ Uncertainty ▪ Risk ▪ Familiarity of the issue ▪ Duration of the issue 	<ul style="list-style-type: none"> ▪ Survey questionnaire ▪ Semi-structured interview
RQ2, RQ3, RQ4	Trustworthiness– recommendations	<ul style="list-style-type: none"> ▪ Accuracy ▪ Believability ▪ Balance ▪ Popularity ▪ Any factor emerged from interview 	<ul style="list-style-type: none"> ▪ Diary ▪ Semi-structured interview
RQ2, RQ3, RQ4	Trustworthiness– recommenders	<ul style="list-style-type: none"> ▪ Cognitive authority ▪ Benevolence ▪ Competence ▪ Any factor emerged from interview 	<ul style="list-style-type: none"> ▪ Diary ▪ Semi-structured interview

Table 4 indicates that survey questionnaire, diary, and semi-structured interviews are the most overlapping methods according to which data to be collected for each RQ.

Answers to RQs require the data of cognitive factors, social factors, and the trustworthiness evaluation of recommendation and recommenders. For the social factors, behavioral logs can be useful to observe how people interact with recommenders in the online space or in social media; however, the interaction with broader spectrum of social relations occurring in face-to-face situations cannot be captured. Also, behavioral logs only reveal what people do with the tools they have in a lab.

Furthermore, due to the exploratory nature of this study, which is to locate meaningful routes for building a recommendation seeking model, a natural setting rather than a lab setting is less intrusive and better to investigate how people's recommendation needs are emerged from their daily life, and how they actually evaluate the trustworthiness of recommendation. Among various research methods, natural inquiry techniques such as observations, interviews, or diary studies provide powerful ways of understanding the contextual factors that influence individuals' personal information management styles in real-life settings (Naumer & Fisher, 2007).

Diary can help present the data with richness when used as a supplement to interviews because journaling does not offer explanations as to why the observed behaviors in the diary entries are carried out. Also, the diary form is designed for simple and quick answers to pre-formatted questions to enhance the response rate by offering it in an undemanding format. Therefore, in order to fully answer the RQs, journals are insufficient and post-diary interviews are necessary. Diary data function as an assistive means and preparation for the further discussion during the post-diary interview. The combination of methods enables the data collection on participants' opinions and thoughts such as interviews. As argued above, semi-structured interviews allow the

collection of rich and high quality data at a relative low cost. Therefore, this study attempts to take the advantages of combining survey questionnaire, diary, and semi-structured interviews in order to answer the RQs of this study. As this research aimed to discover the influential factors during the trustworthiness evaluation of recommendations and recommenders, these methods seemed most appropriate.

4.4 Pilot Studies

The above reviews informed that several methods are more advantageous for discovering possible factors and proper for obtaining detailed data about recommendation seekers' behaviors in everyday life. The pilot studies tested the combination of introductory meeting, diary, and semi-structured post-diary interview. The following section will describe in detail how two pilot studies are conducted, what those studies suggest for revision of the initial instrument design, and whether the selected methods are appropriate for data needed for RQs.

4.4.1 Testing Research Methods Selected

Two pilot studies were conducted, which consist of three procedures: (1) an introductory meeting with demographic survey and self-evaluation of propensity to trust, (2) one-week diary recording, and (3) interviews (either in person or online post-survey). A pre-survey is comprised of two parts: basic demographics and self-evaluation of propensity to trust. A daily journal was in an online survey format accessible from anywhere at any time. After the one week diary, a semi-structured interview (in-person, one on one) was implemented.

In both pilot studies, diary questions asked about the recommendation need situation or problem, who the recommender is, a brief description of recommendation received, simple evaluation of recommendation, decision to accept or not, and the reason for the acceptance or rejection decision, and an importance aspect for the decision (see, e.g., Appendix 2.2). Data from diary entries are designed to help the participant's memory about their daily recommendation interactions in the past week. For instance, the brief description of situation was useful for the participants to remind of their situation at the moment. This record helps us not only identify what was the recommendation needs but also during the interview helps an interviewer prepare questions about how the participant perceives uncertainty and risk in the problems. The perception of recommendation recipient's situation is suitable to answer the RQ1.

While the three methods for data collection remained the same, some diary and interview questions were removed, extended, and adjusted according to my observation and the feedbacks from participants and the advisor. The changes can be found with the comparison of Appendix 1 (i.e., instruments for the Pilot 1) and Appendix 2 (i.e., instruments for the Pilot 2). During the pilot study 1, the initial research tools and procedure (see Appendix 1) were tested. The pilot respondents gave comments about their experiences of the participation. Based on our evaluation and their feedback, the original research instruments (Appendix 1) were modified, and then tested in the pilot study 2 (see Appendix 2). After the pilot study 2, the research tools were revised again and the new version, proposed for the final study, is presented in Appendix 3.

4.4.2 Participants of Pilot Studies

The pilot studies applied an opportunistic sampling where potential participants were available at the time of the pilot study carried out and met the criteria of this study. They were contacted by my personal networks. Effort was made to represent a range of backgrounds and interests amongst the samples. The interaction with the members in various population groups in pilot studies resulted in diverse feedbacks. The two pilot studies recruited seven participants from Rutgers University and New York University. Three respondents were from the field of hard science, and four participants were studying soft science. While the Pilot 1 includes five participants, the Pilot 2 comprises two respondents (i.e., one undergraduate and one master student). The summary of participant profiles is given in Table 5.

Table 5
Summary of Participant Demographics in the Pilot Studies

Study Phase	Subjects	Gender	Age	Field of Study	Academic Status	Education
Pilot 1	P1	Male	35-44	Engineering	Faculty member	Doctorate degree
	P2	Male	25-34	Computer Science	Ph.D. student	Bachelor's degree
	P3	Female	25-34	Communication	Ph.D. student	Master's degree
	P4	Male	25-34	Physics	Post-doctoral researcher	Doctorate degree
	P5	Male	18-24	Engineering	Undergraduate	High school graduate
Pilot 2	P6	Male	18-24	Engineering	Master student	Bachelor's degree
	P7	Female	18-24	Information Technology	Undergraduate	Some college credit

4.4.3 Procedure of the Pilot Studies

After the pilot study was approved by an institutional review board (IRB) in June 2016, two pilot studies were conducted between August and November in 2016 with seven participants. An introductory meeting was conducted in person. During the introductory meeting, a respondent signed up a consent form and briefly learned what this study is about, and the whole procedure of the participation. How to use an online diary was instructed. Also, the definitions of each term in the diary template were thoroughly explained. Then, a pre-survey was completed either during or after the introductory meeting (in person or online, respectively).

Table 6
Summary of Data Collection Methods in Each Procedure

Study Phase	Subject	1. Introductory Meeting		2. Diary Recording	3. Post-Diary Interview
		Meeting	Pre-survey		
Pilot 1	P1	In-person	Paper-based (during meeting)	Online format via Qualtrics	In-person + Online
	P2				In-person
	P3				In-person
	P4				In-person
	P5		Online via Qualtrics		Online
Pilot 2	P6	In-person	Qualtrics (after meeting)	Online format (revised) via Qualtrics	In-person
	P7				

Next, in a follow-up email, a participant received an online diary link which leads to a diary template in an online survey format. The participant was instructed to save the link to his/her favorite in a browser or smart phone in order to enhance accessibility. Since the survey format was enabled for multiple submissions, the same link could be

used every time inputting diary entries. During the next one week, a respondent recorded recommendation-related experiences on the given diary template about their episodes. Although real time recording was instructed and encouraged, all participants in reality chose to record all entries at once when they have time for recording. Some participants took a memo about their experiences during a day, and then input the notes at the end of the day.

The initial diary template (see Appendix 1.2) was constructed for only one entry of a recommendation experience. For instance, a respondent had to visit the link three times if three entries need to be entered. In the Pilot 2, the diary format (see Appendix 2.2) was improved from this single entry to multiple entries per link (up to 3 entries) in order to improve a participant's convenience by asking if he/she has another experience to report after finishing one entry. In doing so, the participant can reduce the number of clicks for the link when recording multiple entries. We expected the more convenient functions to result in a greater number of entries submitted, owing to our observation of the fact that the average number of entries has been minimal (e.g., one or less per day), and participants tended to record all data for the day at one time. The participants commented that the new device is very useful and convenient when they input more than one case; however, the average number of entries remained the same.

During and after a participant's one-week diary session, diary entries were checked and reviewed. Then, the participants were interviewed in person for further investigation and clarification about their diary data on the basis of the submitted records. After the pilot study 1, the initial interview questions (see Appendix 1.3) were modified

and refined for the Pilot 2 (see Appendix 2.3). Then, final changes were made based on the pilot study 2 for this dissertation study (see Appendix 3).

4.4.4 Findings for Research Instrument Revision

During an introductory meeting, a pre-survey was completed. In the early stage of the pilot study 1, a couple of participants suggested to fill out an online pre-survey (see Appendix 1 for the Pilot 1 & Appendix 2 for the Pilot 2) after the first meeting completed instead of during the meeting because of participant's comfort, time-saving, and the effective data management (Table 7). In this way, the participant can finish survey questions as per their convenience without a researcher's presence which may cause pressure on respondent's answers. A paper-based pre-survey was migrated to an online format in Qualtrics. After the initial meeting, a pre-survey link was emailed.

4.5 Sources of Data

As mentioned in the previous section, the pilot studies showed that the chosen methods can deliver data needed. This study adopts a qualitative approach to collect data that address the RQs by integrating one-week diary and semi-structured interview as primary methods, which compensate each other and elicit a powerful combination of in-depth, high quality, and more reliable data in a relatively effective way. The whole procedure of data collection is shown in Figure 8. The following sections will articulate the finalized procedures of data collection in each step.



Figure 8 Data collection procedure

4.5.1 Introductory Meeting and Questionnaires

At the beginning of an introductory meeting, a participant signed on an informed consent form. Then, he/she learned what this study is about, and instructed how to use an online diary form. The definitions of each term on the diary template, such as uncertainty, risk, recommendation, was also explained. Since understanding the definitions of terms in this study is critical for data quality, the meaning of a recommendation was discussed for clarification.

An online pre-survey was emailed after the meeting. The participant answered the survey at his/her convenience before starting one-week diary. The pre-survey (see Appendix 3) is comprised of two parts: basic demographics, and self-evaluation of propensity to trust. Basic demographic questions consist of gender, age, academic status, education level, field of study while self-evaluation of propensity to trust includes eight statements with five-Likert scales from strongly disagree to strongly agree in order to measure how susceptible a participant is regarding a personal tendency toward trusting or accepting information from others. For instance, some people have a tendency to easily trust others, even if they never met them before, whereas others take a long time to develop a comfortable level of trust. The *Propensity to Trust Scale* (McShane & von Glinow, 2009) estimates participant's general willingness to trust other people. The

measurements are adopted and modified from the study of organizational behavior in business research (McShane & von Glinow, 2009) and listed as follows:

1. I tend to trust online reviews from users on the web.
2. I tend to trust people, even those whom I have just met for the first time.
3. Most recommendations about products from anonymous people are commercials (Reverse (R)).
4. Most people would tell a lie if they could earn a benefit (R).
5. I am usually cautious with people until they show their trustworthiness (R).
6. When my acquaintances tell a doubtful story, I will consider that maybe it really did happen even though I don't believe the story.
7. Most people pretend to be more honest than they really are (R).
8. I believe that most people are generally trustworthy.

After the meeting and pre-survey submission, the participant received a diary link to a pre-formatted online template by email.

4.5.2 One-Week Diary Recording

The offered diary link leads participants to a template which they will use for a week, and was enabled for multiple submissions; therefore, they could save the link and use it multiple times. This template was generated by Qualtrics, a software for web-enabled survey data collection and accessible through a link on their computing devices (e.g., computer, tablet, and phone) anywhere with an internet connection.

During one week, participants recorded any recommendation-related situation which he/she experienced whenever seeking a recommendation. Tasks or problems were

self-selected and self-initiated by participants, and they described problems at hand in their diary.

They were instructed to make entries in real time if possible, but also allowed to be done either after the experience happens, or at the end of the day. Reminders were emailed or texted daily during the diary week to prompt their involvement.

“Recommendation” in this study refers to a piece of suggested information that a participant actively seeks from his/her social networks (i.e., online or face-to-face interactions with human information sources) or recommender systems. This study includes any machine-generated and/or peer-generated recommendations such as recommendations from Websites or social media such as TripAdvisor, Amazon, Yelp, etc. Eliciting possibly real time information about how participants receive recommendations through their social connections or other channels (e.g., machine-generated recommendation).

The template (see Appendix 3.2) consisted of simple questions for short answers or 5-Lickert scales. The questions asked were as follows: 1) Date; 2) Time; 3) The description of problems at hand or situation; 4) Brief description of received recommendation; 5) Medium used; 6) Familiarity of the issue; 7) Duration of the issue; 8) Perceived uncertainty level in the issue; 9) Perceived risk level in the issue; 10) Whether to accept; 11) Reason for accepting or rejecting; 12) The most important aspect for accepting or rejecting the recommendation received; 13) Trustworthiness level of recommendation; 14) Trustworthiness level of recommender; 15) Frequency of contact with the recommender; 16) Tie strength with the recommender; 17) Duration of relationship; 18) Closeness with the recommender; and 19) Any other sources contacted

or used. The recommendation evaluation part can be mainly categorized into the evaluation of task, trustworthiness, and social relationship with the recommender.

4.5.3 Semi-Structured Interview

After the diary recording week, a semi-structured one-on-one interview was scheduled at a participant's convenience. Participants' diary entries were reviewed before the exit interviews. During the review process, meaningless entries were weeded out (e.g., irrelevant to the criteria of recommendation evaluation and use behaviors), and were not used for interviews. Only significant entries were highlighted for the further investigation. Diary items were used as a trigger for the participant's fuller reflection and also as the basis for the follow-up interview. During the post-diary interview, the conversation was recorded with a digital recorder for a transcription and further analysis.

The diary entries were used for participants to prompt their memory and for an interviewer to generate questions to be asked during the interview session for further investigation and data clarification. This interview included short questions and descriptive verbal conversation. The semi-structured interview questions consist of five sections: 1) problem-related questions (before receiving recommendations), 2) relationship with recommendation sources (self-perception), 3) recommendation-related questions, 4) recommender-related questions, and 5) after receiving recommendations. During the post-diary one-on-one interviews, diary entries will be explored in depth with probing questions. The details of semi-structured interview questions can be found in Appendix 3.3.

4.5.4 Summary of Data Collected from Three Procedures

The data collected through each method are summarized in Table 7.

Table 7

Data Collected from Each Method

Methods	Questions Asked	Data
Entry Questionnaire	<ul style="list-style-type: none"> ▪ Identifying basic demographics about a participant ▪ Participant's self-evaluation of propensity to trust 	<ul style="list-style-type: none"> ▪ Demographics ▪ Propensity to trust
Diary	1) Date; 2) Time; 3) Description of problems at hand; 4) Brief description of received recommendation; 5) Medium used; 6) Topic familiarity; 7) Duration of the issue; 8) Uncertainty level; 9) Risk level in the issue; 10) Whether to accept; 11) Reason to accept/reject; 12) Most important aspect for #11; 13) Trustworthiness of recommendation; 14) Trustworthiness of recommender; 15) Frequency of contact; 16) Tie strength with the recommender; 17) Duration of relationship; 18) Closeness; and 19) Any other sources used	<ul style="list-style-type: none"> ▪ Participant's problems at hand ▪ Recommendations ▪ Recommenders ▪ Reason for acceptance or rejection ▪ Cognitive factors ▪ Social factors
Exit Interview	<ul style="list-style-type: none"> ▪ Clarifying questions emerging from the diary records and identifying further information ▪ Examples of semi-structured interview questions: <ol style="list-style-type: none"> 1) how they evaluated uncertainty and risks in the issue; 2) how they evaluated the relationship with recommender e.g., tie strength, duration of the relationship, contact frequency, closeness, homophily; 3) how to evaluate the trustworthiness of recommendations; 4) how to evaluate the recommender, any chance to search other sources, the role of the relationship in the evaluation process; and 5) questions about the participant's post-conditions—confidence, satisfaction, usefulness, influence on the subsequent actions after recommendations 	<ul style="list-style-type: none"> ▪ Qualitative evaluation of the recommendation need ▪ Qualitative description of perceived trustworthiness of recommendations and recommenders ▪ Reason for choosing the certain recommender ▪ Behaviors after receiving

4.6 Participant Recruitment

This section describes the recruitment criteria, sampling methods, sample sizes, and recruitment procedure followed by the summary.

4.6.1 Recruitment Criteria

To enhance response rate and quality, this study recruited from academics in the institutions of higher education in the United States rather than from a random sample from a more general population. This population was also chosen because they are often involved in a variety of information intensive environments (e.g., research, term projects, various academic activities, school life, travel, etc.). In order to observe various activities, respondents were selected from three sub-groups in different academic status and ages comprised of undergraduates, master, and doctoral students at Rutgers University and New York University (NYU). In addition, compared to the participation of undergraduates only, graduate students might have better understanding of recommendation behaviors, and provide better quality data. Also, we can observe if there is any difference between age groups or between academic statuses.

While most undergraduates (e.g., 18-24 years old) are representatives of Post-Millennials (i.e., the demographic cohort after the Millennials), many graduates (e.g., 25-34 years old) represent Millennials. They are representative of young people. By collecting data from these population groups, we can better understand the young adults' behavior of recommendation interaction in the course of their problem solving and decision making. The birth years of Post-Millennial generation range from the mid-1990s to early 2000s (Fry, 2017). This generation is the first to have Internet technology

so readily available at a very young age (Prensky, 2001), and is characterized as born-digital and vigorous users of various social media and technologies (Pew Research, 2006).

Table 8
Summary of Proposed Study Population

	Undergraduates	Graduate Students	
		Master Programs	Ph.D. Programs
Population Scope	Post-Millennials	Millennials	
Expected Age Group	18-24 years olds	25-34 years old or older	
Benefits	<ul style="list-style-type: none">▪Young adults (homogeneous ages)▪Born-digital generation▪Intensive users of SNSs and technology▪Likely to have higher response rate with extra credit or monetary compensation▪Easy access	<ul style="list-style-type: none">▪Wider age range of young people▪Born-digital generation▪Intensive users of SNSs and technology▪Better data quality control than only undergrads▪Broader ranges of data▪Easier access to the population	
Shortcomings	<ul style="list-style-type: none">▪Data attrition▪Less data inputs	<ul style="list-style-type: none">▪Difficult to recruit students who are mostly busier than undergraduates	
Recruitment Strategy	<ul style="list-style-type: none">▪Contact undergrads program directors▪Contact Ph.D. student instructors, and faculty members▪Contact faculty members in other university using personal networks	<ul style="list-style-type: none">▪Contact master and Ph.D. program directors▪Ask each department for help by contacting department offices▪Contact faculty members in other university using personal networks	
Data Collection Methods	<ul style="list-style-type: none">▪In-person interview (both initial and post-diary interviews)▪Online diary accessed from any devices with internet connection▪Distant participants→ Skype; GoToMeeting; Google Hangout		

On the other hand, the birth year range of Millennials commonly spans between 1981 and 1994 (Mangold & Smith, 2011). Their population is approximately 50 million in the United States (Jayson, 2010). The Millennials are the biggest generational group since the baby boomers. Likewise, having grown up socializing and making purchases online, this generation's savvy usage of social media will continue to grow along with their discretionary income (Mangold & Smith, 2011). Computers and mobile devices are commonplace tools and even call them essential. Both groups, Millennials and Post-Millennials, allow us to investigate the recommendation experiences of people in young adulthoods as well as to compare the similarities and differences of the two generations. We expect that different academics, and perhaps chronological ages will offer different kinds of experiences during recommendation interactions. As results, comparison between the two age groups will be available through data collection.

Table 8 shows the summary and comparison of study population in this proposal. The expected participants were Post-Millennials and Millennials who are currently enrolled in a university in the U.S. In this way, we can have a wider spectrum of population groups with more diverse experiences in daily life.

4.6.2 Sampling and Sample Sizes

Among nonprobability sampling techniques, both judgmental and snowball sampling were employed. Judgmental sampling (Krathwohl, 1997) is a frequent strategy of qualitative research by selecting a sample representative of the population. According to Krathwohl (1997), a researcher selects individuals "who are presumed to be typical of certain segments of the population and therefore representative of it" (p. 137). Two main

characteristics of the population in this study are: a) whether an individual is an undergraduate or graduate student; and b) whether he/she is currently enrolled in a university in the U.S. Therefore, the representatives of the population should be composed of at least 6-7 different individuals who are from a different academic status (i.e., undergraduate, master, and Ph.D. students).

In addition, participants were recruited through snowball sampling. Although this procedure is appropriate when the members of a special population are difficult to locate such as homeless individuals or undocumented immigrants, this sampling expedites or makes it easier to recruit potential participants who have willingness to involve in the longitudinal diary study. Participants were asked if they can refer other potential participants from their personal network to that satisfy the recruitment criteria. In this way, a researcher can have easier access to the target population and the recruited participants may be more motivated to cooperate with a researcher. However, snowball sampling is subject to sampling bias (Rankin & Bhopal, 2001), which can also exist in other commonly used sampling methods such as simple random sampling for interviews (Herzog & Rodgers, 1988).

To estimate the proper number of participants, similar studies showed that sample sizes ranged from around seven ($N = 7$) to Thirty ($N = 30$). Examples are as follows:

- Rieh (2000) recruited 16 subjects (doctoral students and faculty members) from diverse discipline areas at Rutgers University.
- Oh (2013) in her diary study collected data from 18 participants who are academics in social science fields at Rutgers University.
- Kelly (2004) recruited 7 graduate students at Rutgers University.

- Golbeck's (2005) user study in her FilmTrust research comprised 9 students (5 males and 4 females) at the University of Maryland.
- Kim (2006) in her dissertation study of task-related information seeking behaviors on the web recruited 30 students to identify the diverse information needs.

Based on other similar studies, this study aimed for thirty respondents (i.e., ten students from each group), and the total number of participants who completed the whole sessions were thirty three ($N = 33$). The average number of recommendations submitted per participant was seven diary entries ($N = 7$). This amount of data was enough for data analysis for this exploratory research and was reasonable to collect diverse data points.

4.6.3 Recruitment Procedure

After two pilot studies, the modification of the instruments was submitted and approved by the IRB. Then, a recruitment letter was circulated. Participants were recruited informally by word-of-mouth, through my personal networks, and formally via email invitation.

First, I contacted the directors of undergraduate and graduate programs in the School of Communication and Information at Rutgers University, and asked for the distribution of recruitment emails to reach potential respondents. Next, several instructors of undergraduate classes in the Department of Communication agreed to advertise this study recruitment. Also, the research posted the recruitment advertisement on the online bulletin board only for graduate students at Rutgers University. Later, the recruitment range was expanded to other universities by contacting students in my personal networks or through emails obtained from university directories. Anyone who

is interested in this study and meets our criteria could volunteer to participate in the study. Respondents were told that the study is a longitudinal, naturalistic record of their personal recommendation-related experiences. After agreeing to s participation, the volunteers were scheduled for an introductory meeting as per their convenience.

Upon the completion of all procedures, a monetary compensation of \$45 was awarded. On the other hand, undergraduate participants recruited through a class had two choices: \$45 or extra credits since the class instructors agreed to offer extra credits for participation.

For all sessions, the participants' identities remained strictly confidential, and all identifiers were anonymized prior to storing and analyzing the data. Gender was balanced as much as possible.

CHAPTER 5 DATA ANALYSIS

This chapter presents how units of analysis were defined, and how the data pre-processes for the in-depth analyses were carried out. Both qualitative and quantitative data were collected to describe recommendation seeking behavior and to answer the RQs in this study. While the qualitative data were analyzed with the content analysis method in NVivo12, the quantitative data were processed with the statistical analysis software SPSS25. Before the analyses, collected data were organized and formatted accordingly for the proper analysis tools.

During the introductory interview, two types of data were collected: basic demographics and self-evaluation of propensity to trust (Table 9). The basic demographics were used to describe the study population, while propensity to trust was used as one of cognitive factors. The interview transcripts and the qualitative answers to the open-ended questions in diary were used to understand the details of the participants' behaviors by the content analysis method. Meanwhile, the closed-ended answers with 5-Lickert scales (i.e., quantitative measures) in diary were used to identify the relationships among cognitive factors, social factors, and trustworthiness evaluations (i.e., RQ2, RQ3, and RQ4), and were statistically analyzed with linear regression. Data collected from pre-surveys, diaries, post-diary interviews are used as an important connection, support, and supplementation for the quantitative data analysis.

The recommendation seeking behavior with real life experiences was investigated by checking how the cognitive and social factors are associated with the trustworthiness evaluation of recommendations and recommenders. If empirically supported, it may be

argued that the findings would constitute a distinct context for recommendation-related situation and recommender systems.

Table 9
Summary of Collected Data from Study Procedures

Procedure	Types of Data Collected	Analysis Method
1. Introductory interview	<ul style="list-style-type: none"> • Basic demographic information • Self-evaluated propensity to trust 	<ul style="list-style-type: none"> • Participant description • Statistical analysis
2. One-week diary	<ul style="list-style-type: none"> • Quantitative answers to close-ended questions (5-Likert scale) • Qualitative answers to open-ended questions 	<ul style="list-style-type: none"> • Statistical analysis • Content analysis
3. Post-diary interview	<ul style="list-style-type: none"> • Qualitative answers to pre-formatted questions based on diary content submitted by the participant 	<ul style="list-style-type: none"> • Content analysis

5.1 Data Pre-Processing

Anonymizing data. Before conducting data analysis, all contents from the collected data were screened and coded, which may be recognizable as a certain respondent or harm participants' privacy (e.g., identifiable names and specific locations). Any recognizable data were disabled for any possibility to specify the participants' personal information. ID numbers were the only identifier on the diaries and interview transcripts.

Unit of Analysis. In this dissertation, an episode refers to one recommendation need, and related subsequent items within that need. Each episode serves as a unit of observation for the content analysis. The units of analysis are a recommendation and recommender in an episode. One episode includes either one recommendation from one

recommender or several recommendations from several recommenders since some participants recorded one recommendation need with several recommendations received from multiple recommenders, while others recorded one recommendation need with one recommender and one recommendation.

For the statistical analysis, one episode with multiple recommenders and recommendations was separated, and this split episode refers to one case, where a case is defined as one recommendation from one recommender. Each case serves as a unit of analysis in the statistical analysis.

Data Aggregation and Preparation. Data collected from the three procedures were aggregated into one table in a spreadsheet. For the content analysis in NVivo12, the table was split by a participant in a separate spreadsheet. As results, one file per participant was created and then 33 files of thirty-three participants were imported into NVivo12. Detailed steps were as follows:

- 1) The pre-survey and diary data were downloaded from Qualtrics, and organized by a participant and by an episode in a spreadsheet.
- 2) The audio recordings were transcribed. Answers to the interview questions are grouped and organized by the participant and then by the episode.
- 3) The organized transcripts were merged with dairy entries matching with the corresponding participant and episode in the Excel table.
- 4) The table was split by a participant in a separate file.
- 5) Then, the thirty-three files were imported into NVivo12. Open-ended questions in diaries and interview transcripts were qualitatively coded based on

the themes in the proposed model (Figure 7). Also, the data were reviewed and analyzed to identify any emerging themes outside of the model.

5) Next, another file is created for the statistical analysis. All qualitative data were removed and only quantitative measures remained (Figure 9).

	Cognitive Factors				Social Factors					
Case	Propensity	Topic familiarity	Risk	Uncertainty	strength	length	closeness	contact frequency	Trustworthiness of Recommendation	Trustworthiness of Recommender
					Tie Strength					
Case1	24				Mean value of strength + length + closeness + contact frequency					
Case2	24									
Case3	24									
Case4	24	Quantitative score			Quantitative score				Quantitative score	Quantitative score
Case5	24	1~5	1~5	1~5	1~5			0~8	1~5	1~5
Case6	24	1: unfamiliar	1: safe	1: certain	1: weak	1:short	1: distant	0: Never met	1: untrustworthy	1: untrustworthy
Case7	32	5: familiar	5: risky	5: uncertain	5: strong	5:long	5: close	8: Everyday	5: trustwothy	5: trustwothy
Case8	32									
Case9	32									
Case10	32									

Figure 9 Sample data structure for statistical analysis

Criteria of Recommendation-related Episodes: Only recommendation-related episodes were analyzed. Non-recommendation-related episodes were excluded from the analyses. Participants were instructed and learned about the definition or scopes of recommendation seeking activities. However, they were not strictly restricted by pre-defined behaviors, and allowed to record activities based on their own perception and interpretation. As results, some activities did not meet our scopes of recommendation seeking activities. During the examining process of diary inputs, non-recommendation-related episodes were eliminated from the analysis. The criteria were as follows:

- 1) Second-hand knowledge or information filtered by others or systems
- 2) Others' testimony or actual experiences
- 3) A form of advice in the course of information seeking or a decision-making process

4) A piece of suggested information that a participant receives from algorithmic systems (i.e., machine-generated recommendations), or from people around a participant via either direct in-person or technology-mediated communication, such as texting, emails, social media, or websites (i.e., human-based recommendation).

5.2 Process of Content Analysis

This section describes the process of content analysis (i.e., qualitative analysis) including inter-coder reliability. The technique of content analysis allows considerable flexibility and can preserve the richness of the data collected. To confirm a coding scheme, two inter-coders were collaborated. Through iterative processes of reviews and discussions with inter-coders and the adviser, qualitative codes were finalized.

5.2.1 Creating Provisional Coding Scheme

Open-Coding. At the beginning, open coding was applied for further interpretation and analysis. The qualitative data were processed with manifest and latent content analysis (Babbie, 2007; Graneheim & Lundman, 2004; Lee & Kim, 2001; Mayring, 2007) because the diaries were written with various experiences and perspectives by different participants, and the perception of trustworthiness was diverse. Manifest content analysis is to count the number of the visible and surface contents in the respondents' answers, whereas latent content analysis is to find the underlying meaning of the contents (Graneheim & Lundman, 2004). Latent content analysis method is chosen to suit the needs of analyzing less visible, less separable, and not readily

classifiable issues focused in this study, including cognitive and social factors in using and evaluating recommendation received, asked, or encountered (Babbie, 2007; Graneheim & Lundman, 2004; Lee & Kim, 2001).

Preliminary Coding Scheme. Next, using the theoretical orientations of the conceptual framework in this study (Chapter 3), a provisional list of codes was developed and grouped by thematic category to create a preliminary coding scheme (Miles, Huberman, & Saldaña, 2014, p. 81). Also, codes were generated to address comprehensively all aspects of RQs such as cognitive factors, social factors, trustworthiness evaluation, etc. The preliminary coding scheme was reviewed and discussed with the advisor, and updated during the process.

Based on this preliminary scheme, the data were iteratively analyzed, episode by episode within the participant to assure consistency in the defined meaning of codes across the data. For example, in order to assign a code “homophily,” one episode from one participant was examined and the phrases (thematic units) were identified and coded, which imply the meaning of homophily. Then, the coding process moved onto the next episode of that participant. The same process was repeated until all episodes from all participants were reviewed and coded. In the case of discovery of new thematic phrases, if any, the new code was determined whether it can be combined into existing code categories or need to be assigned a new category. In order to assign the codes, both manifest and latent content analysis techniques were applied. Once it was finished, the whole coding scheme and assigned codes (sample codes) were discussed, revised, and adjusted with the dissertation advisor and the second-coders.

The process of the content analysis is as follows:

- 1) Open-coding was conducted to identify any meaningful themes and phrases.
- 2) The preliminary coding scheme was developed as significant phrases were grouped into thematic categories by analyzing 10% of the episodes (about 15 episodes herein) randomly sampled.
- 3) The advisor reviewed the preliminary scheme, which was revised and updated accordingly to reflect feedbacks. Any disagreements in coding were discussed to resolve.
- 4) Another 10% episodes were sampled to test the revised coding scheme. Again, the same process of review and discussion was conducted for further adjustments.

Next, two inter-coders were hired to finalize the provisional coding scheme. The following section introduces how the inter-coder reliability was processed and calculated and then reports its results.

5.2.2 Process and Results of Inter-coder Reliability

Inter-coding Process. After the preliminary scheme was developed, two second coders were invited, and trained before beginning to assign codes. The iterative inter-coding process was as follows:

- 1) The second coder learned the initial codebook such as the structures and definitions of each code. Once the coder understood the codebook, the trial coding was independently conducted with one episode.
 - 2) I and the second coder synchronously reviewed the coded parts.
- Misunderstood or unmatched codes were clarified during this review process.

- 3) The second coder independently coded four more episodes. Then, I repeated the review process to make sure the coder's understanding. The second coder asked for the further clarification if necessary.
- 4) The second coder independently coded another 10% of episodes, which cover every code in the coding scheme.
- 5) I and the coder reviewed thoroughly the coded episodes, and examined how much the initial codebook can make sense to others. Through the discussion, any disagreements in coding were resolved. As results, some codes are reassigned and the coding schemes are revised.
- 6) Using the Coding Comparison in NVivo12, the inter-coder reliability was calculated. The final results of inter-coder reliability are shown in Table 10.

Table 10
Inter-coder Reliability Results

Code Category	Kappa Coefficient	
	Inter-coder 1	Inter-coder 2
Recommendation Need	0.85	0.80
Situation Evaluation	0.76	0.84
Social Factor	0.74	0.76
Trustworthiness of Recommendation	0.81	0.80
Trustworthiness of Recommender	0.75	0.75
Recipient's Factors	0.78	0.75
Other Factors—Accept or Reject	0.82	0.73
Recommendation Use Activity	0.73	0.73

The function of Coding Comparison in NVivo12 compares coding similarities and differences between the two coders. Then, it displays Kappa coefficients (i.e., chance agreement) and percentage agreement between the two coders in each code category. The results of inter-coder reliability are organized by the main categories of codes (Table 10). One approximate set of guidelines for interpreting the value of Kappa is as follows:

below 0.4 means poor agreement; between 0.4 and 0.75 is fair to good agreement; and over 0.75 interpreted as excellent agreement. The final version of the coding scheme is depicted in Table 11. The comprehensive codebook with definitions is in Appendix 4.

Table 11
Final Coding Scheme

Main Category	Sub-Category	
1. Recommendation Needs	1.1 Functional Factors	Affective Need
		Cognitive Need
	1.2. Temporal Factors	Short-term
		Long-term
2. Situation Evaluation	2.1. Risk (Vulnerability)	
	2.2. Uncertainty	
	2.3. Topic Familiarity	
3. Social Factor	3.1. Social Tie	
	3.2. Homophily	
4. Recommendation (Content) -Trustworthiness	4.1. Accuracy	
	4.2. Balance	
	4.3. Consistency	
	4.4. Credibility	
	4.5. Description Quality (Presentation)	
	4.6. Plausibility	
	4.7. Quality of Entity	
	4.8. Quantifiable Cues	
5. Recommender (Source) - Trustworthiness	5.1. Anonymity	
	5.2. Authority	
	5.3. Benevolence	
	5.4. Competence (Expertise)	
	5.5. Personality (Characteristics; Ethos)	
	5.6. Reputation	
6. Recipient's Factors (Trustworthiness)	6.1. Congruence	
	6.2. Previous Interaction with Source (Trust)	
7. Other Factors -Accept or Reject	7.1. Consequence of Recommendation	
	7.2. Feasibility of Recommendation	
	7.3. Personal Preference of Recipient	
	7.4. Relevance of Recommendation	
	7.5. Usefulness of Recommendation	
8. Recommendation Use Activity	8.1. Affective Change	
	8.2. Further Searching	
	8.3. Decision Making	
	8.4. Problem Solving	

I was also self-critical at various stages of the iterative research process. Based on feedbacks from the two coders and the advisor, the definitions, concepts and themes in the preliminary coding scheme were refined, and developed for the final coding scheme. Finally, the coding scheme was settled, and applied to the whole data set. All thematic units were coded as per the updated coding scheme.

5.3 Process of Statistical Analysis

In order to identify the relationship between cognitive factors, social factors, and the trustworthiness evaluation, linear regression analyses were conducted under the simple assumptions of regression analysis. Regression analysis in SPSS25 was operated twice for RQ2, RQ3, and RQ4: one with trustworthiness of recommendation and another with that of recommender. All numerical data were accordingly organized to be imported into SPSS25.

5.3.1 Cognitive Factors

Cognitive factors were collected to answer RQ2 (Figure 10) and RQ4, and the related questions were asked in terms of propensity to trust, problem duration, topic familiarity, uncertainty of issue, and risk in issue in the diary. Duration of the problem is measured as one part of characteristics of problem at hand, but eliminated from the category of cognitive factors. The problem duration indicates how long a participant has thought or searched answers to solve the problem; thus, it is very likely to be correlated with familiarity of the issue. On the other hand, it can imply the simply span of time and the duration does not directly indicate a participant's cognitive states of topic familiarity.

Furthermore, the result of principle component analysis showed that the duration and topic familiarity can be viewed one factor. Therefore, in this study, duration of the problem is excluded, and only four cognitive factors—*Propensity to Trust*, *Topic Familiarity*, *Uncertainty*, and *Risk*—are used as independent variables (IVs) in order to explain their regression relationships with the trustworthiness evaluation of recommendations and recommenders in the following chapter (Chapter 6).

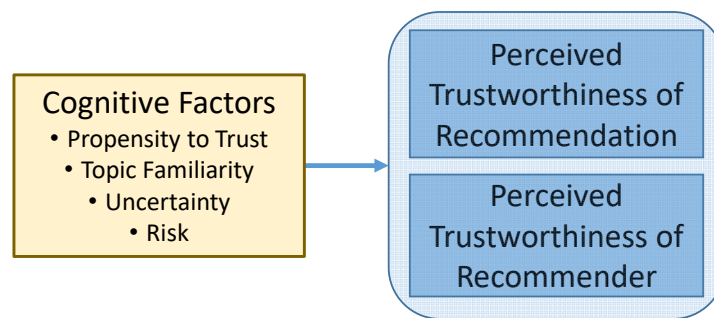


Figure 10 Cognitive factors in RQ2

Propensity to Trust. *Propensity to Trust* was measured during the introductory interview. The participants self-evaluated and answered in 5-Lickert scales (from strongly agree to strongly disagree) after reading each of the eight sentences about tendency to trustworthiness (see Chapter 4). The scores of reversed sentences (i.e., #3, #4, #5, and #7) are inverted backward, and then summed up with other scores. As results, the trust tendency scores of the participants ranged from the lowest score 16 to the highest score 32 out of 40 points, and the average was 24. For each case, the original total scores of 40 were scaled down to 5 in order to be consistent with the scores of other variables. The value of propensity to trust is participant-dependent.

Topic Familiarity, Uncertainty, and Risk. The measures of *Topic Familiarity*, *Uncertainty*, and *Risk* were collected from diary entries with 5-Likert scales. The values of the three variables are episode-dependent; thus, the numeric values are the same within an episode.

5.3.2 Social Factors

Figure 11 illustrates RQ3. Social factors were collected to answer RQ3 and RQ4, and the related questions were asked in terms of the strength, length, and closeness of relationship with a recommender in the diary, and perceived homophily during interviews.

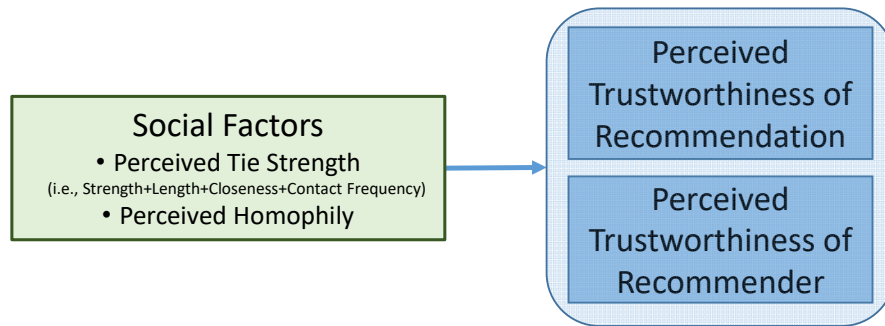


Figure 11 Social factors in RQ3

Perceived Tie Strength. In the quantitative analysis, social factors refer to perceived *Tie Strength* (Figure 11). Participants recorded in the diary how they evaluated recommender(s), based on their own perception, in terms of the *Strength*, *Length*, and *Closeness of Relationship* with a recommender in 5-Lickert scales and *Contact Frequency* with eight multiple choices such as every day, several times per week, etc. In

the analysis, contact frequency (i.e., 0-8 scores) was scaled down to 5 in order to be consistent with the scores of other variables.

Principal component analysis (PCA) with varimax rotation was conducted to assess the underlying structure, how the four variables of tie strength cluster.

Theoretically, strength, length, and closeness are the measures of tie strength (see Levin & Cross, 2004; Marsden & Campbell 1984; Marsden & Campbell, 2012). The perceived contact frequency was added to refine the measurement.

Table 12

Factor Loading for the Rotate Factors of Strength, Length, Closeness, and Contact Frequency (one component extracted from PCA)

Items	Factor Loading	Communalities
	Perceived Tie Strength	
Strength	0.907	0.823
Length	0.886	0.784
Closeness	0.930	0.866
Contact Frequency	0.770	0.594
Eigenvalues	3.067	
% of variance	76.664	

The results of PCA revealed *Strength*, *Length*, *Closeness*, and *Contact Frequency* as a latent variable, *Perceived Tie Strength* (Table 12). This latent variable accounted for 76.66%; that is, the percent of covariance among items accounted for by each factor before and after rotation. The communalities represent the relation between the variable and all other variables. If many communalities are low ($< .03$), a small sample size is more likely distort results, but this is not the case in this analysis. The eigenvalues refer to the variance accounted for, in terms of the number of (items' worth of variance) each

explains. Here, the variable “*Perceived Tie Strength*” explains almost as much variance as in four items. Therefore, it is legitimate to combine them (e.g., summing or averaging), and a new composite variable, *Perceived Tie Strength*, was calculated by averaging the four values of these four items.

Perceived Homophily. As one of social factors, questions in terms of homophily were asked during the interviews, and collected qualitatively, not in numeric values. If necessary, I asked how a participant perceived and evaluated the similarities or differences with a recommender such as tastes, interests, backgrounds, demographics, situations, etc. (e.g., recommender is like me; suggestions based on who bought this item also bought other items, etc.), and how those perception affected the trustworthiness evaluation (Berry, Blonquist, Pozzar, & Nayak, 2018; Kusumasondjaja, 2015; Lapidés, Chokshi, Carpendale, & Greenberg, 2015). The data about *Homophily* were qualitatively analyzed in NVivo12, and the coding scheme for *Homophily* (Table 13) is as follows:

Table 13
Descriptions of Homophily Coded

Codes		Descriptions
Status homophily	Ascribed	Based on informal or formal status Include the major sociodemographic dimensions that stratify society-ascribed characteristics E.g., gender, age, ethnicity, etc.
	Acquired	E.g., religion, education, occupation, behavior pattern, etc.
Value (or cognitive) homophily		Based on attitudes, belief, ethics, values, etc. Include the wide variety of internal states presumed to shape our orientation toward future behavior E.g., perceived similar interests, preference to users
Heterophily		Love of the different Degree to which pairs of individuals who interact are different with respect to certain attributes

5.3.3 Interactions between Cognitive and Social Factors

Interactions are often-occurring and an important aspect of behavioral science. It provides a researcher with a better representation and understanding of the relationship between the dependent variable (DV) and independent variables (IVs) (Figure 12). Interaction effects refer to the effects of one IV depend on the level of another IV; that is, how two or more IVs work together to impact the DV. In this study, the five main effects, IVs—*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty* as cognitive factors, and *Tie Strength* as a social factor—are involved in a research design (Figure 13), the effect of one IV on the DV may not be the same at all levels of the other IVs. There is more to consider than simply the “main effect” of each of the IVs.

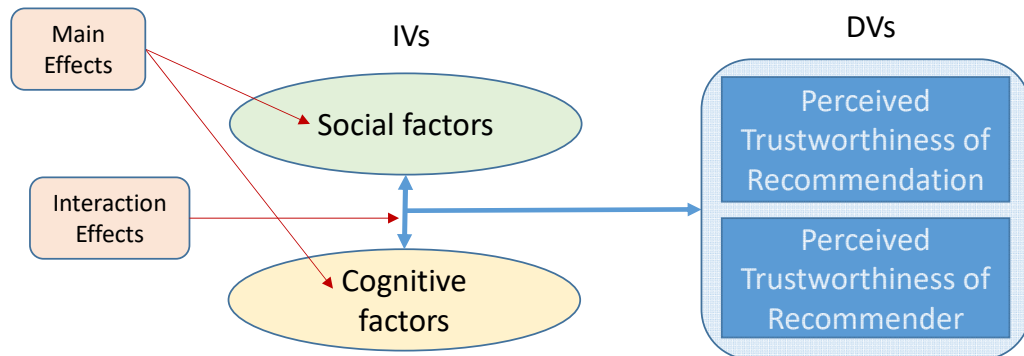


Figure 12 Main and interaction effects in RQ4

In order to investigate interaction effects between cognitive and social factors, linear regression analysis is adopted. Interaction effects incorporated into the regression model may enhance and broaden the understanding of the relationships among the predictors. Interaction effects were obtained from the products (multiplication) of *Tie Strength* and each of the four cognitive factors (see Chapter 4). The four interaction

terms are as follows: (a) *Propensity to Trust* multiplied by *Tie Strength* ($Propen * Tie$); (b) *Topic Familiarity* multiplied by *Tie Strength* ($TopFam * Tie$); (c) *Risk* multiplied by *Tie Strength* ($Risk * Tie$); and (d) *Uncertainty* multiplied by *Tie Strength* ($Uncert * Tie$).

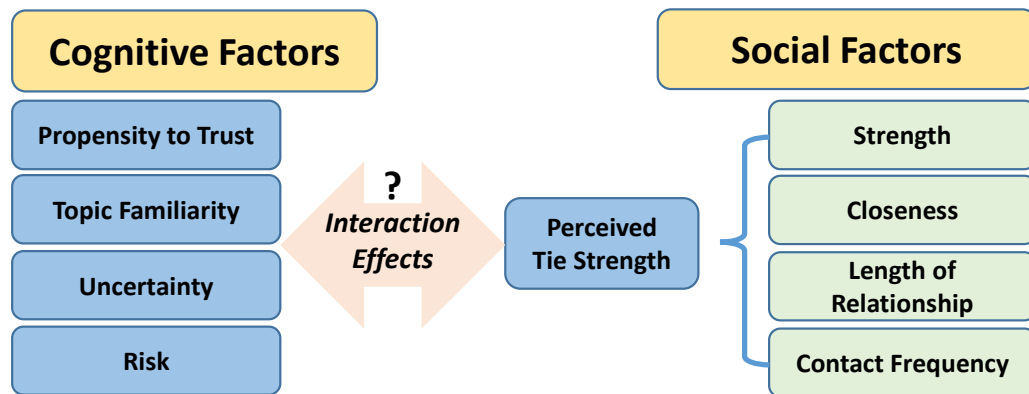


Figure 13 IVs explored in RQ4

CHAPTER 6 RESULTS

This chapter presents findings from this study, including an overview of the results of recruited participants and collected data descriptions. Also, data analysis results are reported to answer the four RQs: (1) reasons for recommendation seeking, (2) the influence of cognitive factors on the trustworthiness evaluation, (3) the influence of social factors on the trustworthiness evaluation, and (4) the interaction effects between the cognitive and social factors on the trustworthiness evaluation of recommendations and recommenders.

6.1 Overall Description of Collected Data

From 33 participants of this study, 229 diary entries and 33 post-diary interviews were collected. The average number of one-week diary entries per respondent was 6.9, and it ranged from 2 to 14.

6.1.1 Participants

Recruitment for this study started in August 2017 and ended in March 2018 when the planned ten participants in each group (proposed total number of participants = 30) were volunteered to participate. They were recruited with a purposive sampling technique (IRB approval number: E16-748). Consequently, thirty-three college students ($N = 33$; Table 14) finished the whole sessions: introductory interview, one-week diary, and post-diary interview. The recruitment sites varied in the states of New York and New Jersey, and the majority of students volunteered from Rutgers University and New York University. Twenty four participants (72.7%) were recruited from Rutgers

University, and the rest ($N = 9$ or 27.3%) were voluntarily participated from New York University. The specific school associations of participants are not reported here for a privacy reason.

I tried to balance the number of participants from different genders as much as possible. As results, gender distributions are evenly proportioned: 16 females (48.5%) and 17 males (51.5%) among 33 participants (Table 14). Also, the groups of college students were balanced in order to obtain the wider variety of recommendation seeking activities, and consisted of undergraduate ($N = 12$), master ($N = 11$), and doctoral ($N = 10$) students.

Table 14
Completed Participants and their Gender in each Academic Group

Academic Group	Number Participated	Gender	
		Female	Male
Undergraduates (UG)	12	6	6
Master Students (M)	11	5	6
Doctoral Students (PhD)	10	5	5
Total	33	16 (48.5%)	17 (51.5%)

In terms of study fields, 66.6% of participants ($N = 22$) study social science or humanity, while 33.4% of them ($N = 11$) are in the field of STEM (Table 15). More than half of students ($N = 18$; 54.5%) are between the age of 18 and 24 (i.e., post-millennials) and thirteen students ($N = 13$; 39.4%) were aged between 25 and 34 (i.e., millennials). Two students are between 35 and 44 (i.e., Generation X) (Table 15).

Table 15
Study Fields and Age Groups of Participants

Participant Group	Field of Study		Age Group		
	Social Sci.& Humanity	STEM	18-24 (Post-millennials)	25-34 (Millennials)	35-44 (GenerationX)
UG	11	1	11	1	0
M	6	5	5	5	1
P	5	5	2	7	1
Total	22	11	18	13	2
%	66.6%	33.4%	54.5%	39.4%	6%

The study participants are not representatives of the whole U.S. population, but rather can show some parts of behavioral patterns of young university students. The wide range of student population in this study offered various recommendation seeking activities.

6.1.2 Characteristics of Collected Recommendations

Recommendation-related Episodes. In this study, people received recommendations by either directly asking, or actively seeking. Passive seeking was excluded from the study. The scope of recommendation acquisition is narrower than that of information seeking since only recommendation-related activities were observed. Two hundred and twenty nine episodes ($N = 229$) were initially submitted from 33 participants (Table 16). All episodes were examined if the recorded ones are met the aforementioned criteria (see Chapter 5). Among 229 episodes, seventy six episodes ($N = 76$ or 33.2%) were classified as non-recommendation-related episodes, and 153 episodes (66.8%) were identified as recommendation-related episodes (Table 16). None of four episodes

submitted by P24 meet the definition of recommendation seeking behavior. Actually, data from thirty-two participants were used for this analysis.

Table 16
Number of Recommendation-related Episodes

Episodes by Recommendation-Related Criteria	Freq.	%
Recommendation-related Episodes	153	66.8%
Non-Recommendation-related Episodes	76	33.2%
Total	229	100%

Episodes with Single or Multiple Recommendations or Recommenders. For each episode, the participant was asked to record all recommendations from the recommenders or sources. The number of recommenders or sources interacted with a participant for an episode varied from one to five. Out of total 229 episodes, eighty seven ($N = 87$ or 38%) included recommendations from multiple recommenders, while 142 episodes' (62%) recommendations were provided by a single recommender or source (Table 17). The reasons for single versus multiple recommender(s)/source(s) were not asked, and had to be speculated from the diary entries and/or interviews. These reasons may depend on each participant's circumstances, network sizes, personal capacity, etc.

Table 17
Number of Recommendation-Related Episodes with Single or Multiple Source(s)

Episodes by Recommendation-related Criteria	Single Source	Multiple Sources	Total	%
Recommendation-related Episodes	88	65	153	66.8%
Non-Recommendation-related Episodes	54	22	76	33.2%
Total	142	87	229	100%
%	62.0%	38.0%	100%	

The summary of the cases (Table 18) displays single or multiple recommendations received. The recommendation-related episodes were split by one recommendation from one recommender for the quantitative analysis (see Chapter 5). In recommendation-related episodes, sixty three episodes ($N = 63$) consisted of multiple recommendations from more than one recommender, while 87 episodes (34%) are from one recommendation from one recommenders. For instance, 22 episodes have three different recommendations from three different recommenders. Therefore, 153 episodes became 260 cases after being separated by one recommender and/or one recommendation. For the statistical analysis, cases with missing values were eliminated, and the final number of cases resulted in 257 cases.

Table 18

Cases of Recommendation-related Episodes with Single or Multiple Recommendations

Single or Multiple	Number of Recommenders	Number of Episodes	Total Number of Recommendations
One Recommendation	1	88	88
Multiple Recommendations	2	34	68
	3	22	66
	4	2	8
	5	6	30
	Sub-Total	65	172
Total N of cases		153	260

Topics of Recommendation-related Episodes. The recommendation episodes were grouped by similar topics (Table 19 and Figure 14). Fourteen groups are identified, including *Miscellaneous*, where the episode topics with only one occurrence do not belong to any categories identified. Unlike restaurant/menu choices or shopping-related episodes, the most episodes in *Miscellaneous* were mostly rare events in everyday life

such as wedding venue seeking, immigration lawyer recommendation, vehicle repair, etc. Among identified categories, the restaurant-related episodes including menu choices were mostly sought. Many participants asked about which restaurant to go for a special event or for everyday meal, which menu to choose during the first visit to the eatery, which menu to try out of their routine choices, etc. Then, health-related episodes were second mostly asked, followed by study and shopping-related episodes.

Table 19
Identified Topic Categories of Recommendation Episodes

Episode Topic Categories	Freq.	Examples	UG	M	D
1.Career/job	14	Interview preparation, getting into a finance company	5	8	1
2.Chores	2	Babysitting, cleaning shirt stains	2	0	0
3.Entertainment	11	Movies, music, TV shows, books (for leisure)	1	4	6
4.Financial	3	Investing bitcoin, car insurance	0	0	3
5.Health	17	Cuts/burns, workout, sleep hygiene, medication, weight loss, gym	9	7	1
6.Restaurant/menu	26	Restaurant and/or menu choices	6	11	9
7.Relationship	5	Issues in relationships	4	1	0
8.Shopping	13	Laptop computer, headset, jump rope, speaker, basketball purchases	2	1	10
9.Learning/study /research	14	Class assignments, research tools, research problem	9	2	3
10.Style/fashion	8	Attire choices for events	7	0	1
11.Time management	6	Exam preparation, multiple tasks/assignments	3	3	0
12.Travel	12	Hotels, tours, transportations	3	7	2
13.Work	4	Customer service issues	0	0	4
14.Miscellaneous	18	Bike repair, car maintenance, wedding venue, garage sale, leisure time, moving, parking, home repair, immigration lawyer, tech issue	5	8	5
Total	153		56	52	45

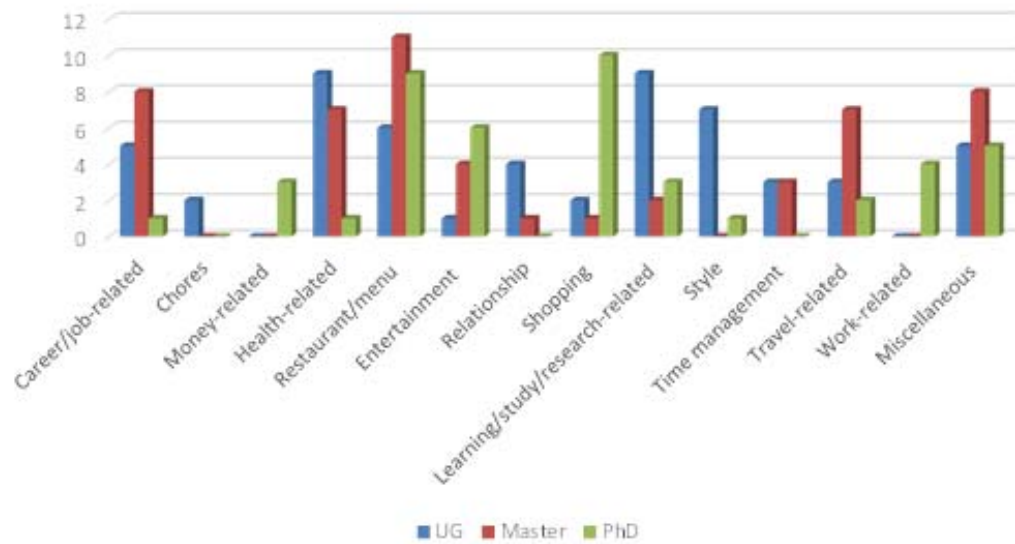


Figure 14 Topic categories by participant groups

Table 20

Frequency Distribution and Mean Values of Recommender Trustworthiness Evaluation in terms of Episode Topic Categories

Episode Topic Categories	Recommender Trustworthiness						Trust Mean
	5	4	3	2	1	Total Freq.	
1.Career/job	24	4	0	1	0	29	4.8
2.Chores	1	1	0	0	0	2	4.5
3.Entertainment	5	5	2	1	0	13	4.1
4.Financial	2	1	0	0	0	3	4.7
5.Health	13	4	7	2	1	27	4.0
6.Restaurant/menu	12	17	7	1	0	37	4.1
7.Relationship	7	2	0	0	0	9	4.8
8.Shopping	9	10	2	2	1	24	4.0
9.Learning/study/research	6	4	3	2	1	16	3.8
10.Style/fashion	20	5	1	0	1	27	4.6
11.Time management	3	2	2	0	0	7	4.1
12.Travel	9	10	6	2	0	27	4.0
13.Work	1	3	1	0	0	5	4.0
14.Miscellaneous	17	9	4	1	0	31	4.4
Total Freq.	129	77	35	12	4	257	4.2
Marginal %	47.5	31.1	13.6	7.0	0.8		

5: Very trustworthy; 1: Very untrustworthy

It appears that most recommendations were considered as trustworthy for the participants' recommendation needs (Table 21). More than three quarters of the recommendations (78.6%) are evaluated as either *Somewhat Trustworthy* ($N = 77$; 31.1%) or *Very Trustworthy* ($N = 129$; 47.5%). The recommenders who gave recommendations about *Career/Job* or *Relationship* were the most trustworthy (Avg. =4.8) while the *Learning/Study/Research* recommenders were the least trustworthy (Avg. =3.8) (Table 20). In the cases of recommendation trustworthiness (Table 21), the recommendations about *Relationship* were the most trustworthy (Avg. =4.8), and those about Financial were the least trustworthy (Avg. =3.7).

Table 21

Frequency Distribution and Mean Values of Recommendation Trustworthiness
Evaluation in terms of Episode Topic Categories

Episode Topic Categories	Recommendation Trustworthiness						Trust Mean
	5	4	3	2	1	Total Freq.	
1.Career/job	23	4	0	2	0	29	4.7
2.Chores	1	1	0	0	0	2	4.5
3.Entertainment	5	6	2	0	0	13	4.2
4.Financial	0	2	1	0	0	3	3.7
5.Health	12	8	4	2	1	27	4.0
6.Restaurant/menu	10	14	12	1	0	37	3.9
7.Relationship	7	2	0	0	0	9	4.8
8.Shopping	7	12	2	3	0	24	4.0
9.Learning/study/research	9	4	1	2	0	16	4.3
10.Style/fashion	19	2	2	3	1	27	4.3
11.Time management	5	0	0	2	0	7	4.1
12.Travel	8	11	6	2	0	27	3.9
13.Work	2	3	0	0	0	5	4.4
14.Miscellaneous	14	11	5	1	0	31	4.2
Total	122	80	35	18	2	257	4.2
Marginal %	47.5	31.1	13.6	7.0	0.8		

5: Very trustworthy; 1: Very untrustworthy

6.1.3 Characteristics of Recommenders Interacted by Participants

The participants interacted with diverse recommenders or sources, categorized into the following groups: *Acquaintance*, *Co-worker*, *Family*, *Friends*, *Self*, *Strangers*, and *Online Users/Web* (Table 22). Recommendation episodes with the categories of *Self* ($N = 2$) were eliminated from the further analyses since they do not meet our criteria of recommenders (see Chapter 5). *Online Users* include reviewers on review websites, users at a forum, commenters, bloggers, peer users of a website, etc., and they meet in online spaces randomly and have no social relationship in reality. Overall, the mostly-sought recommenders were *Friends* (30%) followed by the various types of *Online Users/Web* (23.3%) and *Family* (19.5%).

Table 22

Types of Recommenders with Whom Participants Interacted

Tie	Recommenders	<i>Freq.</i>	%	Examples	UG	M	D
Yes	Acquaintance	24	9.1%	neighbor, friend of friend, family friend	8	13	3
	Co-worker	22	8.4%	lab mates	4	2	16
	Family	51	19.5%	parents, siblings, relatives, wife, husband	32	16	3
	Friends	78	30.0%	roommates, classmates, grade-school friends	46	26	6
	Sub-total	175	67.6%		90	57	28
No	Strangers	21	8.0%	taxi driver, policeman, hotel staff, park rangers, woman on the street	2	16	3
	Online Users/Web	61	23.7%	reviewers at Yelp or Amazon, online forum users, commenters, bloggers, websites where recommend something	13	12	36
	Sub-total	84	31.7%		15	28	39
Total		257	100%		105	85	67

The recommender types with whom each participant group interacted are also presented in Table 22. *Undergraduates* and *Master Students* preferred to ask their *Friends*, 43% and 30.2% respectively, while *Doctoral Students* mostly interacted with online recommenders/sources (i.e., *Online Users/Web*, 53.7%) followed by *Co-workers* (24.2%). It can be assumed that most doctoral students might be more independent or have more complicated lives than the others, and could not rely as much on the pool of family. Indeed, in the interviews, they said that they were living away from their hometowns where their close family members and friends live, and spent most of their time, working in a lab or doctoral students' offices.

Table 23

Frequency Distribution and Mean Values of Recommender Trustworthiness Evaluation in terms of Recommender Types

Tie	Recommender Type	Recommender Trustworthiness						Trust Mean
		5	4	3	2	1	Total Freq.	
Yes	1.Acquaintance	18	4	1	1	0	24	4.6.
	2.Co-worker	11	8	1	0	2	22	4.2
	3.Family	36	9	4	0	2	51	4.5
	4.Friends	42	25	9	2	0	78	4.4
No	5.Strangers	7	6	6	2	0	21	3.9
	6.Online Users/Web	15	25	14	7	0	61	3.8
Total		129	77	35	12	4	257	4.2
Marginal %		47.5%	31.1%	13.6%	7.0%	0.8%		

5: Very trustworthy; 1: Very untrustworthy

It appears that most of the recommenders the participants interacted with were considered as trustworthy sources for their recommendation needs. Two hundred and six recommenders (78.6%) were evaluated as *Somewhat Trustworthy* ($N = 77$) or *Very*

Trustworthy ($N = 129$) (Table 23). *Acquaintances* as recommenders were perceived the most trustworthy (Avg. =4.6) regarding the participants' recommendation needs, and *Online Users/Web* were least trustworthy (Avg. =3.8). The recommendations from *Acquaintances* were evaluated as most trustworthy (Avg. =4.7) while the recommendations from *Strangers* were least trustworthy (Avg. =3.7) followed by *Online Users/Web* (Avg. =3.8) (Table 24). Overall, recommendations from people with ties were more trustworthy.

Table 24

Frequency Distribution and Mean Values of Recommendation Trustworthiness
Evaluation in terms of Recommender Types

Tie	Recommender Type	Recommendation Trustworthiness						
		5	4	3	2	1	Total Freq.	Trust Mean
Yes	1.Acquaintance	17	7	0	0	0	24	4.7
	2.Co-worker	7	14	0	1	0	22	4.2
	3.Family	34	8	2	7	0	51	4.4
	4.Friends	45	19	10	3	1	78	4.3
No	5.Strangers	5	6	8	2	0	21	3.7
	6.Online Users/Web	14	26	15	5	1	61	3.8
Total		122	80	35	18	2	257	
Marginal %		47.5%	31.1%	13.6%	7.0%	0.8%		

5: Very trustworthy; 1: Very untrustworthy

6.1.4 Characteristics of Collected Cognitive Factors

The case summary of cognitive factors (Table 25) shows the occurrence of cases that participants answered to the questions about their problem evaluation in terms of *Familiarity*, *Uncertainty*, and *Risk* in the diary. The summary indicates that 66% of

recommendation need situations have high familiarity to respondents, and about 23% of problems have low familiarity. Results in terms of uncertainty and risk indicated 51% of issues as relatively high uncertainty; 32.5% of them as low uncertainty; 32% of issues as relatively high risk; and 56% of low risk. To summarize the characteristics of recommendation need situations, more than half of issues reported as high familiarity, high uncertainty, and low risk. The column, unique number of episodes refers to the number of episodes submitted by participants while the column the number of episodes after splitting by recommenders presents the number of episodes divided by different recommenders interacted with the participant in order to receive different recommendations.

Table 25 Case Summary of Cognitive Factors

		Unique # of episodes		# of episodes after splitting by recommenders	
		N	Marginal Percentage (%)	N	Marginal Percentage (%)
Familiarity	1 very unfamiliar	15	9.93	24	9.3
	2 somewhat unfamiliar	19	12.58	38	14.8
	3 neither familiar nor unfamiliar	18	11.92	24	9.3
	4 somewhat familiar	53	35.10	97	37.7
	5 very familiar	46	30.46	74	28.8
Uncertainty	1 very certain	12	7.95	21	8.2
	2 somewhat certain	37	24.50	73	28.4
	3 neither uncertain nor certain	24	15.89	34	13.2
	4 somewhat uncertain	51	33.77	84	32.7
	5 very uncertain	27	17.88	45	17.5
Risk	1 very safe	57	37.75	88	34.2
	2 somewhat safe	27	17.88	52	20.2
	3 neither risky nor safe	18	11.92	30	11.7
	4 somewhat risky	37	24.50	73	28.4
	5 very risky	12	7.95	14	5.4
Valid		150	100	257	100

6.2 Qualitative Analyses of Trustworthiness Evaluation

In addition to the quantitative measures of the trustworthiness evaluation of recommendations and recommenders in the diaries, the participants responded what factors were most influential when answering the trustworthiness scores. Any phrases in the interview transcripts, implying or expressing the trustworthiness evaluation of recommendations or recommenders were coded. As results of the latent and manifest content analyses, eight categories appeared in the trustworthiness evaluation of recommendations such as *Accuracy*, *Balance*, etc. (Table 26 and 27), while six categories were recognized in that of recommenders such as *Anonymity*, *Authority*, etc. (Table 28 and 29). The following sections introduce the definitions and examples of qualitative codes in the trustworthiness evaluation of recommendations and recommenders. Detailed discussion will be followed later in the discussion section (see Chapter 7).

6.2.1 Qualitative Evaluation of Recommendation Trustworthiness

Data analysis revealed eight key categories of the influential factors on the trustworthiness evaluation of recommendations: *Accuracy*, *Balance*, *Consistency*, *Credibility*, *Description or Presentation Quality*, *Plausibility*, *Quality of Entity*, and *Quantifiable Cues* (e.g., rankings and ratings) (Table 26 and 27). These aspects were important for the participants to evaluate the level of recommendation trustworthiness.

Quality of Description or Presentation. Twenty four participants in their episodes mentioned that the factor, *Quality of Description or Presentation* is influential when evaluating *Recommendation Trustworthiness*. *Quality of Description or Presentation* in a recommendation was defined as how well-written and/or -described the

recommendation was. Some participants pointed out that short descriptions or vague expressions made them difficult to identify or evaluate trustworthiness regarding the recommender's truth or real experience; thus, less trustworthy recommendations were perceived. Meanwhile, detailed or specified information or long explanation (or reviews) about their real experiences, especially in online reviews were helpful to figure out *Recommendation Trustworthiness*. In addition, depending on how the recommendation is described, it can attract or entice the recommendation recipient's interest or can evoke his/her curiosity. On the other hand, some participants responded that the clarity of a recommendation description is an important aspect when they assigned how trustworthy the recommendation is. As another component of *Quality of Description or Presentation*, visual cues such as photos, videos, etc. are mentioned.

Table 26
Number of Participants and Coded Phrases with each Influential Factors

Factors	Number of Participants	Number of Coded Phrases
1. Accuracy	2	3
2. Balance	3	5
3. Consistency	17	28
4. Credibility	9	15
5. Description (Presentation) Quality	24	82
6. Plausibility	8	16
7. Quality of Entity	11	18
8. Quantifiable Cues	14	27

Note: Number of Participants means how many participants mentioned the corresponding factors during their interviews.

Table 27

Definitions and Examples of Influential Factors on Trustworthiness Evaluation of Recommendation

Factors	Definitions	Examples
1. Accuracy	<ul style="list-style-type: none"> • Being correct or precise 	<ul style="list-style-type: none"> • Amazon Reviews are usually very accurate. It is more accurate if looking at products that got hundreds of reviews. Increasing the data set of reviews gives the reviews more weight and trustworthiness. If the reviewers upload pictures, it is even more reliable because it shows visual proof of what they are discussing in the review.
2. Balance	<ul style="list-style-type: none"> • Taking into account different opinions and presenting information in a fair and reasonable way. • Different or opposite elements are equally proportionated. • Degree of balance: how much skewed toward one side. • Unbiased: showing no prejudice for or against something. 	<ul style="list-style-type: none"> • He pointed out several places. It was like this place has burgers; this place is pizza; this place has sandwiches that kind of stuff. And then we asked him specifically about the pizza place like what he thought about it if he would recommend it. And he did so. He gave us a general informational overview.
3. Consistency	<ul style="list-style-type: none"> • Overall trend or pattern in reviews: how overall contents/ideas in various sources, reviews, & comments converge to or diverge from a certain viewpoint (e.g., positive or negative) • Concurrence: similar or same contents appear in many places. • e.g., what most reviewers say about a certain aspect 	<ul style="list-style-type: none"> • I usually look to see if there are any negative reviews to see what they have to say about it. So I get an idea of what potential bad things are going to be about it. And usually it depends on the situation but sometimes it's just something about services or something wasn't good on that day. But then if I read through other reviews, others say service was great. And they have an overall higher rating. Then usually I think that maybe it was an off day or they just had a bad experience. But if

		looking at the other reviews, it sounds like the place is a good place to go to.
4. Credibility	<ul style="list-style-type: none"> • Includes reliability & believability • Convincing • Recent or up-to-date recommendation 	<ul style="list-style-type: none"> • I did find 12 easy and reliable realistic recommendations from this Harvard Medical School site and they were really basic. [...] I think this one was the most reliable. [...] His advice, I can consider credible because he usually is a level headed individual. And he also knows me that I had sleep problems before. So that was my judgment with him. But it was more prompt for him. The website I determined was just because it was a medical school.
5. Description or Presentation Quality	<ul style="list-style-type: none"> • Quality of writing or expression: how well-written and/or well-described • Attractive or interesting • Entices a recipient's curiosity. • Detailed or specified • Clarity • Offering visual cues (e.g., photos, videos, etc.) 	<ul style="list-style-type: none"> • So in some cases where they provide very detailed comments maybe more than 200 words. I think this is very detail, this is trustworthy. But sometimes the only three or two words like very bad, too bad, or I'll never try. I don't know whether it's trustworthy or not because maybe it's not. It's not about the shop. Maybe it's something personal. I don't know.
6. Plausibility	<ul style="list-style-type: none"> • Reasonable • Understandable 	<ul style="list-style-type: none"> • I was told to forgo the retail shift because they pay less than my main job and the added stress would not be worth the reduced pay boost from a short retail shift. It really just made sense in the end while I am trying to raise as much money as possible for my trip... • I asked if I should sell a jacket for \$30 at a garage sale. Then received a lower price of 20 because 30 was too much for garage sale scenario Accepted because made sense because of the reason he gave on the price suggestion.
7. Quality of Entity	<ul style="list-style-type: none"> • Indicating or implying the quality of recommended 	<ul style="list-style-type: none"> • I reserved a room through this website. I bought the BB Inn. It seems clean and

	entities (e.g., products, items, etc.)	also close to the campus with reasonable price. • I decided to go to one place over the other as reviews were all good for one place and very mixed for the other. Considered reviews about quality of the food and of the service
8. Quantifiable Cues	<ul style="list-style-type: none"> • Popularity such as number of clicks, views, or people purchased. • Number of comments or reviews. • Rankings: any ranked item offered by a website or system. • Ratings: scores (e.g., number of stars) given by users. 	<ul style="list-style-type: none"> • The length of the comments, and how many comments. For example, if auto body shop has a thousand comments and most of them are good. Then probably I'll pick this shop. But for another about auto body shop, maybe it has comments all good, but only five or 10 comments and probably I will think about it. • The top-ranked one is popular among customers and has plenty of good comments.

6.2.2 Qualitative Evaluation of Recommender Trustworthiness

Communication researchers (Burgoon, Blair, & Strom, 2008; Burgoon & Levin, 2010) states that in online settings (i.e., recommenders are mostly strangers), people trust general impression of honesty and truthfulness, and rely on nonverbal cues without paying proper attention to their actual veracity. In face-to-face setting, the participants rely on verbal cues as well as experience with sources or recommenders. Thus, the characteristics or traits of recommenders are important factors in recommender-recommendation seeker interaction.

Data analysis identified six key categories of the influential features on the trustworthiness evaluation of recommenders: *Anonymity*, *Authority*, *Benevolence*, *Competence*, *Personality*, and *Reputation* (Table 28 and 29). These aspects were important for the participants to evaluate the level of recommender trustworthiness.

Table 28

Number of Participants and Coded Phrases with each Influential Factors

Factors	Number of Participants	Number of Coded Phrases
1. Anonymity	8	11
2. Authority	9	14
3. Benevolence	10	18
4. Competence (Expertise)	27	81
5. Personality (Characteristics; Ethos)	13	23
6. Reputation	5	9

Table 29

Definitions and Examples of Influential Factors on Trustworthiness Evaluation of Recommenders

Factors	Definition	Examples
1. Anonymity	<ul style="list-style-type: none"> • Anonymous or unknown • e.g., I don't know who are recommenders; thus I don't trust them. 	<ul style="list-style-type: none"> • I decided to accept my mom's recommendation over the internet recommendations because obviously her suggestion was not only more proactive, but she was a more verifiable source since she is well known to me and live in person. • They're anonymous because it's all people from the internet behind created usernames so it's who are they really telling me this stuff.
2. Authority	<ul style="list-style-type: none"> • Recommender's power to influence a recipient, especially because of a recommender's commanding manner. • Recommender's power or right to make decisions, and enforce obedience on the recipient. 	<ul style="list-style-type: none"> • She hasn't any authority; she's not a doctor or anything. She's my mom. I know her very intimately. I know where you're coming from my own or what you're saying. So even though she doesn't have medical authority to herself. Maybe it's based on my experience with her for a long time.

3. Benevolence	<ul style="list-style-type: none"> • Positive intention, no reason to harm. • Good will/intention that the recommender has when providing a recommendation • A recommender will act in the best interest of the recipient. • Includes integrity (i.e., extent to which the recipient perceives the recommender as acting in accordance with a set of values and norms shared with, or acceptable to, the recipient) • Truthfulness of a recommender or a source 	<ul style="list-style-type: none"> • I figured they have no reason to lie to me. They are friends and family. I would just assume that what they're saying is the truth pretty much. In this case, if my husband was to recommend the place then I would generally believe him that he would do so knowing that I would like it. • So one thing that makes her trustworthy because she cares about your health.
4. Competence (Expertise)	<ul style="list-style-type: none"> • Ability, talent, skill, knowledge, or proficiency in the topic. • Expertise in the areas of recommendation needs. • Degree (including lack) of competence or expertise. • Recommender with appropriate credentials • Recommender's Experience – Focusing on a source's direct and/or indirect experiences about issues when evaluating the trustworthiness of a recommender 	<ul style="list-style-type: none"> • In this particular case it was an author whose books I read before I trust his opinion and he's also well-known and trusted and he's made movies out of the books about diet and about food. So he's like a well-known person. • My lab mate is an expert in data analysis, he knows what is good for the analysis... • I decided not to accept my parents' recommendations for this issue because they themselves are both very overweight and seemed to me to be projecting their own failures in this department onto me by telling me it was not necessary to exercise every day in order to guarantee weight loss.
5. Personality (Characteristic s; Ethos)	<ul style="list-style-type: none"> • Personal characteristics or personality of a recommender such as hard-working, well-organized, patient, level-headed, kind, 	<ul style="list-style-type: none"> • What she recommended was trustworthy because it makes sense if you're not feeling well, take a mental health treatment. But that being said, from how I know Anne, she's also not

	friendly, etc. • Recommender's personal background • Attitude toward a recipient or problem: Recommender's settled way of thinking or feeling about a recipient, typically one that is reflected in a person's behavior.	very well good with handling money. She didn't quite understand me to work. So that's why I ended up not accepting her recommendation. • My dad is a very-work focused individual. I feel like this was a conflict of job. [...] I asked him since he's had for a lifetime of wisdom to gather what you think I should do. I didn't take the retail shift.
6. Reputation	• Broader population's beliefs or opinions on a recommender or a source. • Widespread belief that a recommender has.	• In this particular case it was an author whose books I read before I trust his opinion and he's also well-known and trusted and he's made movies out of the books about diet and about food. So he's like a Well-known person. • I decided to accept my boyfriend's advice because he knows me and he also has tried sleep hygiene. I decided to accept the Harvard Medical School's recommendations on sleep hygiene because they are a reputable source, and sounded most reasonable.

Next, this study reports why people sought recommendations, how cognitive factors are associated with participants' evaluation, and to what extent those factors are associated with one another.

6.3 Analyses of Recommendation Needs (RQ1)

RQ1 asks the following question. Why do people engage in recommendation seeking behavior? The answers to this question attempt to describe recommendation needs; that is, the reasons people seek a recommendation rather than other information

(i.e., those that are not categorized as recommendations). As mentioned previously, a recommendation need was defined as a situation or motivation that causes people to seek a recommendation.

6.3.1. Qualitative Analysis of Recommendation Needs

As results of qualitatively analyzing the collected data, the participants' recommendation needs were categorized into two different main criteria according to the motivation of recommendation seeking: functional and temporal (Table 30). The functional category distinguishes the participants' reactions in a recommendation need situation whether the inner motivational states ended up with handling the emotional or cognitive states during recommendation seeking. That being so, this category divided their needs into affective (changes in emotion or feeling) and cognitive (gaining knowledge due to ignorance).

The affective needs included the motivation of emotional support, risk or uncertainty reduction, confirmation need, and confidence increase. Participants collected other's experiences, second-hand knowledge, or opinions either to increase their intelligence and thereby chase their knowledge or to alleviate negative emotions such as anxiety, nervousness, etc. Cognitive needs were caused by lack of knowledge or information, and included the motivation of knowledge gaining (particularly, second-hand knowledge, decision making, planning, and solving problems. Cognitive needs in this study refer to needs for information, knowledge, and understanding of one's environment. Some participants expressed the natural need for recommendations during the process of learning, exploring, discovering and creating to better understand the

environment. Also, these needs were generated when obtaining learning skills or tools for the participants' research or study. In the cognitive needs, some participants expressed the situations with single or multiple choice(s) (Table 30). Situations with multiple choices referred to the episode where a participant lacked knowledge or was ignorant in order to make a better choice among multiple options; thus, knowledge support was necessary.

The temporal category (Table 30) reflected the timeliness of a recommendation, and consists of short-term (immediate) or long-term (future) use. Long-term uses were mostly related to the needs for recommendations for planning at the browsing stage of information seeking. Short-term uses were associated with quick and specific solutions under time constraints or for the purposes of time saving.

Table 30
Functional and Temporal Categories of Recommendation Needs

Category		Descriptions
Functional	Affective Needs	Needs for transitions from negative to positive mental states. Emotional support, confirmation acquisition, confidence gaining, and risk and uncertainty reduction.
	Cognitive Needs (multiple or single choice(s))	Needs for others' knowledge due to participant's gap or lack of knowledge about given situations or problems. Needs for second-hand knowledge such as opinions, experiences with similar situations (situational similarity), subjective ideas, suggestion for alternatives.
Temporal	Short-term Use	Need for immediate use. Situations in which participants have to make quick decisions; better or best solutions within time constraints
	Long-term Use	Need for future use (or planning). Browsing stage, collecting advices or ideas for future events

6.3.2. Examples of Qualitative Analysis: Functional Categories

Affective Needs. The participants reported that they sought recommendations when (a) the situations were uncertain, (b) negative emotional or affective status was perceived, or (c) any support, confirmation, or agreement from others is needed. For instance, P4 stated,

“My boyfriend is answering neither phone calls nor text messages a while, and I was not sure if I should be worried or not.” In one episode by P5, she responded that *“I didn't want to do it [this part-time job], but I wanted someone else to tell me not to do it.”*

In another episode about a loose tooth, she mentioned,

“I panicked and ran to my dad, who had lost his front tooth as well once, to ask what I should do. [...] My dad was confirming that I want to take care of that. I was afraid of it. So he said what I wanted to hear whereas my mom didn't. I was a little more angry towards her whereas my dad. I felt like he was on my side.”

Cognitive Needs (Single Choice). Some participants approached to the recommenders who might have knowledge or experiences for similar problems when (a) the situations were new or unfamiliar, (b) they wanted to change their routine behaviors, or (c) the lack of information was perceived. For example, P11 said that, during his trip to Disney World, he asked the restaurant recommendations to his friend who was living nearby and might know a lot about the area. As another example, P19 had a rare and unfamiliar event, and stated,

“I didn't really get a clear answer about [how to fix my chimney]. It's hard to know what to do when I know nothing about chimneys. It's kind of a rare case. Every once or twice in a lifetime to me.”

In addition, when the participants wanted to change the current situation but lacked the information about alternatives, they sought recommendations. P18 said,

“I use clouds for my citation management, which are not really a management system. I just used to use it for a storage and this method has been working. So I just kept this but found that my classmates were using Mendeley and asked them what it is. [...] Now, I realized that I need something more organized”

When P11 failed to solve an issue or needed a better solution, he surveyed how others successfully dealt with the similar situations:

“I just throw my shirt in the washing machine but didn't work well. After I got it out from the dryer, and the stain was still there. [...] So I asked Kate because she always wears clean and neat clothes.”

Cognitive Needs (Multiple Choices). When the participants wanted to confirm their selection among multiple choices, they asked recommendations such as restaurants, menus, movies, hotels, shopping items, etc. P2 sought recommendations to choose a good hotel with reasonable price or watch a good movie during a weekend. For instance, P10 responded:

“I need to find appropriate shoes to match my dress for a formal banquet I am attending this upcoming Saturday. I decided to go to Amazon to read reviews on shoes that interest me.” P28 said: *“I want to buy a headphone and did not know which one to choose.”*

6.3.3. Examples of Qualitative Analysis: Temporal Categories

Long-term Uses. This category was characterized by the situations, in which the participants needed recommendations for future uses. Some participants indicated that they are in browsing stage and were collecting advices or ideas for future events such as deciding career path, job choices, etc. For instance, P12 responded:

“I asked my friend who is in the sports radio business about a good strategy and some advice that I can use to be in the sports radio industry in the future. I asked because I am very interested in one day in the future being a sports radio personality as a career.”

Short-term Uses. This category was characterized by the situations, in which the participants needed recommendations for immediate uses. Some participants described the recommendation needs for upcoming events or situations where they had to make quick decisions in a short time, such as selecting a movie, choosing menu in a restaurant,

looking for a restaurant in an unfamiliar location, travel-related questions. For example,

P11 responded:

“I visited New York, and didn't know where and what to eat when I arrived TS. So I called a friend who lives in the city.”

P19 mentioned:

“We're going to France in a couple weeks and we are looking for recommendations for restaurants and places to visit.”

6.3.4 Code Summary from Qualitative Analysis

The number of participants, episodes, and phrases coded in NVivo12 in terms of the recommendation needs (Table 31) were assorted according to the above categories (Table 30). Within the functional category, cognitive needs was dominant with 128 coded phrases, 107 episodes, and the largest number of participants ($N = 30$). In forty three episodes ($N = 43$), the participants sought recommendations due to affective needs. Within the temporal category, there were almost 50% larger number of episodes for the long-term use ($N = 37$) than for the short-term use ($N = 23$).

Table 31
Number of Participants, Episodes, and Phrases Coded in Different Categories

Categories		Number of Participants	Number of Episodes	Number of Phrases
Functional	Affective Needs	22	62	74
	Cognitive Needs	30	107	128
Temporal	Long-term Use	14	37	25
	Short-term Use	17	23	24

6.3.5 Quantitative Analysis of Recommendation Needs

After qualitative analysis, linear regression was conducted to test the differences between the populations with affective and cognitive needs in the trustworthiness evaluation of recommenders and recommendations, compared to the results of regression analyses with the total participants. The whole population of the participants was divided into two groups, and then the analyses were run separately for each group. The results (Table 32, 33, 34, 35, and 36) showed that these two groups (participants with cognitive needs versus affective needs) were indifferent or minimally different from those of the total participants. Regardless of recommendation need types, the participants with cognitive needs showed tendency to disregard cognitive factors and rely only on social factors in the trustworthiness judgment. In other words, recommendation seeking behaviors were dominated by the social factors, which implies that they are socially oriented.

Table 32

Correlations between Functional Needs and Cognitive and Social Factors

	Affective Needs		Cognitive Needs	
	Trust- Recommender	Trust- Recommendation	Trust- Recommender	Trust- Recommendation
Propensity	0.017	0.213*	0.061	-0.001
Topic Familiar	0.076	0.124	0.139*	0.085
Risk	0.119	0.076	0.109*	0.039
Uncertainty	0.199*	0.009	0.011	-0.076
Tie Strength	0.524*	0.227*	0.407*	0.433*

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 33
Regression Analysis of Cognitive Factors with Trustworthiness of Recommender

DV		Trustworthiness of Recommenders				
Cognitive Factors		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Affective Needs	(Constant)	2.555	0.931		2.744	0.008
	Propensity	0.007	0.031	0.027	0.225	0.823
	TFamiliarity	0.178	0.097	0.255	1.837	0.070
	Risk	-0.007	0.088	-0.010	-0.077	0.939
	Uncertainty	0.272	0.119	0.349	2.286	0.025
Note: $R^2 = .088$; adjusted $R^2 = 0.038$; $F(4,73) = 1.768, p > .05$						
Cognitive Needs	(Constant)	3.432	0.525		6.541	0.000
	Propensity	0.008	0.020	0.034	0.397	0.692
	TFamiliarity	0.111	0.067	0.143	1.658	0.099
	Risk	0.090	0.066	0.117	1.370	0.173
	Uncertainty	0.003	0.072	0.004	0.048	0.962
Note: $R^2 = .035$; adjusted $R^2 = 0.008$; $F(4,145) = 1.307, p > .05$						

Table 34
Regression Analysis of Cognitive Factors with Trustworthiness of Recommendation

DV		Trustworthiness of Recommendations				
Cognitive Factors		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Affective Needs	(Constant)	1.917	1.092		1.756	0.083
	Propensity	0.067	0.037	0.222	1.830	0.071
	TFamiliarity	0.089	0.114	0.110	0.781	0.437
	Risk	0.079	0.103	0.101	0.766	0.446
	Uncertainty	0.071	0.140	0.078	0.508	0.613
Note: $R^2 = .069$; adjusted $R^2 = 0.018$; $F(4,73) = 1.358$, $p > .05$						
Cognitive Needs	(Constant)	4.065	0.477		8.524	0.000
	Propensity	0.001	0.019	0.004	0.043	0.966
	TFamiliarity	0.049	0.061	0.070	0.809	0.420
	Risk	0.046	0.060	0.066	0.772	0.441
	Uncertainty	-0.056	0.065	-0.079	-0.859	0.392
Note: $R^2 = .015$; adjusted $R^2 = -0.013$; $F(4,145) = 0.537$, $p > .05$						

Table 35

Regression Analysis of Tie Strength (DV: Trustworthiness of Recommenders)

DV		Trustworthiness of Recommenders				
Tie Strength		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Affective Needs	(Constant)	2.913	0.278		10.473	0.000
	TieStrength	0.369	0.069	0.524	5.362	0.000
Note: $R^2 = .274$; adjusted $R^2 = 0.265$; $F(1,76) = 28.750$, $p < .05$						
Cognitive Needs	(Constant)	3.322	0.182		18.228	0.000
	TieStrength	0.274	0.050	0.407	5.426	0.000
Note: $R^2 = .166$; adjusted $R^2 = 0.160$; $F(1,148) = 29.438$, $p < .05$						

Table 36

Regression Analysis of Tie Strength (DV: Trustworthiness of Recommendations)

DV		Trustworthiness of Recommendations				
Tie Strength		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
Affective Needs	(Constant)	3.549	0.369		9.619	0.000
	TieStrength	0.185	0.091	0.227	2.030	0.046
Note: $R^2 = .051$; adjusted $R^2 = 0.039$; $F(1,76) = 4.121$, $p < .05$						
Cognitive Needs	(Constant)	3.321	0.162		20.527	0.000
	TieStrength	0.262	0.045	0.433	5.847	0.000
Note: $R^2 = .188$; adjusted $R^2 = 0.182$; $F(1,148) = 34.183$, $p < .05$						

6.4 Cognitive Factors Influencing the Evaluation of Trustworthiness (RQ2)

RQ2 asks as the following question. Do recipients' cognitive factors affect assessing the trustworthiness of the recommendations and recommenders? Cognitive factors in this study refer to a participant's propensity to trust, topic familiarity, and their evaluation of problem at hand in terms of uncertainty and risk (Figure 10). The

correlations of the data were analyzed according to the aforementioned thresholds of 0.3 and 0.5 (Cohen, 1988).

6.4.1 Relationships between Cognitive Factors and Recommendation

Trustworthiness

Table 37 includes the means, standard deviations (SD), and the correlation coefficients between each cognitive factor and the trustworthiness of the recommendations. For each cognitive factor, the mean and SD were calculated across all cases, i.e., all recommendations for all episodes. Since *Propensity to Trust* is participant-specific, so are their values for all cases of that participant. The trust tendency scores of respondents ranged from the lowest score of 2 to the highest score of 4 out of 5 (in the transformed scale from the conventional scale of 40), and the average was 2.93.

The correlation matrix indicates the low positive relationship ($|r| < .3$) between *Topic Familiarity* and *Propensity to Trust*; the moderate negative relationship ($0.3 < |r| < .5$) between *Topic Familiarity* and *Uncertainty*; and the moderate positive relationship between *Risk* and *Uncertainty*. That is, the more familiar a participant was with a given problem topic, the less uncertainty perceived by the participant. Also, if a participant was more uncertain with a given problem topic, more risk was perceived. The correlation between *Topic Familiarity* and *Propensity to Trust* does not make sense conceptually, and must be no correlation. This result may be caused by the data duplication of the scores of *Propensity to Trust* and *Topic Familiarity* because when the episodes were not expanded by the number of recommendations received, the correlation of the two were not statistically significant ($p = .088$). The correlations between *Propensity to Trust* and

Risk, *Propensity to Trust* and *Uncertainty*, and *Topic Familiarity* and *Risk* were not statically significant ($p > 0.01$).

The correlations between *Trustworthiness of Recommendation* and the cognitive factors were not statically significant ($p > 0.01$). In other words, none of the cognitive factors alone as predictors was statistically meaningfully related with *Trustworthiness of Recommendation*. Note that, in these results, the one on one correlation between the trustworthiness of recommendation and each of the cognitive factors was obtained without taking into account their combined or coupled effects.

Table 37

Descriptive Statistics of Trustworthiness and Cognitive Factors

Variable ($N = 257$)	Mean	SD	Correlation Coefficients (r)			
			1	2	3	4
Trustworthiness of Recommendation	4.18	0.966	0.032	0.094	0.039	-0.011
Trustworthiness of Recommender	4.23	0.958	0.024	0.082	0.089	0.089
Predictors						
1. <i>Propensity to Trust</i>	2.93	0.485		0.182**	-0.060	0.054
2. <i>Topic Familiarity</i>	3.62	1.294			-0.054	-0.358**
3. <i>Risk of Issue</i>	2.51	1.355				0.341**
4. <i>Uncertainty of Issue</i>	3.23	1.262				

** . Significance level $p < 0.01$ (2-tailed).

Multiple regression was conducted, and the relevant means, SDs, and intercorrelations were obtained (Table 38). None of the cognitive factors as independent variables predicted the *Trustworthiness of Recommendations* (dependent variable), and the regression model with the cognitive factors is not statistically significant; $F(4,252) = 0.716, p = 0.582 > .05$ (Table 38). These results indicate that the null-hypothesis is

accepted, and we conclude that the regression model with the cognitive factors does not provide a better fit than the intercept-only model (obtained with a constant as base). In other words, the insignificant p -value indicates that the changes in the predictor (i.e., the cognitive factors) are not associated with the changes in the response (i.e., *Trustworthiness of Recommendation*), which was better predicted by its own mean than by the regression model.

The adjusted R^2 value was -0.004, indicating that *Trustworthiness of Recommendations* cannot be accurately predicted from *Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*. In other words, the predictor (the four cognitive factors) towards responses (trustworthiness) is very low or negligible.

Table 38

Regression Analysis of Cognitive Factors and Trustworthiness of Recommendation

Variable ($N = 257$)	<i>Sig. (p)</i>	<i>B</i>	<i>SEB</i>	β	Partial Correlations
Constant	0.000	3.719	0.44		
<i>Propensity to Trust</i>	0.794	0.034	0.13	0.02	0.016
<i>Topic Familiarity</i>	0.164	0.072	0.05	0.10	0.088
<i>Risk of Issue</i>	0.524	0.031	0.05	0.04	0.040
<i>Uncertainty of Issue</i>	0.909	0.006	0.06	0.06	0.007

Note: $R^2 = .011$, adjusted $R^2 = -0.004$; $F(4,252) = 0.716$, $p > .05$

6.4.2 Relationship between Cognitive Factors and Recommender Trustworthiness

The mean, SD , and the correlation coefficients of *Trustworthiness of Recommender* relative to each cognitive factor are presented in Table 39. The results of regression analysis with the four cognitive factors and *Recommender Trustworthiness* are similar to the above results for *Recommendation Trustworthiness*. Also, the

intercorrelations between *Trustworthiness of Recommender* and each cognitive factor are similar, although the values of the correlation coefficients are slightly different. Like the results for *Trustworthiness of Recommendations*, the correlations between *Trustworthiness of Recommenders* and the four cognitive factors were not statically significant ($p > 0.01$). In other words, none of the cognitive factors alone as predictors was statistically meaningfully related with *Trustworthiness of Recommender*. Again, in these results, the one on one correlation between the *Trustworthiness of Recommender* and each of the cognitive factors was obtained without taking into account their combined or coupled effects.

None of the cognitive factors predicted the *Trustworthiness of Recommenders* (dependent variable), and the regression model with *Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty* is not statistically significant; $F(4,252) = 1.670$, $p = 0.157 > .05$ (Table 39). Like for *Trustworthiness of Recommendation*, these results indicate that the null-hypothesis is accepted, and we conclude that the regression model with the four cognitive factors does not provide a better fit than the intercept-only model.

Table 39
Regression Analysis of Cognitive Factors and Trustworthiness of Recommender

Variable	Sig. (p)	B	SEB	β	Partial Correlations
Constant	0.000	3.510	0.43		
<i>Propensity to Trust</i>	0.980	0.000	0.02	-0.02	-0.002
<i>Topic Familiarity</i>	0.065	0.094	0.05	0.13	0.116
<i>Risk of Issue</i>	0.397	0.040	0.05	0.06	0.053
<i>Uncertainty of Issue</i>	0.108	0.088	0.06	0.12	0.101

Note. $N = 257$; $R^2 = .026$; adjusted $R^2 = 0.010$; $F(4,252) = 1.670$, $p > .05$

The adjusted R^2 value was 0.010 (or 1% effect size of the regression model), which is very low or negligible, indicating that *Trustworthiness of Recommender* cannot be accurately predicted from *Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*. In other words, in this study population, the evaluation of *Trustworthiness of Recommenders* was not affected by their perception of *Propensity to Trust*, *Topic Familiarity*, *Risk*, or *Uncertainty*.

6.5 Social Factors Influencing the Evaluation of Trustworthiness (RQ3)

RQ3 asks as the following question. Do recipients' social factors influence their trustworthiness evaluation of recommendations and recommenders? The social factors in this study indicate a participant's tie strength with a recommender (Figure 11). As above, the correlations of the data were analyzed according to the aforementioned thresholds of 0.3 and 0.5 (Cohen, 1988).

6.5.1 Relationships between Tie Strength and Trustworthiness of Recommendations and Recommenders

The descriptive statistics of *Tie Strength* (independent variable) and the correlation coefficients with *Trustworthiness of Recommendation* and *Trustworthiness of Recommender* are shown in Table 40. The mean and SD were calculated across all cases, i.e., all recommendations for all episodes. Since *Tie Strength* is recommender-specific, their values are different for all cases. *Tie Strength* as the independent variable was scored as the average of the four items in the diary: the participants' perceived strength,

length, closeness, and contact frequency, each of which ranged from 0 (lowest) to 5 (highest). The mean was 3.401 and the SD was 1.483.

The correlation coefficients between *Tie Strength* and *Recommendation Trustworthiness* and between *Tie Strength* and *Recommender Trustworthiness* indicate the moderate ($0.3 < |r| < .5$) positive relationships, 0.351 and 0.422, respectively. This study population showed that the stronger tie a participant has with a recommender (either human or recommender system), the higher the trustworthiness of both the recommendation and the recommender. Both of their correlations were statistically significant ($p < 0.01$). *Tie Strength* was meaningfully related with each of *Trustworthiness of Recommendation* and *Trustworthiness of Recommender*.

Table 40
Descriptive Statistics of Tie Strength and Correlation Analysis

M	SD	Correlation Coefficient (r) between Tie Strength and	
		Trustworthiness of Recommendation	Trustworthiness of Recommender
3.401	1.483	0.351**	0.422**

$N = 257$

** Significance level $p < 0.01$ (2-tailed)

The regression analysis (Table 41) showed that *Tie Strength* is statistically significant in predicting both *Trustworthiness of Recommendations*, $F(1,255) = 35.829$, $p < .05$, and *Trustworthiness of Recommenders*, $F(1,255) = 55.141$, $p < .05$. These results indicate that the null-hypotheses are rejected, and we conclude that both regression models with respect to *Tie Strength* (as one of the social factors) provide better fits than the intercept-only models. In other words, the changes in the predictor (i.e., *Tie Strength*)

are meaningfully associated with the changes in the response (i.e., *Recommendation Trustworthiness* or *Recommender Trustworthiness*). However, the effect sizes of both *Recommendation Trustworthiness* and *Recommender Trustworthiness* are small or less than typical based on the common thresholds of 0.3/0.5 (Cohen, 1988). The adjusted R^2 value was 0.120 and 0.175, respectively, indicating that *Tie Strength* predicts 12.0% of the variance in *Trustworthiness of Recommendations* and 17.5% of that in *Trustworthiness of Recommenders*.

Table 41
Regression Analysis of Tie Strength and Trustworthiness of Recommendation and Recommender

Dependent Variables ($N = 257$)	Predictor	<i>Sig.</i>	<i>B</i>	<i>SEB</i>	β	Partial Correlations
Recommendation Trustworthiness	Constant	0.000	3.397	0.142		
	Tie Strength	0.000	0.229	0.038	0.351	0.351
	Note: $R^2 = .123$, adjusted $R^2 = .120$; $F(1,255) = 35.829$, $p < .05$					
Recommender Trustworthiness	Constant	0.000	3.300	0.136		
	Tie Strength	0.000	0.272	0.037	0.424	0.424
	Note: $R^2 = .178$, adjusted $R^2 = .175$; $F(1,255) = 55.141$, $p < .05$					

6.5.2 Homophily and Recommender Trustworthiness

In addition to *Tie Strength*, many participants indicated that similarities with recommenders are important in evaluating the trustworthiness (Table 43). As mentioned previously (Chapter 3, Chapter 5), *Homophily* data were qualitatively collected and analyzed. *Homophily* includes the two aforementioned aspects: status and value (Table 42). Status homophily explains that “individuals with similar social status characteristics

are more likely to associate with each other.” Value homophily refers to “a tendency to associate with others who think in similar ways, regardless of differences in status.”

Table 42

Definitions and Examples of Qualitative Evaluation of Homophily

Classification		Definitions	Examples
Homophily	Status	Ascribed: sociodemographic dimensions that stratify society-ascribed characteristics	Gender, age, ethnicity, nationality, etc.
		Acquired: earned through informal or formal processes	Religion, education, occupation, or behavior pattern, etc.
	Value	Based on attitudes, belief, ethics, values, etc.	Perceived similar interests, preference to users
	Situation	Based on similar situation that the pair had	Travel with family on budget, tight schedule management, etc.
Heterophily		Love of the different	No case in this study

Table 43

Occurrences of Homophily Coded

Classification		Number of Participants	Number of References
Homophily	Status	16	37
	Value	18	34
	Situation	11	21

Some participants mentioned that the *Status Homophily*, such as age, genetics, language, ethnicity, educational/cultural background, appearance resemblance, health conditions, etc., played a critical role when assessing the trustworthiness. For instance, Participant P2 responded, “*The waiter is a person from my country, so he should have some idea about my preference. We spoke same language [...] there will be not much miscommunication about description or ingredients.*” P4 described that the similarity in age or the family’s genetic background affected the evaluation of trustworthiness:

“My Twitter followers are probably all around the same age as me. [...] So I go to twitter to ask a bunch of my peers like what are you guys think looking on mine, is more than just getting information. Also, I asked my dad because my mom said ‘I’ve got my first gray hair at 26.’ He said, apparently my dad’s sister got her first grey hair at the age 18. Maybe it is genetic.”

Some other participants pointed out that the *Value Homophily*, such as values, attitudes, belief, etc., was considered as an important driver of evaluating the trustworthiness. For example, Participant P13 indicated that sharing the same values with the recommender helped developing trustworthiness:

“I think of me and my friends have a lot of things in common. So we like the same things or dislike the same things. We have the same values and morals. So it's easier to trust. I do have friends where we're not so similar but I won't go and ask them. I ask more people who have more in common.”

P31 said,

“He didn't specifically recommend any one thing he did say, ‘Oh yeah, you can use these in general.’ I did trust his evaluation because I thought we share lots of interest in terms of meditation and religion. He's probably three or four years older than me and we're both white men, born in America and English speaking but he moved to Israel... We have in certain respects, similar backgrounds but-- Obviously we have different situations right now because I'm not living in Israel.”

Although most participants focused more on similarities than differences, it was noted from the collected data that, for some cases, lack of similarities or even contrast influenced their evaluation of trustworthiness. For instance, P30 commented,

“First of all, I understood, he's old as well and I'm very young so our personalities are bound to be different and our tastes, 100% certain. There are different like we are from different in time periods and even the recommendation didn't even make sense.”

Other participant responded,

“Different kinds of people make of reviews about the same lipstick. But they say that the same isn't going to look good on everyone. So maybe I'm reading the review of someone that has a totally different skin tone from me. Then it's not going to look the same on me. That's in their pictures. So maybe they might give it a good review but maybe it might not work for me”

6.6 Interactions between Cognitive and Social Factors (RQ4)

RQ4 asks as the following question. Are there interaction effects between social and cognitive factors in the evaluation of trustworthiness? The quantitative data of *Tie Strength*, as one of the social factors, and the four cognitive factors were statistically processed for their interaction analysis, excluding the qualitative data of the other social factor, homophily. Previously, the calculation of the four interaction effects was presented (Chapter 5). In this section, interaction effects between the four cognitive factors—*Propensity to Trust*, *Topic Familiarity*, *Risk*, *Uncertainty*—and the composite social factor *Tie Strength* will be described.

The descriptive statistics and intercorrelation matrix are presented in Table 44. For brevity in Table 44, some terminologies are shortened additionally as follows: *TrustContent* (Trustworthiness of Recommendation), *TrustSource* (Trustworthiness of Recommender), *Propensity* (Propensity to Trust), and *TopFam* (Topic Familiarity). Note that the correlations among the four cognitive factors and the trustworthiness of recommendation and recommender were presented previously. Like the analyses in RQ2 and RQ3, the means and SDs were calculated across all cases, i.e., all recommendations for all episodes. Both dependent variables, *Recommendation Trustworthiness* and *Recommender Trustworthiness* showed statistically-significant correlations with the low ($r < 0.3$) or moderate ($0.3 < r < 0.5$) positive relationships with *Tie Strength* (as described previously) and the four interaction terms: (a) *Propensity to Trust* multiplied by *Tie Strength* (*Propen*Tie*); (b) *Topic Familiarity* multiplied by *Tie Strength* (*TopFam*Tie*); (c) *Risk* multiplied by *Tie Strength* (*Risk*Tie*); and (d) *Uncertainty* multiplied by *Tie Strength* (*Uncert*Tie*).

Statistically-significant correlations were observed among the majority of the main effects and interaction effects, with most of them being positive and four being negative (Table 44). For instance, the interaction term *Propen*Tie* has statistically-significant positive correlations with the independent variables *Propensity to Trust*, *Topic Familiarity*, and *Tie Strength*. The interaction term *TopFam*Tie* showed positive correlations with *Topic Familiarity*, *Tie Strength*, and *Propen*Tie*; and negative correlation with *Uncertainty*. Most of the statistically significant correlations were with significance level of $p < 0.01$ (2-tailed), while the correlations between *Propen*Tie* and *TopFam* and between *Risk*Tie* and *Propensity* were statistically significant with $p < 0.05$ (2-tailed).

Table 44
Descriptive Statistics of Cognitive and Social Factors, and their Interactions

Variable	Mean	SD	Correlation Coefficients				
			<i>Tie Strength</i>	<i>Propen*Tie</i>	<i>TopFam*Tie</i>	<i>Risk*Tie</i>	<i>Uncert*Tie</i>
<i>TrustContent</i>	4.18	0.97	.351**	.373**	.320**	.219**	.208**
<i>TrustSource</i>	4.23	0.96	.422**	.439**	.355**	.281**	.331**
<i>Propensity</i>	2.93	0.49	-.200**	.180**	-.001	-.152*	-.115
<i>TopFam</i>	3.62	1.29	.052	.141*	.647**	.001	-.188**
<i>Risk</i>	2.51	1.36	.086	.062	.038	.766**	.306**
<i>Uncertainty</i>	3.23	1.26	.061	.074	-.172**	.309**	.685**
<i>TieStrength</i>	3.40	1.48	1	.915**	.747**	.635**	.719**
<i>Propen*Tie</i>	9.82	4.46		1	.756**	.571**	.668**
<i>TopFam*Tie</i>	12.41	7.34			1	.460**	.375**
<i>Risk*Tie</i>	8.70	6.68				1	.678**
<i>Uncert*Tie</i>	11.10	6.93					1

** Significance level $p < 0.01$ (2-tailed).

* Significance level $p < 0.05$ (2-tailed).

The regression analysis of *Recommendation Trustworthiness* in terms of the main (cognitive and social factors) and interaction effects (Table 45) showed conflicting results. The overall regression model is statistically significant with $F(9,247) = 4.972$, $p < .05$. However, none of the individual main and interaction effects is statistically significant in predicting *Trustworthiness of Recommendations*, with all $p > .05$ in t -tests. This disagreement occurs because the F -test of overall significance assesses all of the coefficients jointly, whereas the t -test for each coefficient examines them individually. In other words, the overall F -test proved that the coefficients are jointly significant, while the t -tests failed to find individual significance. The coefficients of the main and interaction effects jointly improved the fit of the regression model. The adjusted R^2 value (exploratory power or effect size of the regression model) was 0.123, which is small or less than typical (as compared with 0.3 threshold), indicating that 12.3% of the variance in *Trustworthiness of Recommendation* can be predicted from the combination of the main and interaction effects.

Table 45

Regression Analysis of Trustworthiness of Recommendation in terms of Main and Interaction Effects

Classification		Variable ($N = 257$)	Sig. (p)	B	SEB	β
Base (y-intercept only)		Constant	0.004	3.236	1.108	
Main Effects	Cognitive	<i>Propensity</i>	0.497	-0.208	0.306	-0.104
		<i>TopFam</i>	0.647	0.054	0.118	0.073
		<i>Risk</i>	0.830	0.025	0.115	0.035
		<i>Uncertainty</i>	0.227	0.164	0.136	0.215
	Social	<i>TieStrength</i>	0.762	0.086	0.284	0.132
Interaction Effects		<i>Propen*Tie</i>	0.154	0.117	0.082	0.539
		<i>TopFam*Tie</i>	0.817	-0.007	0.032	-0.056
		<i>Risk*Tie</i>	0.978	0.001	0.031	0.006
		<i>Uncert*Tie</i>	0.143	-0.054	0.037	-0.386

Note: $R^2 = .153$; adjusted $R^2 = 0.123$; $F(9,247) = 4.972$, $p < .05$

Similar to the above regression analysis of *Recommendation Trustworthiness*, conflicting results were revealed in the analysis of *Recommender Trustworthiness* in terms of the main and interaction effects (Table 46). The overall regression model is statistically significant with $F(9,247) = 7.464, p < .05$. However, none of the individual main and interaction effects is statistically significant in predicting *Trustworthiness of Recommenders*, with all $p > .05$ in t -tests. Like in the previous case, this disagreement is due to the difference between the F -test and the t -test, where the overall F -test proved that the coefficients are jointly significant (in terms of fitting of the regression model) while the t -tests failed to find individual significance. The adjusted R^2 value was 0.185, which is small or less than typical (versus 0.3), indicating that 18.5% of the variance in *Trustworthiness of Recommenders* can be predicted from the combination of the main and interaction effects jointly.

Table 46
Regression Analysis of Trustworthiness of Recommender in terms of Main and Interaction Effects

Classification		Variable ($N = 257$)	Sig. (p)	B	SEB	β
Base (y -intercept only)		Constant	0.013	2.652	1.058	
Main Effects	Cognitive	<i>Propensity</i>	0.569	-0.166	0.292	-0.084
		<i>TopFam</i>	0.429	0.089	0.113	0.121
		<i>Risk</i>	0.136	0.165	0.110	0.233
		<i>Uncertainty</i>	0.314	0.131	0.130	0.172
	Social	<i>TieStrength</i>	0.528	0.172	0.272	0.266
Interaction Effects		<i>Propen*Tie</i>	0.184	0.104	0.078	0.484
		<i>TopFam*Tie</i>	0.702	-0.012	0.030	-0.089
		<i>Risk*Tie</i>	0.197	-0.039	0.030	-0.270
		<i>Uncert*Tie</i>	0.572	-0.020	0.035	-0.143

Note: $R^2 = .214$; adjusted $R^2 = 0.185$; $F(4,252) = 7.464, p < .05$

Table 47

Regression Analysis of Trustworthiness of Recommendations in terms of Interaction Effects Only

Classification	Variable (<i>N</i> = 257)	<i>Sig.</i> (<i>p</i>)	<i>B</i>	<i>SEB</i>	β
Base (<i>y</i> -intercept only)	Constant	0.000	3.388	0.137	
Interaction Effects	<i>Propen*Tie</i>	0.002	0.010	0.003	0.359
	<i>TopFam*Tie</i>	0.524	0.008	0.012	0.060
	<i>Risk*Tie</i>	0.607	0.006	0.012	0.043
	<i>Uncert*Tie</i>	0.383	-0.012	0.013	-0.083

Note: $R^2 = .145$; adjusted $R^2 = 0.132$; $F(4,252) = 10.707$, $p < .05$

DV: *Trustworthiness of Recommendations*

Table 48

Regression Analysis of Trustworthiness of Recommenders in terms of Interaction Effects Only

Classification	Variable (<i>N</i> = 257)	<i>Sig.</i> (<i>p</i>)	<i>B</i>	<i>SEB</i>	β
Base (<i>y</i> -intercept only)	Constant	0.000	3.287	0.131	
Interaction Effects	<i>Propen*Tie</i>	0.004	0.009	0.003	0.322
	<i>TopFam*Tie</i>	0.398	0.010	0.012	0.078
	<i>Risk*Tie</i>	0.945	0.001	0.012	0.006
	<i>Uncert*Tie</i>	0.368	0.011	0.013	0.083

Note: $R^2 = .198$; adjusted $R^2 = 0.185$; $F(4,252) = 15.555$, $p < .05$

DV: *Trustworthiness of Recommenders*

Unlike the results of main and interaction effects on the trustworthiness of recommendation and recommenders (i.e., no statistically-significant predictions), the regression analysis of the interaction-effect-only model showed slightly different results. As shown in Table 47 and 48, the interaction effect between *Propensity to Trust* and *Tie Strength* is statistically significant to predict the level of both recommendations and recommenders trustworthiness. This result suggests that the level of trustworthiness in

recommendations might depend on the social relationship between recommendation seeker and recommender as well as the seekers' innate cognitive states about trust tendency.

CHAPTER 7 DISCUSSION

This dissertation study explored the undergraduate and graduate students' real-life experiences in terms of recommendation seeking behaviors in natural settings. Based on the conceptual model developed in the previous chapter, one-week diary surveys and post-diary interviews were conducted with the thirty three participants. These results were qualitatively and statistically processed and are used in this chapter to address the proposed research questions. In the following sections, the results will be examined with respect to each of these research questions, and the conceptual model will be revisited accordingly.

The processed results are analyzed and used to address the research questions: the motivators of recommendation seeking (RQ1), the influence of cognitive (RQ2) and social (RQ3) factors on the trustworthiness evaluation of recommenders and recommendations, and their interactions (RQ4). These outcomes will be evaluated with respect to other existing study results. In accordance, the initial conceptual model of the trustworthiness evaluation in recommendation seeking behavior is also evaluated and modified for a finalized model.

7.1 Recommendation Needs (RQ1)

In this dissertation, recommendation needs were basically considered as a subcategory of information needs, as recommendations were to information (see Chapter 3). However, the recommendation needs or motivators in recommendation seeking behavior (RSB) have been relatively unexplored in the studies of information seeking behavior (ISB). Learning about the motivators of recommendation seeking can help us to

identify their unique behavioral patterns, but there is no benchmark for such examinations. In the following, the different recommendation needs identified in the collected data are discussed under the two main facets that were introduced in this study (Chapter 6): functional (cognitive and affective) and temporal (short-term and long-term).

7.1.1 Recommendation versus Information Seeking Behaviors

While there are no distinctive definitions of recommendation versus information in literature, one of the aspects of RQ1 was to observe how recommendation needs diverge from or converge to the prevalent notion of information needs. Similar to information needs in ISB (e.g., Devin & Nilan, 1986; Savolainen, 2017; Wilson, 1994, 2000), the recommendation need is characterized as a motivator that made people engage in the recommendation seeking processes. Although the resulting categories (i.e., coding scheme) of recommendation needs in the qualitative analysis resemble those of information needs as motivators of seeking, the different inherent characteristics of RSB were revealed and used to develop its own categories (see below) under RSB. Specifically, whereas studies in information science have considered ISB to be primarily cognitive-oriented, this study (in RQ2, 3, and 4) revealed that RSB is inherently social. These differences are also relevant to the results about cognitive factors not being significant in the natural settings of this study, as opposed to previous studies in laboratory settings. Regardless of recommendation need types, the participants in this study, even those with cognitive needs showed a tendency to disregard cognitive factors and rely only on social factors in trustworthiness judgment. This social nature of RSB led to the types of behaviors that are different from general ISB. In particular, the

socially-oriented nature of recommendations is coupled with relatively more personalized processes in RSB. For instance, the participants in this study strongly preferred to directly or indirectly interact with known people within their social circles; evaluated social cues on the web such as popularity and rankings, based on personal criteria; and compared or related their own situations to others' situations/contexts, actual experiences, and subjective interpretation of information.

7.1.2 Functional Categories

Dominant Cognitive Needs, Meaningful Affective Needs. Traditionally, cognitive dimensions have been the main focus in the modeling of information behavior, while the role of affective factors, such as emotions and feelings, has remained secondary (Case, 2012, pp. 133-162). Some other studies addressed that cognitive and affective (or emotional) factors in information seeking are intertwined (Kuhlthau, 1991; Savolainen, 2015; Wilson, 1981). In other words, affective needs (e.g., fear, anxiety) may trigger cognitive needs (e.g., recognizing ignorance), or cognitive needs (e.g., knowledge gap) may be accompanied by affective needs (e.g., uneasiness, nervousness) (Wilson, 2006). In this study, similar to the findings in information seeking studies, cognitive needs were dominant in the collected data for the recommendation seeking. Specifically, the number of episodes (and phrases) coded for cognitive needs was approximately two third of that of affective needs (Table 30). At the same time, the results showed that affective needs are also significant, as it makes up 37% of all episodes, which is consistent with the results in some information studies (e.g., Savolainen, 2014).

More on Affective Needs. In existing literature, the cognitive appraisal precedes the affective evaluation of information or causal connections; for instance, cognitive uncertainty causes negative feelings (Savolainen, 2015). The affective needs in the collected data in this study referred to the needs for social and/or emotional support/relief, such as fear and anxiety reduction, confirmation, and confidence gain, which imply the participants' emotional reactions or arousals to their recommendation needs. These emotions and feelings can be deduced from the participants' subjective evaluations of the situations they encountered (de Sousa, 2012), and might have led to the recommendation seeking. In some communication studies, individuals were, for the most part, motivated to resolve or reduce their anxiety caused by uncertainty in order to be in a productive or equilibrium state (Berger & Calabrese, 1975; Neuberger & Silk, 2016). Unstable or negative emotions had strong motivational force that produces recommendation seeking action to help individuals adapt to or deal with problematic situations in their everyday lives (e.g., Mulligan & Scherer, 2012). Likewise, also this study revealed that that recommenders or recommendations sought from affective needs were used to deal with the participants' affective states. On the other hand, emotions not only regulate our social encounters but also influence our cognition, perception and decision-making through a series of interactions with our intentions and motivations (Damasio, 1994; Scherer, 2001). The results from this study suggest that recommenders and recommendations can play a role in more effective decision-making or problem-solving processes by guiding the seeker in a stable emotional states.

7.1.3 Temporal Categories

Temporalities in Evaluation of Recommenders and Recommendations.

Although temporal categories were not dominant in the collected data as compared with functional categories, it is worthwhile to discuss about them in RSB due to the growing popularity of the networked sources and instant access to information by overcoming spatial and temporal barriers (Savolainen, 2006). The qualitative analysis of the data revealed that the temporal categories were identified as promptness or how soon the recommendations are needed or used, and showed that the temporality influenced the participants' source choices and trustworthiness evaluation behaviors in some episodes. Temporal categories can be viewed as the qualifiers of access to and assessment of recommenders and recommendations. In a conceptual study (Savolainen, 2006), time was considered as one of the main contextual factors of information seeking. However, only a few studies have explored the role of temporal factors in information needs and seeking. Generally, temporal factors in information studies refer to the questions of how long it takes to identify and access information sources and channels (Connaway, Dickey, & Radford, 2011; Savolainen, 2006), or how different kinds of information sources are accessed/used in terms of temporality issues (Hardy, 1982; Marton & Coe, 2002; Savolainen, 2006). Also, temporal contexts were taken into account when investigating how information needs and relevance judgements change as the information seeking process evolves temporally (Bruce, 2005; Lin & Belkin, 2000; Sonnenwald & Iivonen, 1999; Spink, Wilson, Ford, Foster, & Ellis, 2002).

Prompt Applicability of Recommendations (Short-term Needs). In this study, immediateness (or promptness) of recommendation use is identified as an important

factor in recommendation seeking behavior. Many participants ($N = 19$) characterized the significant aspects of recommendations as immediately useable or applicable to their problems at hand (e.g., as direct answers). Applicational or immediate needs refer to the interests of information that is needed to be immediately applicable to a problem at hand (Feinman, Mick, Saalberg, & Thompson, 1976; Krikelas, 1983). In order to enhance time-saving ability, as termed in Hardy (1982), of recommendation seeking processes, the participants selected the sources or recommenders that are highly likely to offer reliable and reasonably relevant recommendations in short time. In this regard, under the conditions of short-term needs, the participants sought for sources/recommenders that are immediately available, while leveraging with their trustworthiness (such as source quality, competence, and benevolence). In the same vein, a previous empirical study of source accessibility (Marton & Coo, 2002) identified the relationship between the influential factors, “time and effort needed to approach, contact, or locate the source” and “ease of getting desired information from the source” (p. 149). Whereas Hardy (1982) identified easy accessibility of sources as a primary factor for source selection, Marton and Coo (2002) showed the strong connection between source quality and source usage, but no relationship between time/effort to contact the source. However, in these studies, both (affordable) time and information quality served as the seekers’ selectable factors, while, in this study, (short) time is given as a condition and trustworthiness is the selectable factor. Nevertheless, like in those studies (Hardy, 1982; Marton & Coo, 2002), the results in this dissertation do not provide a generalizable or strong evidence on how recommendation seekers leverage the benefits derived from more prompt (possibly superficial) recommendations over the risks of receiving less trustworthy ones. One

possible explanation is that most everyday problems have low risks as perceived in the collected data.

Time Affordance in Information Seeking. Time affordance has been conclusively studied in only a few empirical approaches (Savolainen, 2006). In one empirical study on the connection between information needs and future time perspectives, many female adolescents, who were seeking information about education and jobs, deferred more detailed information seeking because they felt that it was too early (Edwards & Poston-Anderson, 1996). In another study, the limited time horizons of everyday activities may severely restrict information seeking, in that they discourage the consultation of a broader repertoire of information sources (Chatman, 1991). In the conceptual framework for information behavior developed by Feinman *et al.* (1976), time affordance explicitly referred to a factor of information seeking and is defined as “the length of time the individual is willing to maintain the behavior before obtaining information” (p. 8). Time affords or constrains various information seeking activities (Savolainen, 2006); for instance, time available permits people to access and use a limited set of information sources and channels to some extent.

Time Affordance in Recommendation Seeking. Similarly, in recommendation seeking processes, time constraints can be one of the factors that affect how people seek recommendations, such as source preferences, perception of source accessibility, use of recommendations, and content evaluation. The collected data showed that the time affordances and the perception of trustworthiness in recommenders and recommendations are associated with each other. Depending on time affordances, the subsequent activities or evaluation patterns can be different in recommendation seeking. Several participants

explicitly mentioned that the temporality is an important aspect of recommendation needs and influenced how they interacted and evaluated recommenders and recommendations. In the cases of prompt uses of recommendations, the participants wanted to have direct answers to their questions. On the other hand, in some cases of long or indefinite deadlines for the recommendation uses, the participants tended to be informed by the recommenders' successful or failed experiences in order to speculate the possible outcomes of their future events instead of having concrete answers.

7.2 Cognitive Factors in the Trustworthiness Evaluation (RQ2)

The purpose of linear regression analysis was to examine how cognitive factors (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*) are associated with the participants' trustworthiness evaluation of recommenders and recommendations. The results showed that the cognitive factors were not statistically significant in predicting the level of trustworthiness in recommenders and recommendations.

7.2.1 Propensity to Trust.

Propensity to Trust can be viewed as an individual's innate characteristics or a personal trait that leads to generalized expectations about the trustworthiness of others (Farris, Senner, & Butterfield, 1973; Mayer, Davis, & Schoorman, 1995). In the initial conceptual model (Figure 7), *Propensity to Trust* was described as an influential factor which may affect the likelihood whether the participants would more or less trust the recommenders or recommendations. Since people with different developmental experiences, personality types, and cultural backgrounds vary in their propensity to trust

(e.g., Hofstede, 1980), in this study, like in other studies (Gill, Boies, Finegan, & McNally, 2005; Mayer *et al.*, 1995; Mayer & Davis, 1999), it is assumed that propensity would influence how much trust one has for a recommender without any *a priori* information about that recommender. However, the results in this study are not consistent with this assumption, which may be due to several reasons, such as the characteristics of the collected data, the methodology adopted in this study, and sample sizes. These are explained in the following.

Results from Natural (vs. Laboratory) Settings. The two dependent variables, i.e., the trustworthiness levels of recommenders (Table 20 and 23) and recommendations (Table 21 and 24) in the collected cases, were mostly highly scored, not showing a wide spectrum of variability. Unlike a previous laboratory study with experimental manipulations (Gill *et al.*, 2005), the data in this study were collected in natural settings, in which the participants mostly interacted with their known sources or recommenders. The participants already have had some level of experiences with the recommenders. These results are inconsistent with the findings in other observation-based (Mischel, 1977) or empirical studies (Gill *et al.*, 2005; Mayer & Davis, 1999), in which the propensity to trust was evaluated under pre-arranged scenarios of different (high and low) levels of trustworthiness situations. Specifically, propensity to trust was correlated positively with intention to trust when information about the trustworthiness was ambiguous; it was not correlated with intention to trust when information about the trustworthiness was clear (Gill *et al.*, 2005). On the other hand, in most cases of this dissertation results, the participants naturally sought or interacted with known sources or recommenders, who have the certain levels of experiences within their social circles,

resulting in the tendency of mostly high trustworthiness. Depending on the participants' needs, they already knew whom to ask what, as conceptualized in the theory of cognitive authority (Wilson, 1980). These aspects justify the current results obtained in natural settings, which are inconsistent with the characteristics of propensity to trust found in the existing studies under pre-arranged laboratory settings (Gill *et al.*, 2005; Mayer & Davis, 1999; Mischel, 1977).

Nested Data Structure. Due to the characteristics of the collected data structure, which can be viewed as a nested data, different analysis methods might lead to different results. As nested data, *Propensity to Trust* depends on the participants, each participant is associated with one or more episodes, and each episode may result in one or more cases (Figure 9). Although the total number of cases was 257, these are from thirty three participants, according to which, the number of values ($N = 33$) of *Propensity to Trust* was obtained. Therefore, the scores of *Propensity to Trust* are shared across episodes and then cases within one participant. For the quantitative (statistical) analysis in this study, each case serves as the unit of analysis, which consists of a recommendation or a set of recommendations from a recommender. (Note that, in qualitative analysis in this study, each episode serves as the unit of analysis; see Chapters 5 and 6). In this study, the data size of the cases ($N = 257$) was sufficient for the resulting linear regression. On the other hand, if much larger dataset would have been available, the nested nature of this data structure would allow multilevel analysis or hierarchical linear modeling, which is particularly appropriate for research designs where data for participants are organized at more than one level.

7.2.2 Topic Familiarity.

Generally, high *Topic Familiarity* (or domain expertise as a synonym) is associated with better ability in the evaluation of information credibility (Freeman & Spyridakis, 2004; Kelton *et al.*, 2008; Lucassen, Muilwijk, & Noordzij, 2013). In the information credibility studies, it is accepted that domain experts are better in evaluating the credibility of information than novices are, because their propensity to trust is less influential on the credibility assessment (Kelton *et al.*, 2008). In this line of thoughts, in the proposed conceptual model of recommendation seeking (Figure 7), *Topic Familiarity*, as one of the influential factors, affects the likelihood of how much the participants would trust the recommenders or recommendations.

Selective Influences of Topic Familiarity on Recommendation Seeking. The collected data in this study indicated no evidence of statistically significant relationship between *Topic Familiarity* and the trustworthiness evaluation. This finding is in contrast to those in other similar studies in the field of information seeking (Eastin, 2001; Fogg & Tseng, 1999; Lucassen & Schraagen, 2011, 2013). For instance, Eastin (2001) found that domain expertise was influential on the trustworthiness of information contents, but not on the source credibility in credibility evaluation. Lucassen and Schraagen (2011) demonstrated that having knowledge on the topic at hand leads to more trust. They found that domain expertise influenced factual accuracy of information at a semantic level, whereas domain novices did not recognize factual errors in information. Later, they (Lucassen & Schraagen, 2013) confirmed that the interactions between topic familiarity and source credibility had significant influence on credibility evaluation. That is, domain experts trusted information less when source cues were available, while domain novices

were indifferent regardless of the availability of sources cues. In contrast, other information seeking studies (Chesney, 2006; Self, 1996) found that experts had more trust in Wikipedia than novices had. The inconsistencies in these results of information credibility evaluation are due to the level or types of expertise, for instance, experts (Chesney, 2006) versus mere familiarity (Lucassen & Schraagen, 2013) on the topics.

In recommendation seeking, the results in this dissertation indicate that *Topic Familiarity* had minor (or negligible) effects on the recommendation trustworthiness, which is similar to the results in an information seeking study (Eastin, 2001). On the other hand, another recommendation seeking study found that recommendation recipients with high levels of expertise or experience tend to rely less on recommendations from others (Gilly *et al.*, 1998). The findings in this and above studies suggest that the level of topic familiarity has selective influence on the trustworthiness evaluation of content and sources. Also, people behave differently, depending on the types of information whether it is formal or informal information (including recommendations).

Results from Natural (vs. Laboratory) Settings. The distinctively positive or negative effects of *Topic Familiarity* on the evaluation of content and source credibility in the above literature findings were obtained under controlled conditions with online information. In contrast, the unpredictability of the level of trustworthiness in recommenders and recommendations as found in this dissertation indicates that, in natural settings (uncontrolled conditions), the effect of *Topic Familiarity* on the trustworthiness evaluation does not exist or is negligible. It should be noted that, even in the natural settings in this study, most of the collected episodes were centered toward ordinary situations, in which, the participants mainly: (a) interacted with their familiar

sources or recommenders, which is consistent with principle of least effort (Case, 2009; Zipf, 1949), sufficiency principle (Chaiken, Liberman, & Eagly, 1989) or cognitive miser tendency (Fiske & Russell, 2010); (b) sought everyday life recommendations, which do not require intense domain expertise or comprehensive topic knowledge; and (c) were involved in low risk situations, and thus perceived less critical about trusting the recommendations. The outcomes may differ greatly under controlled (like in the laboratory settings in the above literature results) or special (or rare) conditions, in which the participants interact with completely unfamiliar sources or strangers for recommendations.

Topic Familiarity vs. Accuracy vs. Recommenders. Lucassen and Schraagen (2011) pointed out that topic familiarity contributed crucially in identifying the accuracy of factual information rather than the information credibility in a semantic level. Later (Lucassen & Schraagen, 2013), they found that topic familiarity and source credibility meaningfully interacted in recognizing online information credibility in Wikipedia. On the other hand, in this study, the recommendation evaluation through the qualitative analysis of interview transcripts showed that the accuracy of recommendation contents was not mainly considered as one of the critical aspects of recommendation trustworthiness. These results revealed that the participants tended to seek their recommenders based on their accumulated experiences with sources or recommenders rather than topic familiarity. In other words, the trustworthiness of recommenders was not influenced by topic familiarity, but by the characteristics of recommenders, such as benevolence, integrity, competence, authority, and personality.

7.2.3 Risk Perception in Recommendation Needs

The results in this dissertation suggest that *Risk* perception in the recommendation needs was not statistically influential on predicting the trustworthiness evaluation of recommenders and recommendations. One potential explanation for these results is that, throughout the episodes in the collected data, the participants had strong tendency to interact with sources or recommenders that are trustworthy or are thought to be cognitive authority, regardless of the level of risk perceived in the recommendation needs in the uncontrolled settings. Therefore, the recommendations the participants received were mostly perceived to be trustworthy, which may be the natural consequences of this study's uncontrolled settings. Under controlled settings with high risk situations or unfamiliar sources/recommenders, the outcomes could have been very different from this study's results. It is speculated that larger sample data with high variance might have shown more effects of risk perception on the evaluation of trust and trustworthiness, as found in other studies (Catellier & Yang, 2012; Colquitt, Scott, & LePine, 2007; Trumbo & McComas, 2003).

Risk Factor in Trustworthiness Evaluation. Generally, in the trust literature (e.g., Johnson-George & Swap, 1982; Mayer *et al.*, 1995), the concept of risk is often considered as one of the essential components of trust situations. Trust is a willingness to take risk (Mayer *et al.*, 1995). Trust serves both to reduce risk (Giddens, 1990; Ring & van de Ven, 1992) in an issue and to increase the willingness of risk taking in a relationship (Mayer *et al.*, 1995). In this regard, as in an information study (Kelton *et al.*, 2008), trustworthiness evaluation in recommendation seeking aims at the reduction of risk (and vulnerability). In turn, trustworthiness plays a role as a determinant in a

decision making on whether or not to use the recommendations. In this dissertation, using a recommendation implies that the participant is willing to take the risk in case the recommendation turns out to be inaccurate or harmful to the participant's outcome or expectation. Hence, assessing and perceiving the risk in the recommendation needs, like in information evaluation (Bierman, Bonini, & Hausman, 1969; Coleman, 1990), refer to weighing the likelihood of both positive and negative outcomes that might occur if the participants behave upon the recommendation they received.

Risk perceptions have not been substantially taken into account in the studies of credibility or trustworthiness evaluation in ISB. In a few conceptual studies of information trustworthiness (Chopra & Wallace, 2003; Kelton *et al.*, 2007), *Risk* is conceptualized as one of the preconditions or necessary conditions for trust. In other words, trusting behavior is relevant under the conditions of a certain level of risk. While many studies have introduced the credibility evaluation of information, empirical studies about the relationship between risk and trustworthiness evaluation are rare in the field of ISB. In the literature, no generalizable or accepted relationship can be found between risk perception and recommendation evaluation behaviors. Although the findings from this dissertation revealed no statistically significant association between the risk perception and the level of trustworthiness in recommenders and recommendations, the results point to the possibility or consideration of examining the effects of risk perception on RSBs.

7.2.4 Uncertainty Perception in Recommendation Needs

The results suggest that *Uncertainty* perception in the recommendation needs was not statistically significant on predicting the trustworthiness evaluation of recommenders and recommendations. Like in the cases of *Risk* factor in the previous section, these results are possibly caused by the participants' strong tendency to interact with the sources/recommenders that are trustworthy or are thought to be cognitive authority, regardless of the level of uncertainty perceived in the recommendation needs in the uncontrolled settings. As one of the strategies to mitigate the uncertainty in their recommendation use, the trustworthy recommendations from the familiar (at least, perceived as reliable) recommenders could have helped to reduce the complexity of decision making or problem solving. This also simplifies the relationship of the recommender and recommendation seeker by avoiding unknown sources or strangers as recommenders. If they encountered high uncertainty situations or unknown sources/recommenders, the outcomes could have been diverted from this study's results.

Relationship with Trustworthiness. In trust research, *Uncertainty* arises from lack of information or knowledge (Giddens, 1990; Luhmann, 1979) and, along with risk (or vulnerability) and dependence, is considered as one of the important preconditions of trust (Chopra & Wallace, 2003; Kelton *et al.*, 2008). Under this condition, people engage in trusting behavior as an effort to reduce uncertainty, in which, the trustworthiness of recommenders and recommendations is evaluated. As another relevant theory (in communication research) that links uncertainty to information-seeking, Uncertainty Reduction Theory (Berger & Calabrese, 1975) states that information seeking is to reduce the influence of uncertainty on decision making or problem-solving in the perception of

an ambiguous situation for a decision or solution. In the field of information seeking behavior, *Uncertainty* has been studied extensively in various ways and conceptual definitions (Belkin, 1978; Dervin, 1998; Kuhlthau, 1993; Wilson, Ford, Ellis, Foster, & Spink, 2002). *Uncertainty* (Kuhlthau, 1993) or anomalous status of knowledge (Belkin, 1978) leads people to information seeking process. Individuals are, for the most part, motivated to resolve or reduce their uncertainty in order to maintain a productive, equilibrium state (Neuberger & Silk, 2016). In all these studies, *Uncertainty* is viewed as a cognitive factor for triggering information seeking behaviors or an origin of affective symptoms such as anxiety and lack of confidence (Kuhlthau, 1993). However, the relationship between the uncertainty level in information needs and the trustworthiness evaluation has been understudied. This initial study contributed to introduce the comparative analysis between the perceived uncertainty level in recommendation needs and the trustworthiness evaluation of recommenders and recommendations; it was indicated that there is no statistically significant association between them under natural and uncontrolled settings.

Uncertainty in Other Stages of Recommendation Seeking. In the proposed model, only *Uncertainty* within the context of recommendation needs was taken into account. In recommendation needs, *Uncertainty* is one of the characteristics of *Cognitive Needs* in recommendation seeking (Chapter 4 and Chapter 5). However, it should be noted that *Uncertainty* may exist and play certain roles in other stages of recommendation-related behavior, particularly, for the trustworthiness evaluation of recommenders and recommendation. In other words, in addition to referring to states of doubt, unpredictability, indeterminacy, or indefiniteness in recommendation needs,

Uncertainty also refers to those states in the predicted consequence of the participants' decision to act upon the recommendations. In the latter case, *Uncertainty* can be regarded as one of the factors for trustworthiness evaluation. In many cases, the consequence of accepting and acting on the recommendation may depend on the choices of sources/recommenders in recommendation seeking (Deutsch, 1962; Golbeck, 2013, p. 76; Golembiewski & McConkie, 1975). Since these additional aspects of *Uncertainty* were not reflected in the diary/interview design, it seems that some responses related to *Uncertainty* in trustworthiness evaluation were mixed in within the collected data. These aspects should be considered in future models and data collection tools (see Chapter 8).

7.3 Social Factors in Trustworthiness Evaluation (RQ3)

The two social factors *Tie Strength* and *Homophily* were analyzed using quantitative and qualitative methods, respectively, in this study. Linear regression analysis was conducted to understand the effects of *Tie Strength* between a recommender and a recommendation seeker on the seeker's trustworthiness evaluation. Content analysis was adopted to observe how the participants perceived and were influenced by *Homophily* when evaluating the recommenders and recommendations. This dissertation addresses how a person's perceptions of the relationship with a source/recommender could affect the trustworthiness evaluation of the recommendation and the intention to act upon it. In particular, social tie and homophily were found to be the two main determinants for the trustworthiness evaluations of this study's participants (i.e., young adults). These results are in contrast to those in other relevant studies (Becerra, Lunnan, & Huemer, 2008, Chowdhury, Gibb, & Landoni_2014, Lucassen *et al.*, 2013), in which it

was found that cognitive factors are the most important contributors for information evaluation. Prior studies have focused mainly on the information content characteristics, such as valence, style, grammar errors, writing length (Bataineh, 2015; Filieri, 2015) in the evaluation of information credibility. In addition to the attributes of the information itself, the information user's personal perceptions of social environments (herein, *Tie Strength* and *Homophily*) may be important in information evaluation (Kelton *et al.*, 2008, p. 371). The role of social ties in recommendation evaluation and adoption was relatively unexplored. Social ties can play a crucial role in recommendation seeking in everyday life. In the natural settings in the collected data, the participants interacted more often with recommenders in their social circle to obtain both formal and informal recommendations.

7.3.1 Tie Strength

Stronger Ties, More Trustworthiness Perceived. In the results, *Tie Strength* between a source/recommender and a recommendation seeker is positively associated with the *Trustworthiness* evaluation of recommenders and recommendations. That is, the stronger *Tie Strength* exists between the source/recommender and the seeker, the more *Trustworthiness* of recommenders and recommendations was perceived. Deriving from past experiences with sources/recommenders, an individual can infer and estimate the trustworthiness of the recommender's probable recommendations, while the recommender with strong tie can approximate the preferences and interests of the recommendation seeker through prolonged relationship and interactions. These results are similar to those in prior studies, in which recommendations from people with strong

ties, high homophily, credibility, and experience have been shown to be persuasive (Brown & Reingen, 1987; Gilly *et al.*, 1998). De Bryun and Lilien (2008) showed that tie strength plays an important role in initiating awareness in the context of email recommendations. Chu and Kim (2011) demonstrated that tie strength in a social networking context had a positive effect on opinion-seeking and opinion-passing behaviors. In an online experiment for social recommender systems, Oechslein and Hess (2014) showed that a recommendation (of a news article) is more highly valued if it is made by a strong tie (e.g., a close friend or a family member). Also they found that the credibility of the recommending person and the recommendation's media source affected the value of recommendation as well. The results suggest that *Tie Strength* is an influential determinant of the trustworthiness perception in recommenders and recommendations. This may be partially because of the benevolence of the recommenders, in the sense that, people believe recommenders with strong ties do not have any reasons to lie or harm.

Tie Strength vs. Competence. The qualitative analysis of the interview transcripts indicated that *Competence* (or expertise) of a recommender dominated over *Tie Strength* in the trustworthiness evaluation of recommenders and recommendations. In some cases, the recommendations were sought from weak ties, but only for those with perceived competence. From the viewpoints of information/knowledge transfer, a few prior studies have suggested that weak ties play an important role (Granovetter, 1973), in that one's weak ties might be an effective information source because they traveled across separate social circles, and so could better transmit new information. Likewise, Brown and Reingen (1987) suggested that recommendations from weak tie sources serve a

bridging function, allowing information to travel from one distinct subgroup of referral actors to another subgroup in the broader social system (the “network effect”). Also, Zhao, Wu, Feng, Xiong and Xu (2012) showed that sources with weak ties play a crucial role as an informational bridge in social media, facilitating information dissemination across isolated clusters. Whereas weak ties can be effective in transferring and bridging information inter social groups, the influence of weak ties may be diminished in evaluating trustworthiness. For instance, regarding negative word of mouth (WOM), strong ties were considered as important sources of recommendations, but weak ties are as influential as strong ones (in recommending services) if the recommenders offered recommendations from their own personal experiences (Koo, 2016). In this line of thoughts, the participants in this study perceived the weak ties as trustworthy as the strong ones if those weak ties have expertise or certain experiences about the specific topic areas. While the statistical analysis of the collected data showed the positive effects of *Tie Strength* on the trustworthiness evaluation, the qualitative analysis provided some evidences of trusting the recommendations despite weak ties. For instance, one participant (P3) said that the tour guide whom she met was knowledgeable about the area although they had no ties. Another participant (P7) evaluated her co-worker’s, who has a weak tie, recommendation as very trustworthy after she learned that the co-worker had successful outcomes from the same weight-loss program that she participates in. These evidences show that the association between *Tie Strength* and *Trustworthiness* evaluation can be mediated by the competence of the recommenders.

7.3.2 Perceived Homophily between Seekers and Recommenders

The qualitative analysis of interview transcripts indicated that *Homophily* with respect to situation, demographics, and value can be influential on evaluating the trustworthiness of recommenders and recommendations. *Homophily* was first described as “a tendency for friendships to form between those who are alike in some respect” (Lazarsfeld & Merton, 1954, p. 23). The homophily theory (particularly, with respect to status and value) (McPherson *et al.*, 2001) suggests that users have more in common with their strong ties and are thus more interested in information from them (Lapides, Chokshi, Carpendale, & Greenberg, 2015). Likewise, in this dissertation, *Homophily* was considered as one of the determinants in the trustworthiness evaluation of recommenders in recommendation seeking in everyday life. The participants’ recognition of the link between *Homophily* and trustworthiness facilitated more useful and persuasive recommendations.

Status Homophily. Lazarsfeld and Merton (1954) distinguished the friendship process by two mechanisms, through which, ties among similar people are formed—status and value. In an extended work (McPherson *et al.*, 2001), *Homophily* in social networks was distinguished similarly. *Status Homophily* forms the friendships with those similar to an individual based on social status (e.g., age, race, gender, and education). These were observed in some cases of the collected data, in which, for instance, the participant P26 tends to trust more the similar-aged reviewers during online shopping, and P30 did not trust TV show suggestion from an older online peer. As another example in the collected data, a participant (P28) expressed more trustworthiness of recommendations from his lab mates as recommenders who have the same

nationality/ethnicity backgrounds, which was observed as the strongest group affiliation in evident *Homophily* (McPherson *et al.*, 2001). This is followed by the characteristics of members in family networks, in which their bonds are stronger and harder to be deteriorated than with outsiders (McPherson *et al.*, 2001). For instance, in addition to strong family bonds, family members share their genetic backgrounds, such as body conditions. In this regard, P4 worried about gray hair in very early age, but her father recommended not to worry about it, since this issue runs in their family. These societal characteristics result in homogenous social network groups. *Homophily* takes one step further the nature of the relationships within a social network. When demographic similarity provides shared meaningful knowledge, an expectation would be that individuals associate with similar others for easy, comfortable communication (McPherson *et al.*, 2001). The collected data also included occupation networks, which were proved homophilic among people by structure (groups separated at the workplace) and nature (the kind of works that people engaged). Similarity in any homophilic group facilitated information flow, knowledge sharing, and understanding (McPherson *et al.*, 2001).

Value Homophily. *Value Homophily* happens when individuals modify behaviors to align themselves with those of friends, which as shaped by the friends' values/thoughts regardless of social status (Lazarsfeld & Merton, 1954). Some other participants pointed out that *Value Homophily* was considered as an important driver of evaluating the trustworthiness. One participant (P13) thought that the recommendations from her friend are trustworthy because they share the same preferences, flavors, values, and morals. P26 mentioned that the online peers in a specific website seemed to have similar tastes

based on her prolonged observation of their reviews; she felt like in the same social circle with the reviewers even though they have never met.

Situational Homophily. While status and value homophilies are specific (at least temporarily) to an individual, sharing similar situations can also result in homophily. Unlike status and value homophily, situational homophily is relatively unexplored in literature. The collected data showed that, some participants evaluated recommendations based on how similar the situations they encountered were with those the sources/recommenders were encountering at that time. When others' current situations are similar, the participants in this study were likely to trust the recommendations from them. For instance, a participant (P7) recognized that her coworker had not only successful outcomes but also been on the same weight loss program. As a result, she evaluated the recommendations from the coworker as very trustworthy, despite of weak tie with this recommender. Also, P16 felt very trustworthy about the recommendations from her friend, who shares similar situations dealing with multitasking in a hectic life with the same expectations in academic performances. These results suggest that situational similarity between a recommendation seeker and a recommender may increase the trustworthiness and persuasiveness of recommendations, particularly when new situations are encountered. Situational similarities can be a strong indicator of trustworthy recommenders and recommendations. Existing studies in information and recommendation have not actively explored the influence of homophilic relationships existing in concurrent similar situations during recommendation seeking and evaluation. It should be noted that, the concept of situation homophily is based on concurrency. In this dissertation, the situations in the past are relevant to experiences that are considered

as *Competence* of a recommender, whereas, if the similar situations are concurrent, they are viewed as *Situational Homophily*. In the case of above example, if both the seeker (P7) and the recommender (her coworker) are currently on the same weight loss program, then they have *Situational Homophily*. If the coworker has already completed the program at the time of recommendation seeking, then this should be regarded as *Competence* of the recommender. However, if the coworker had been participating in the program for a long time by the time of recommendation seeking, the recommender's experience (*Competence*) plays a role, in addition to *Situational Homophily*, in the trustworthiness evaluation. In general, *Situational Homophily* and *Competence* may have some overlapping contributions in trustworthiness evaluations, depending on temporal aspects.

7.4 Interactions between Cognitive and Social Factors (RQ4)

The purpose of linear regression analysis was to examine whether or not each of the cognitive (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*) and social (*Tie Strength*, which is the only quantifiable factor, while *Homophily* was qualitatively measured) factors have interaction effects in the participants' trustworthiness evaluation of recommenders and recommendations. Statistically, these interaction effects were represented by *Propen*Tie*, *TopFam*Tie*, *Risk*Tie*, and *Uncert*Tie*, while the main effects include *Propensity to Trust*, *Topic Familiarity*, *Risk*, *Uncertainty*, and *Tie Strength*. As a common approach, all main and interaction effects were examined against the trustworthiness of recommenders and recommendations. The results showed that both main and interaction effects were not statistically significant in predicting the level

of trustworthiness. In order to investigate the interaction effects further from another aspect, additional linear regression analysis was performed in this study only with the interaction effects, which is a less common but legitimate method (Introduction to SAS. UCLA: Statistical Consulting Group, 2019). (However, the interaction effect may not have the same meaning between both approaches.) In these results, all other interaction effects were shown to be not statistically significant except for *Propen*Tie*. This indicates that a recommendation seeker's *Propensity to Trust* and his/her *Tie Strength* with a recommender influence each other in evaluating the trustworthiness of recommenders and recommendations.

Recall that the individual cognitive factors were not statistically significant in predicting the seeker's trustworthiness (RQ2), which suggests that the seekers are not necessarily influenced by their personal cognitive factors when evaluating the trustworthiness of recommenders and recommendations. Also, recall that *Tie Strength* alone was dominant in predicting the seeker's trustworthiness (RQ3), implying its main role in the trustworthiness perception in recommendation seeking. This may have contributed to the interactions between *Propensity to Trust* and *Tie Strength*. In line with a previous study (Pettigrew *et al.* 2001) about the social paradigm of information seeking behavior, this result provides evidence that social environments and perspectives can be influential in active recommendation (as a subset of information) seeking behavior, which is interactive and social in nature. The participants showed preference for receiving recommendations from stronger ties regardless of the types of recommendation needs. Even for cognitive needs, none of the cognitive factors alone (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*) influenced the trustworthiness evaluations.

On the other hand, as in the previous discussion about the possible methodological issues for RQ2 and RQ3, all these significant results may be due to the natural or uncontrolled settings in this study's data collection, and therefore, the lack of interactions between various *Tie Strength* and other cognitive factors (*Topic Familiarity*, *Risk*, and *Uncertainty*) requires further investigation in the future.

7.5 Evaluation and Modification of Conceptual Model

The initial conceptual model (Figure 7 in Chapter 3) was developed and then used in an attempt to investigate the associations between the variables (or influential factors) and the trustworthiness evaluation in recommendation seeking behavior. The influential factors in the initial model included (a) motivators, (b) cognitive (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*), and (c) social factors (*Tie Strength* and *Homophily*) in the trustworthiness evaluation of recommenders and recommendations. The research questions were derived from this model to address and explain those relationships. This initial model is rather hypothetical, and is meant to be subject to modifications or improvements based on the empirical data and the associated analysis in this study.

A modified model components (Figure 15) are deduced from the analysis of the diary and interview data collected in this study. Since none of the cognitive factors—*Propensity to Trust*, *Topic Familiarity*, *Uncertainty*, and *Risk*—alone affected the participants' trustworthiness evaluation in their RSB, the influences of those components (except for *Propensity to Trust*) are now eliminated from the initial model. The social factors *Tie Strength* and *Homophily*, which were influential, remain in the model. The

interaction effect between *Propensity to Trust* and *Tie Strength* was significant, while those between other individual cognitive factors and *Tie Strength* were not. This leads to including *Propensity to Trust* and its association with *Tie Strength* in the modified model. The resulting modified model of trustworthiness evaluation in RSB in natural or uncontrolled settings is shown in Figure 15. To summarize, the influential factors in the modified model includes (a) cognitive factor (*Propensity to Trust*), (b) social factors (*Tie Strength* and *Homophily*), and (c) interaction terms between *Propensity to Trust* and *Tie Strength*.

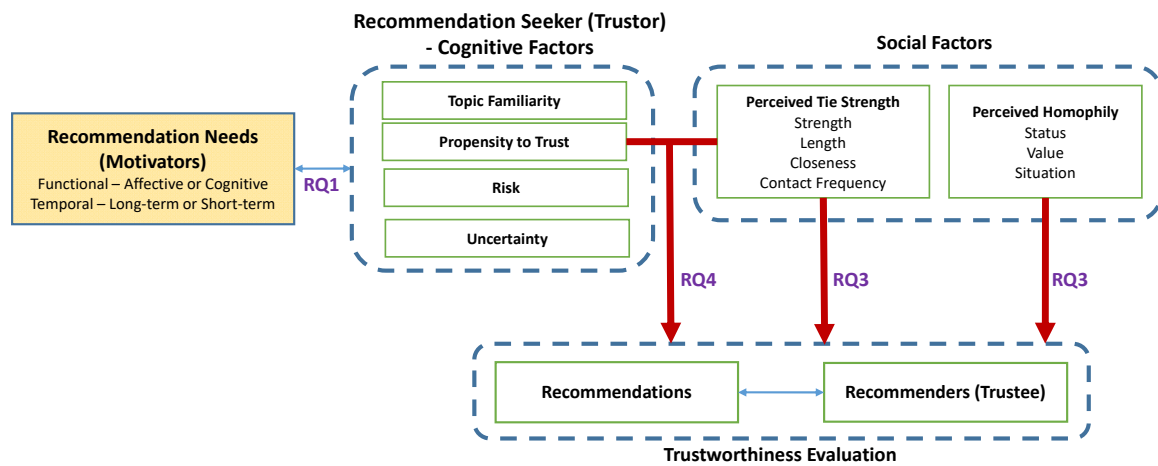


Figure 15

Modified model of trustworthiness evaluation in recommendation seeking behavior in natural or uncontrolled settings. The RQs that identified the influential factors are also shown.

The results of this study of “normal” RSB, which found that all the influencing factors for seeking and trustworthiness evaluation are social aspects, and that cognitive factors had no significant effect, indicate the inherently social nature of recommendation

seeking behavior. These findings can be used to characterize RSBs that can be distinguished from more general ISBs, in which cognitive as well as social aspects are known to have significant influences on trustworthiness evaluation (e.g., Deutsch, 1962; Golbeck, 2013, p. 76; Golembiewski & McConkie, 1975). In other words, the results provide an important clue on how recommendation behaviors stand out from the types of behaviors for broader information seeking. In particular, the aforementioned distinction can provide implications in developing a clear definition or notion of recommendation, which should be differentiable from more general information, with respect to seeking behavior patterns.

CHAPTER 8 CONCLUSIONS

In this section, the key findings and answers to each of the RQs are summarized. This is followed by the limitations of this study and the associated future studies. Then, research and practice implications of the proposed methods, model, and analyses in the relevant fields are discussed. Finally, the concluding remarks summarize this study's unique contributions to the related fields.

8.1 Answering the Research Questions

This dissertation intended to provide deeper insight into recommendation seeking behavior by focusing on the roles of individuals' cognitive and social factors in the trustworthiness assessment of recommenders and recommendations. In uncontrolled settings, real-life experiences during recommendation seeking were considered as the context, in which personal recommendation acquisition takes place from the perspectives of active recommendation seekers (or recipients). Six key factors (*Propensity to Trust*, *Topic Familiarity*, *Risk*, *Uncertainty*, *Tie Strength*, and *Homophily*) in recommendation seeking behavior were measured through diary recordings and interviews, in order to better understand their relationships with trustworthiness evaluation and, ultimately, trust. Moreover, the qualitative and quantitative data could show which particular factors (or strategies) the recommendation seekers applied to evaluate trustworthiness. Below, the key findings are summarized as answers to each RQ.

RQ1. Why do recommendation recipients engage in recommendation seeking behavior? The motivations of the recommendation recipients' engagement in recommendation seeking behaviors were evaluated according to two main criteria in the

qualitative analysis: functional (affective and cognitive needs) and temporal (long-term and short-term needs). The functional category depends on the participants' reactions in recommendation need situations toward their inner motivational states. The results show that negative emotions had strong motivations leading to recommendation seeking actions to help the individuals adapt to problematic situations. Overall, the cognitive needs were dominant, but the affective needs were also meaningful in recommendation seeking. The temporal category reflected the timeliness of a recommendation. Prompt applicability was the noticeable characteristics of short-term needs, and the participants wanted to have direct answers to their recommendation-related questions. Also, the qualitative data showed that time affordances could shape how people seek and evaluate recommendations, with respect to, e.g., recommender selections and cross-referencing patterns. In some cases of indefinite deadlines for the recommendation uses, the participants preferred to interact with strong ties, and tended to be informed by the recommenders' experiences that allow speculation about the possible outcomes of their future events. Overall, regardless of the values of facets of recommendation needs—functional (including cognitive) or temporal—trustworthiness judgments in recommendation seeking behaviors were dominated by social factors, which implies that they are socially oriented.

RQ2. Do the recommendation recipients' cognitive factors affect their assessing the trustworthiness of recommendation and recommenders? This study did not find any statistically significant evidence of the cognitive factors' influences on the evaluation of the trustworthiness. The four cognitive factors (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*) did not predict the trustworthiness evaluation. These results are

unexpected and contrary to the initial speculation posed in this study's conceptual model (Figure 7) and those reported in other previous studies (e.g., Deutsch, 1962; Golbeck, 2013, p. 76; Golembiewski & McConkie, 1975). The natural or uncontrolled settings during the data collection and the nested data structure in this study might have caused these results. Unlike in controlled settings where the cognitive factors are evaluated under pre-arranged scenarios with different levels of various factors (e.g., high and low trust situations), and where recommendation needs are externally assigned, the natural settings in this study led the participants, regardless of their propensities to trust, mostly seek or interact with known sources or recommenders, with whom the participants already have had some level of experiences. In addition, the participants mainly sought everyday-life recommendations with mostly low risk, which do not require intense domain expertise or comprehensive topic knowledge. Therefore, the perceived risks in the consequences of accepting or rejecting the recommendations were relatively low. This insignificant role of cognitive factors is also in line with the intrinsic social nature of recommendation seeking in natural settings (as addressed in RQ3 and 4), as opposed to primarily cognitive-oriented general information seeking behaviors.

RQ3. Do the recommendation recipients' social factors influence evaluating the trustworthiness of recommendation and recommenders? *Tie Strength* between recommendation seekers and recommenders was shown to be statistically significant predictor in evaluating the trustworthiness. Also, the results of qualitative data analysis revealed that *Status*, *Value*, and *Situation Homophily* can be considered as determinants in the trustworthiness evaluation of recommenders during recommendation seeking in everyday life. The participants' recognition of *Homophily*, which enhances

trustworthiness, made them perceive the recommendations to be more useful, persuasive, and emotionally relieving. The inherently social nature of recommendation seeking behavior under natural settings is a reasonable explanation of the significant influences of *Tie Strength* and *Homophily* on the trustworthiness evaluation, which is in contrast to results of studies in controlled settings, where both cognitive and social factors are influential.

RQ4. Are there interaction effects between cognitive and social factors in the evaluation of trustworthiness? If yes, what are they? In the main and interaction effects model, the results did not show any statistical significance of interactions between the cognitive (*Propensity to Trust*, *Topic Familiarity*, *Risk*, and *Uncertainty*) and social (*Tie Strength*) factors in the prediction of trustworthiness levels in recommenders and recommendations. However, in the interaction-only model, *Propensity to Trust* and *Tie Strength* were found to be statistically influential with each other. Within this scope, these findings indicate that a recommendation seeker's *Propensity to Trust* and his/her *Tie Strength* with a recommender may influence each other in evaluating the trustworthiness of recommenders and recommendations. As in RQ3, the association of *Tie Strength* in this regard is also in line with the intrinsic social nature of recommendation seeking behavior under natural settings.

8.2 Limitations

Study Sample and Generalization. The sample participants in this case study are limited in two aspects: population type and size. The participants were young adults who are undergraduate or graduate students. Different behaviors and results could be derived

from other populations with different ages, cultural backgrounds, jobs, etc. The size of the study population can also be influential. As in most empirically-based studies, samples of larger size would provide more reliable results. Increasing the diversity and size of the sample populations in future research would allow more complex statistical methods, such as multilevel analysis (also known as hierarchical linear models, linear mixed-effects models, mixed models, and nested data models), and provide guidance toward more generalized insight. This should also be accompanied by the evaluation against formal conditions/assumptions of standard regression analysis, and the associated refinement of data collection design.

Coding in NVivo12: Considerations and Interpretations. It should be noted that, in general, the results of the coded data from NVivo12 should be interpreted carefully (Table 25, and 27). The number of coded phrases may lead to misleading interpretations, since the software counts the total number of relevant coded phrases regardless of their number of appearances in a given episode, which is the observation unit in this study. In other words, when multiple phrases were mentioned and thus coded as, for example, cognitive needs for a given episode, that number of phrases are counted in NVivo12. Therefore, the number of categorized recommendation needs may not be accurately represented by the total number of coded phrases, which usually over-counts. An approach to obtain exact number of categorized recommendation needs is to count multiple coded phrases into one. On the other hand, NVivo12 counts the number of participants who, at least once, mentioned the categorized phrases across recorded episodes. Thus, the number of participants coded is equal or less than the number of categorized recommendation needs.

In theory, the summation of all the items in each category (functional or temporal) must be larger than (when multiple coded episodes are included) or equal to (when no multiple coded episodes exist) the total number of episodes. However, in these results the summation of all the items in each category (particularly, temporal aspects) was smaller than the total number ($N = 157$) of episodes collected. For temporal categories, this is due to the lack of explicit or implicit temporal indications in the interview transcripts, which made them unidentifiable by the coders. Nonetheless, the relative distributions and trends in these results can provide valid interpretation due to the statistically significant number of samples involved.

Capturing Complete Descriptions and Influential Factors. Acquiring complete and detailed descriptions of episodes during data collection is critical, and will also affect the coverage areas of influential factors. These aspects are common challenges for general empirical-based studies including this dissertation, although the combination of a one-week diary and pre/post-diary interviews in this study provided rich data in examining the recommendation seeking behaviors. This was particularly noticed in the cases of seeking activities that lasted longer than this study's diary period, i.e., a week. Longer collection periods for each participant may allow us to capture episodes, including rare cases, which include broader ranges of influential factors (especially, *Topic Familiarity*, *Risk*, and *Uncertainty*); this can also be acquired under controlled settings by imposing the associated (e.g., rare) conditions. Future studies should shed light on various dimensions of people's behaviors in order to reveal dominant influential factors across broader domains.

Terminologies in Diary Design. Terminologies or definitions of concepts used in the questionnaires in the survey, diary, and interviews should be more deliberately clarified and operationalized in order to obtain more intended data. In many cases, the data quality depends on how the participants understand or interpret the terminologies used in diary forms and interviews. Although the meanings of each questionnaire and concepts in the diary form were explained in detail during the introductory interviews, they may still have been inaccurately perceived by the participants during diary recordings under unsupervised settings. For instance, it turned out in the collected data that uncertainty and risk in the current context were sometimes used by the participants to describe two different aspects of trustworthiness evaluation—recommendation needs or recommendations. While it is important to refine possibly confusing terminologies in the diary and survey questionnaires, in many cases, it can be done only through multiple iterations of studies, informed by the lessons learned from previous studies. In this regard, the successes and failures in the terminologies used in this study can also contribute to more advanced survey and diary questionnaires in future studies.

Further Quantification of Temporal Needs. The qualitative analysis in this study revealed the potential importance of the temporal aspects in the recommendation needs, although they were not reported in all collected episodes (Table 30). In order to systematically identify the temporal aspects of all recommendation needs, the design of the future surveys should consider including some questions such as “How soon should your recommendation be fulfilled?” As for the corresponding responses, multiple options for temporal measures may be given as, for example, immediate, intermediate, or future use (as perceived by the participants); or within an hour, a day, a month, or a year (as

measured by the participants). These multiple options will provide quantitative data, which allows systematic process by the coders or software (e.g., NVivo12).

Further Quantification of Homophily. The qualitative analyses of *Homophily* showed the significance of similarities between the seeker and the recommender, and there might be statistical explanation for these relationships. It would be worthwhile in future research to investigate further and find out more explicit role(s) of *Homophily* in trustworthiness of recommenders/recommendations. This will lead to the quantitative analysis of *Homophily*.

8.3 Future Research

Passive Receiving of Recommendations. Recommendation behaviors include seeking, receiving, and transferring (or giving). While the scope of this dissertation study focused on active recommendation seeking, which was based on the participants' recommendation needs, many recommendations in these days are passively delivered or received. Specifically, without explicit expression of needs, recommendation engines or platforms deliver and present recommendations based on people's online activities in everyday life. Examples include product suggestion in online shopping sites (e.g., Amazon), video and music recommendations in streaming services (e.g., Netflix, YouTube and Spotify), content recommenders for news media platforms, and menu recommenders in delivery services (e.g., Caviar, Grubhub, and Doordash), in which recommendations are provided without people's active seeking. Therefore, future studies on the trustworthiness evaluation and passive receiving of recommendations would greatly enhance our understanding of the complete picture of recommendation behavior.

Building upon the methods and models developed in this dissertation, such studies will also provide meaningful results in comparison with those in this dissertation study.

Overcoming Bias: Controlled Settings for Weak Ties and Heterophily. Within the natural settings in this study, the participants tended to seek recommendations mostly from recommenders with strong social ties and similarities (homophily). While these are beneficial in terms of ease of access, high trustworthiness, and high likelihood of relevance, recommendations from social ties and homophily may be inherently biased and narrow in scope. Weak ties are considered to be important in transferring knowledge and bringing new ideas by connecting different clusters of social groups (Granovetter, 1977). Therefore, it is worthwhile to investigate recommendation behavior with recommenders with weak ties and heterophily, which may hypothetically provide more balanced, unbiased, and broad-in-scope recommendations. Such investigations may require controlled settings, in contrast to the natural settings in this study, in order to break the natural tendency of the recommendation seekers in their selection of recommenders. The effects and differences identified in recommendation behavior between strong versus weak social ties and homophily versus heterophily may provide unique insight to our understanding of recommendation-related phenomena. Furthermore, the findings from these future studies may be able to provide guidance in developing methods of regulating RSs.

8.4 Implications

8.4.1 Implications for Research

The findings of this research advance our knowledge and understanding about people's recommendation seeking and trustworthiness evaluation behaviors, of which little is currently known. While extensive studies (e.g., Shah, 2012, 2017) have offered critical and insightful findings in understanding information seeking behaviors for the development of information retrieval systems, recommendation seeking behaviors have been understudied. This dissertation study is an initial attempt to investigate information seeking behaviors with specific focus on recommendation seeking under uncontrolled settings. Since there are no distinctive definitions of recommendation versus information in literature, the (socially-oriented) characteristics of RSB found in this study will provide guidance toward more refined definitions of recommendation versus information.

The approaches proposed for the seekers' perceptions of recommendation need situations and their relationships with the recommenders, in addition to recommendation and recommendation trustworthiness characteristics, can be useful for developing better recommender systems (RSs). Also, this study lays out an empirical foundation for further studies of recommendation seeking behaviors, in that it was an interdisciplinary endeavor embracing multiple academic fields including information science, library science, marketing, business, organization study, psychology, and information technology.

This study enhances the understanding of RSB with relation to trustworthiness in three important ways. First, although no statistically significant evidence was found, this study's categorization of recommendation needs into the two facets of functional and

temporal, and their respective subcategorizations into affective vs. cognitive and long-term vs. short-term may have certain implications in other studies on the trustworthiness evaluation. With further refinement and expansion (with possible inclusion of additional categories) of the proposed (sub)categorizations as preliminary benchmarks, more patterns from different perspectives may be extracted. Also, these categorizations will allow comparison studies on different behaviors of trustworthiness evaluations across different categories.

Secondly, the results provided further empirical support for the roles of social ties and homophily (status, value, and situation) in the trustworthiness evaluation of recommenders and recommendations. This suggests that tie strength and homophily apparently constitute a distinct context for recommendation-related situations.

Thirdly, the structured categorization and the model (into which *Tie Strength* and *Homophily* were incorporated) in this study will provide better organized and systematic approaches and benchmarks for future studies in the relevant fields. The modified model, with or without adjustments/tuning, will provide guidance to future similar studies. If a study's scope and conditions of the collected data are similar to those of this dissertation, the same model can be used with possibly some minor adjustments. Else, the model can be revised according to different scope/conditions of a study by adding or eliminating any component(s) and rearranging their influential relationships.

8.4.2 Implications for Practice

Current RSs are based on the preferences of like-mined users. The influence of various factors on the trustworthiness of recommenders and recommendations identified

in this study can provide valuable implications into data-driven online RSs, such as Amazon's item suggestions, Netflix's movie recommendations, Music recommendations, YouTube, News Feeds, TripAdvisor, and Yelp. The three influential factors found in this study—*Tie Strength*, *Propensity to Trust * Tie Strength*, and *Homophily*—should play a main role in the structures of RSs. Recommenders with strong ties and homophily are highly correlated with trustworthy recommendations, and the identification of such recommenders will improve the RSs' performance. At the same time, other factors that were statistically insignificant may also have implications in the development of RSs in the sense that, in natural settings, those factors may be excluded in the processing for filtering, preference identification, and pattern estimation. These identified factors as influential or non-influential will guide various metrics (e.g., popularity, similar items/contents/genres, purchase history, and behavior patterns) in RSs with improved accuracy, relevance, and algorithmic efficiency, particularly under natural settings. In general, in developing RSs, it is suggested that the controlled situations as in other studies, as well as the uncontrolled situations in this dissertation are both taken into account.

One possible issue in clustering potential candidate recommendations based on *Tie Strength* and *Homophily*, which were two of the three determinants revealed, is that the RSs may provide unbalanced recommendations. Similar values due to *Tie Strength* and *Homophily* between the recommendation seekers and the recommenders (either directly or through RSs) may result in biased pool of recommendations (e.g., the items from the preferences of the like-minded members) with the lack of diversity. This aspect often leads the recommendation seekers to be misinformed by and to overrate the

trustworthiness of the recommendations received. In fact, weak ties can be useful for transferring information and knowledge and connecting people in different clusters. In this regard, this study's identification of *Tie Strength* and *Homophily* as influential factors may in turn be used to assess possible bias and take it into account in making recommendations in RS algorithms. The strong influence of tie strength and homophily on trustworthiness suggests that RSs should, at least in some instances, provide recommendations from non-homophilic recommenders.

8.5 Concluding Remarks

This dissertation presents initial insights on trustworthiness evaluation in recommendation seeking behaviors in natural settings. The characterization of recommendation needs with different facets (functional and temporal) and their categorizations should contribute to research and system designs for various associated behaviors. The proposed approaches of model refinement, data collection, and coding schemes will contribute to advancing RSs and laying out foundations for further relevant studies.

The results of this dissertation indicate that recommendation seeking behaviors in natural settings are dominantly shaped by social factors. Due to this inherent social nature, trustworthiness evaluations of recommendations and recommenders are strongly driven by social factors—*Tie Strength*, *Homophily*, and the interactions between *Propensity to Trust* and *Tie Strength*. This study in natural settings found, contrary to common studies of general information seeking in controlled settings, that cognitive factors did not significantly affect the judgement of trustworthiness of recommendations

and recommenders. The socially-oriented characteristics of recommendation seeking behaviors in natural settings will serve as criteria and provide a distinction or redefine the relationship between recommendations and recommendation seeking behavior and general information and information seeking behavior. The results of this study also suggest that the usual approaches in which information seeking behavior has been studied and understood need to be expanded to include more attention to social factors.

APPENDICES

Appendix 1

Instruments—Pilot Study 1

The following instruments are the tools submitted to and approved from the IRB. After the IRB approval, the diary in an Excel format transferred to a survey format in Qualtrics when the pilot study 1 was launched.

Appendix 1.1. Initial Interview: Definition of Terms —Pilot 1

Thank you for agreeing to participate in this study. This is the diary in which you are asked to record information each time you receive and/or ask for a recommendation over the next one week. Here are some definitions and explanations which will help you in doing this.

“*Recommendations*” refers to suggested information that you receive or encounter from your social networks (e.g., online or in face-to-face interaction with human information sources), or from sources such as TripAdvisor, Amazon, Yelp, and the like.

“*Source of recommendation*” means who, or what, provided a recommendation. For instance, sources could be friends, family, acquaintances, members of an online community, websites, etc., and may include anonymous people from a Q&A or recommendation service, or machine-generated recommendation sources. Thus, a recommender could be human or non-human.

For the next one week, please plan to set aside about five minutes for recording a diary entry whenever you seek, receive, and encounter recommendations. Please record the following information for each recommendation experience.

1. The *date* and *time* that you encountered the recommendation.

2. *Problem at your hand* (or reason for recommendation). Please record what question (or incident) or which situation you had regarding your recommendation need. In the case that you receive a recommendation without asking for one, please note why the source gave you that recommendation (e.g. "others who bought this also bought [something else]", or "these are recommended for you"). .

3. *The source of the recommendation*. You may encounter various *recommenders* such as friends, other people, Websites, personal networks, peers in an online community, peers in a website, etc. Please record who or what gave you this recommendation that is, where, or from whom, the recommendation comes.

4. *Medium used*. Please record how you interacted with the source of the recommendation. For instance, in person, social media, online community, phone, chat, email, websites, etc.

5. *Brief description of recommendation you received*. Please record briefly what was the recommendation you received. For instance, a product name, a name of hotel, things to do in a travel place, what to eat in a specific restaurant, research papers related to your research topic, and so on.

6. *Whether you decided to accept the recommendation, or not*.

Please DO NOT make a record in the diary for any recommendation experience that you feel should be private. Thank you very much for your participation.

Appendix 1.2. Pre-Survey during Initial Meeting

—Pilot 1

[At the beginning of data collection, the paper-based survey migrated to an online-based form, but the questions remained the same.]

Entry Questionnaire

The following entry questionnaire session consists of three parts: (1) basic demographics, (2) self-assessment of propensity to trust, and (3) instruction of recording a diary entry.

PART 1. Demographics

The following questions ask about your demographic information. Please circle or write one which explains yourself.

Q1. Gender: What is your gender? Please circle one.

- (1) Female
- (2) Male
- (3) Prefer not to disclose

Q2. Age: Which category below includes your age? Please circle one.

- (1) 18-24 years old
- (2) 25-34 years old
- (3) 35-44 years old
- (4) 45-54 years old
- (5) 55-64 years old
- (6) 65-74 years old
- (7) 75 years or older

Q3. Academic Status: Which of the following categories best describes your status?

Please circle or write one.

- (1) Undergraduate student
- (2) Master student
- (3) PhD student
- (4) Post-doctoral researcher
- (5) Faculty member (tenured)

- (6) Faculty member (pre-tenure)
- (7) Other (please specify) _____

Q4. Education: What is the highest degree or level of school you have completed? If currently enrolled, highest degree received. Please circle or write one.

- (1) High school graduate, diploma or the equivalent (for example: GED)
- (2) Some college credit, no degree
- (3) Associate degree
- (4) Bachelor's degree
- (5) Master's degree
- (6) Professional degree
- (7) Doctorate degree
- (8) Other (please specify) _____

Q5. Field of Study: What is your current field of study (please specify)? Please write your major(s).

PART 2. Self-Assessment of Trust Tendency—Pilot 1

Please read each statement in this self-assessment. Using the response scale below, please circle one that indicates the extent to which you agree or disagree with that statement. This instrument has 6 statements. Please choose and circle only one for each statement.

- (1) It is easy for me to trust others.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

- (2) I usually trust people until they give me a reason not to trust them.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

- (3) I tend to trust others even if I have little knowledge of them.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

(4) Trusting another person is not difficult for me.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

(5) My typical approach is to trust new acquaintances until they prove I should not trust them.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

(6) My tendency to trust others is high.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

Appendix 1.3. Diary Survey

—Pilot 1

Q1-1 - Date (MM/DD/YY) you received the recommendation.

Q1-2 - Time of Day (HH:MM:AM/PM) you received the recommendation.

Q2 - The Problem at hand that led you to ask for a recommendation. (In the case that you receive a recommendation without asking, please note why the source gave it to you.)

Q3 - Source of the recommendation (e.g. person's name, company's name ...)

Q4 - Medium used

Q5 - Brief description about the received recommendation

Q6 - Whether to accept the recommendation?

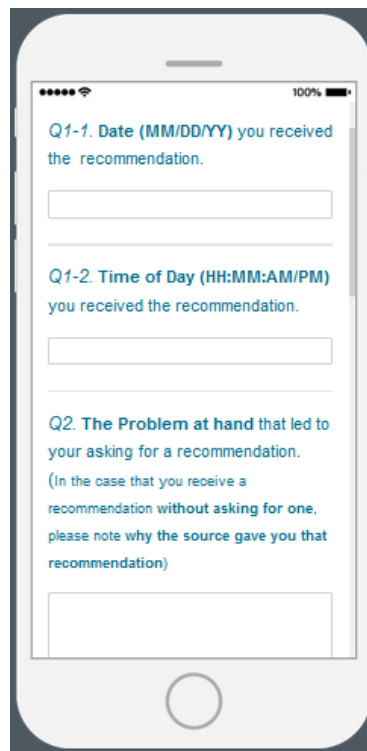
A screenshot of a mobile phone screen displaying a survey form. The phone has a white bezel and a home button at the bottom. The screen shows a list of questions in blue text. The first question is 'Q1-1. Date (MM/DD/YY) you received the recommendation.' followed by a text input field. The second question is 'Q1-2. Time of Day (HH:MM:AM/PM) you received the recommendation.' followed by a text input field. The third question is 'Q2. The Problem at hand that led to your asking for a recommendation. (In the case that you receive a recommendation without asking for one, please note why the source gave you that recommendation)' followed by a text input field. The status bar at the top shows signal strength, Wi-Fi, and 100% battery.

Figure 16 Screenshot of an example diary on a mobile phone (Pilot 1)

Q1-1. Date (MM/DD/YY) you received the recommendation.

Q1-2. Time of Day (HH:MM:AM/PM) you received the recommendation.

Q2. The Problem at hand that led to your asking for a recommendation.
(In the case that you receive a recommendation without asking for one, please note why the source gave you that recommendation)

Q3. Source of the recommendation (e.g. person's name, company's name, ...)

Q4. Medium used

Q5. Brief description about the received recommendation

Q6. Whether to accept the recommendation?

- ☐ Accept
- ☐ Not Accept
- ☐ I don't know or Not decided

SUBMIT

Figure 17 Screenshot of an example diary on a computer screen (Pilot 1)

Appendix 1.4. Semi-Structured Interview Questions

Trustworthiness Evaluation Table (example)—Pilot 1

On top of interview questions, each participant was asked how they evaluated the trustworthiness of recommendations in terms of accuracy, currency, coverage, believability, objectivity, validity, stability (i.e., consistency), and relevancy with 5-Lickert scales. Also they were asked if they were used any other criteria for the evaluation. [This table was distributed to each participant before an interview began. The participant evaluated each recommendation and scored each item.]

Interview Questions—Pilot 1

1. About problems: (1) How familiar (2) How long have you involved (3) uncertainty level (4) risk level

2. Source: (1) Why you chose this recommender (2) Tie strengths (how long you have known; how often you correspond; how close) (3) How trustworthy (4) Share similar interests? Why? In case of receiving recommendations without asking, why the source gave you the recommendation? And how well does the source know your situation or problem? (5) Homophily (age, gender, ethnicity, education, financial status, neighborhood, job, organizational foci, religion, etc....)

3. Do you think the relationship affected your decision to accept or not? Are you going to act on this recommendation?

4. Why did you make this decision?

5. After receiving recommendations: (1) How confident are you in terms of solving your problem after receiving this recommendation? (2) How satisfied were you with this recommendation? (3) How useful was this recommendation in order to solve your problem?

Appendix 2

Instruments—Pilot Study 2

Appendix 2.1. Introductory Meeting:

Pre-Survey & Introduction of Diary Study—Pilot 2

Thank you very much for your participation. The purpose of this study is to explore how people actually seek and receive recommendations in everyday life and how they evaluate those recommendations. Participation in this study will involve three separate sessions: (1) this introductory meeting (total duration: about 30 minutes) including online pre-survey (estimated response time: 5 minutes; can be completed before, after, during this meeting upon your choice); (2) one-week diary recording about your recommendation experiences (estimated response time for one entry: 5 minutes); and (3) one-hour post-diary interview for in-depth investigation.

During this introductory meeting, you will sign up an informed consent form, and briefly learn what this study is about. Next, you will receive an online pre-survey by email, which asks about basic demographic information and your self-evaluation of trust tendency. Then, the definition of each term in a diary template will be explained as well as how to use an online diary survey form will be instructed.

In a follow-up email, you will receive an online diary link, which will lead you to the diary template in a survey format. Please save the link to your favorite in your browser and smart phone. Then you can use this link every time you input your recommendation experience and evaluation.

During the following ONE WEEK, you will record your recommendation experience on this given diary template when you seek or receive recommendations to

solve your issues or accomplish your task. If possible, please try your best to record your experiences as soon as you have. Otherwise, please set some time aside at the end of every day to input recommendations you sought or received during the day. During the diary participation week, a reminder email and/or text will be automatically sent to you to remind you of recording your recommendation experiences every day.

After your one-week diary session is completed, the investigator will review the records for data analysis. For further investigation and/or clarification about your data, the researcher will contact you and schedule a post-diary interview with you. The post-diary interview will take about one hour. Specific dates, times and places of the interviews will be scheduled at your convenience. The post-diary interview can be either in person or through Skype, and will be audio-recorded.

[Each term in the diary template will be explained while showing the diary survey form.]

Pre-Survey (Online)—Pilot 2

The entry questionnaire session consists of the following parts: (1) basic demographics, (2) self-assessment of propensity to trust, and (3) instruction of recording a diary entry.

PART 1. Demographics (Online)—Pilot 2

Q1. *Gender*: What is your gender? Please check one.

- (1) Female
- (2) Male
- (3) Prefer not to answer

Q2. *Age*: Which category below includes your age? Please check one.

- (1) 18-24 years old
- (2) 25-34 years old
- (3) 35-44 years old
- (4) 45-54 years old

- (5) 55-64 years old
- (6) 65-74 years old
- (7) 75 years or older
- (8) Prefer not to answer

Q3. *Academic Status*: Which of the following categories best describes your academic status? Please check or write one.

- (1) Undergraduate student
- (2) Master student
- (3) Ph.D. student
- (4) Post-doctoral researcher
- (5) Faculty member (tenured)
- (6) Faculty member (pre-tenure)
- (7) Other (please specify)

Q4: *Education*: What is the highest degree or level of school you have completed? If you are currently enrolled, indicate the highest degree you have already received. Please check or write one.

- (1) High school graduate, diploma or the equivalent (for example: GED)
- (2) Some college credit, no degree
- (3) Associate degree
- (4) Bachelor's degree
- (5) Master's degree
- (6) Professional degree
- (7) Doctorate degree
- (8) Other (please specify)

Q5. *Field of Study*: What is your current field of study (please specify)? Please write your major(s). _____

PART 2. Self-Assessment of Trust Tendency—Pilot 2

Please read each statement in this self-assessment. Using the response scale below, please check one that indicates the extent to which you agree or disagree with that

statement. This instrument has eight statements. Please choose and check only one for each statement.

1. Most people can be counted on to do what they say they will do.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

2. I tend to trust people, even those whom I have just met for the first time.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

3. Unless you remain alert, someone will soon take advantage of you.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

4. Most people would tell a lie if they could gain by it.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

5. My typical approach is to be cautious with people until they have demonstrated their trustworthiness.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

6. I usually give acquaintances the benefit of the doubt if they do something that seems selfish.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

7. Most people pretend to be more honest than they really are.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

8. I believe that most people are generally trustworthy.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

PART 3. Instruction of Diary Entry—Pilot 2

Thank you again for agreeing to participate in this study. By another email, you will receive a link to a diary template in a survey format. This survey form is the diary in which you are asked to record your everyday experience over the next ONE-WEEK period about recommendation you receive and/or ask for. You should try to make an entry for each recommendation experience in each day. This can be done either immediately after the experience, or at the end of the day. If at all possible, recording immediately after having recommendations would be preferred, so that you can take advantage of fresh memory with sufficient details.

3.1 Recommendation and Source of Recommendation: Notions and Examples—Pilot 2

3.1.1. Recommendation

A “*recommendation*” is a form of advice with respect to the course of an action or a decision. People encounter recommendations either through directly asking for them, or being offered without having elicited them from another (person/entity). A “recommendation” can be a piece of suggested information that you receive or encounter from algorithmic systems (i.e., machine-generated recommendations), or from people around you (i.e., human-based recommendation) via either direct communication in person or technology-mediated communication, such as texting, emails, SNS, or websites.

Some examples of recommendations are as follows:

- (1) Recommended news articles from your friends, family, acquaintances via online interaction, by email, phone, or texting, or from your news feeds, and the like;
- (2) Suggested information or advice received from people around you through face-to-face interaction or technology-mediated interaction (e.g., your thesis/dissertation advisor may recommend to read a research article or to take a specific course, or your teammate may recommend programming codes (or software) to enhance your project performance);
- (3) Recommended products or services by peer users in websites, blogs, news media, YouTube, TripAdvisor, and so on. For instance, bloggers often recommend certain products after using them;
- (4) Advices which are related to your situation. For instance, a server at a restaurant may recommend a dish from the menu;
- (5) Recommended information from social review sites such as TripAdvisor, Amazon, Yelp, Netflix, and the like. For instance, Netflix shows users' ratings and reviews, and you could choose one of Netflix recommended movies;
- (6) Shopping sites' recommended items. For instance, Amazon shows recommended items based on your search history or purchase history;
- (7) And the like...Please do not limit your entries to the above examples.

3.1.2. Source of Recommendation

A “*source of recommendation*” or a recommender could be human or non-human (i.e., system) that provided a recommendation.

Some examples of sources of recommendation are as follows:

- (1) Human sources such as friends, family, and acquaintances;
- (2) People you know online such as members of an online community and websites, bloggers, etc.;
- (3) You may also include anonymous people from social Q&A sites such as Yahoo Answers! or any recommendation services;
- (4) Socially generated sources such as user ratings, user likes in Yelp, Netflix, Movielens, TripAdvisor, Library Thing, IMDb, Expedia, etc.;

(5) Website's generated recommendation sources such as Amazon, News media websites, etc.;

(6) And the like... Please do not limit your entries to the above examples.

For the next ONE WEEK, please try your best to record your recommendation experiences as soon as you have them. Otherwise, please plan to set some time aside for recording a diary entry at the end of every day in each day. Please look up the notes in each question to see the meaning of each term in the questionnaire.

In case of having several recommendations for one situation or issue, you can choose one of the followings:

a) Separate submission

You can fill each recommendation in a separate diary form. Each submission indicates one recommendation you received. You could have several recommendations regarding the same issue. In this case, please record each recommendation and submit separately. For instance, you plan to purchase a car. Your friend recommends Honda Civic, your mom recommends Ford Taurus, and the Consumer Reports suggests Hyundai Sonata. Then, you may record these incidents in three separate diaries. Please record not only human recommenders but also non-human recommenders such as recommender systems (i.e., algorithmic suggestions), recommendation services, or other websites. For example, if Kelley Blue Book suggested 10 best lists for compact cars, you may consider it as recommendations from a website.

b) Merged submission

Another option is that you can fill all recommendations you received in one diary form by listing all you have had. In this case, you should indicate who (or what) gave which recommendation. In this way, we can recognize which recommendation originated from whom or what.

If you have any questions while filling in the diary or need to make any corrections after a submission, please feel free to contact the investigator at eunbaik@rutgers.edu or eunjungbaik@gmail.com. At any time, you can exclude information that is private or confidential from the diary. Please do not make a record in

the diary for any recommendation experience that you feel should be private. Again, thank you very much for your participation. You will receive a reminder every day.

Please provide your contact number and email address.

Appendix 2.2. Diary Survey (Online)

—Pilot 2

Q1. *Date (MM/DD/YY)* you received or encountered the recommendation. Please write the date.

Q2. *Time of the day* you received or encountered the recommendation. Please choose one.

- (1) Morning (5 AM—Noon)
- (2) Afternoon (Noon—5 PM)
- (3) Evening (5 PM—9 PM)
- (4) Night (9 PM—5 AM)

Q3. *The problem, issue at hand, or situation* that led you to ask for a recommendation.

Please write in the text box.

Note: Please record what question (or incident) or which situation you had regarding your recommendation need. In case that you receive a recommendation without asking for one, please explain the situation why the source gave you that recommendation. For instance, "others who bought this also bought [something else]," or "these are recommended for you."

Q4. *Familiarity of the Issue or Topic You Had:* How familiar are you with the problem or issue you had?

Note: If you received a recommendation without asking, please write how familiar you are about the topic or theme of the recommendation you received.

- (1) Extremely familiar
- (2) Very familiar
- (3) Moderately familiar
- (4) Slightly familiar
- (5) Not familiar at all

Q5. *Source(s) of the Recommendation* (e.g. father, cousin, friend, office colleague, police officer, Amazon, Netflix, blogger, writer, online nickname, person's nickname, or company's name...). List ALL sources that provided you with the recommendations if you choose to a merged submission for multiple recommendations.

Note: You may encounter various **recommenders** such as friends, acquaintances, anonymous people, Websites, personal networks, peers in an online community, peers in a website, etc. Please record who or what gave you this recommendation. Names of persons are not required; please just record your relationship with the person, e.g., friend, advisor, roommate, etc.

Q6. *Medium used*: Please write how you interacted with the sources. For instance, in person, email, mobile phone, phone texting, chatting, laptops, desktops, threads in websites, comments in a blog, etc.

- (1) In person (face to face)
- (2) Desktop computer. Please list any application/website used: _____
- (3) Laptop computer. Please list any application or website used: _____
- (4) Mobile phone browser. Please list any application/website used: _____
- (5) Mobile phone apps. Please list any application/website used : _____
- (6) Mobile phone texting. Please list any application/website used: _____
- (7) Mobile phone (Verbal communication)
- (8) Landline phone
- (9) Other medium. Please list any medium you used: _____

Q7. *Brief Description about the Received Recommendation*. In case of multiple recommendations, please indicate who (or which) gave you each recommendation.

Note: Please write briefly about what the recommendation was about. For instance, a product name, a name of hotel, things to do in a travel place, where to eat, what to eat in a specific restaurant, research papers related to your research topic, and so on.

Q8. *Whether to accept* the recommendation.

- (1) Accept
- (2) Not accept
- (3) I don't know or have not decided

Q9. Please write *why* you decided to accept, not to accept, or to be indecisive of this recommendation.

Q10. Please write what *the most important aspect* is to make this decision in this situation.

Q11. *Other Sources*: Did you consulted with any other people or websites for this problem or situation?

(1) Yes

(2) No

If yes in Q11, please write what other sources were:

Q12. Please carefully recall your recommendation experiences and make sure this is the only one to report now. Do you have another recommendation to record?

(1) Yes, I have another one.

(2) No, this is the only one that I have now.

[If the answer is Yes in Q12, another set of a diary form (the same set as the above Q1-Q12) will appear on the screen up to 3 more entries. In case of No, the survey will be terminated.]

Appendix 2.3. Semi-Structured Post-Diary Interview—Pilot 2

This interview is for in-depth investigation and/or data clarification after reviewing participants' data that are submitted. The estimated time for this interview is around one hour. This interview will be verbal conversation, and some questions are in multiple choice forms. Please answer the following questions based on your recommendation experience in your diary records.

Problem-Related—Pilot 2

Q1. *Duration of the Issue*: How long have you been involved in this problem or issue?

(1) Minutes (2) Hours (2) Days (3) Weeks (4) Months (5) Years (6) N/A

Q2. *Uncertainty of the Issue*: How uncertain were you about the solution to this problem?

Extremely uncertain—somewhat uncertain—Neither certain nor uncertain—Less uncertain—Not at all uncertain

Q3. *Risk in the Issue*: Please indicate how risky it is if you accept this recommendation.

Extremely risky—somewhat risky—Neither risky nor safe—Less risky—Not at all risky

Relationship with Recommendation Sources (self-perception)—Pilot 2

The following questions are associated with your relationship with the recommenders in your diary. Please answer each question based on your perception.

Q4. *Strength*: How strong relationship do you have with this recommender?

Very strong—Somewhat Strong—Neither strong nor weak—Somewhat weak—Very weak

Q5. *Duration*: How long have you known this recommender?

Very long—Somewhat long—Neither long nor short—Somewhat short—Very short

Q6. *Frequency*: How often do you contact with this recommender on average?

Q7. *Closeness*: How close are you with this recommender? Please choose one.

Very close—Somewhat close—Neither close nor distant—Somewhat distant—Not at all close

Q8. *Shared Interests*: How similar are you in shared interests with this recommender, in general? Please choose one.

A great deal—A lot—A moderate amount—A little—None at all N/A

Q9. Please explain what your shared interests are with this recommender, in general.

Q10. *Similarity*: How similar are you with this recommender? For instance, age, ethnicity, neighbor, education, organizational foci,

Q11. *Gender*: What is the gender of this recommender? Please check one.

(1) Male (2) Female (3) Prefer not to answer

Recommendation-Related—Pilot 2

Q12. How trustworthy is this recommender's recommendation for this issue?

Extremely trustworthy—Somewhat trustworthy—Neither trustworthy nor untrustworthy—Less trustworthy—Not at all trustworthy

Q13. Why did you think the trustworthiness of this recommendation is as your above answer? Please explain how you decide the trustworthiness of recommendation when you accepted or did not accept the recommendation you received. What aspects did you consider to decide to accept or not to accept the recommendation? Why is this recommendation meaningful and significant?

(Note: For instance, accuracy up-to-date, coverage, reliability, believability, objectivity, consistency, relevance, and so on.)

Recommender (Source)-Related—Pilot 2

Q14. How trustworthy is this recommender in terms of the recommendation you received?

Extremely trustworthy—Somewhat trustworthy—Neither trustworthy nor untrustworthy—Less trustworthy—Not at all trustworthy

Q15. Please tell me how you decided the trustworthiness of this recommender when you accepted or did not accept the recommendation you received.

Q16. Did your relationship with this recommender affect your decision to accept this recommendation or not? In what way?

Q17. *Other Sources*: Did you consult with any other sources (e.g., people, website, etc.) for this problem or issue? This question was previously asked in the diary, but the following questions are asked for further understanding.

Why did you choose this person, website, or another source (e.g., books, media, etc.) as the recommender for your problem over other sources? If you did not ask for the recommendation, why did this source give you this recommendation or suggestion?

Q18. How did the relationship with the recommender affect your decision or thought?

After Receiving the Recommendation—Pilot 2

Q19. *Confidence level after receiving recommendation*: How confident were you in terms of solving your problem or issue after receiving this recommendation?

Extremely confident—Somewhat confident—Neither confident nor unconfident—Less confident—Not at all confident

Q20. *Satisfaction level after receiving recommendation*: How satisfied were you after receiving this recommendation in terms of solving your problem or issue?

Extremely satisfied—Somewhat satisfied —Neither satisfied nor dissatisfied — Less satisfied —Not at all satisfied

Q21. *Usefulness of This Recommendation*: How useful was this recommendation in solving your problems/issues or helping your situation?

Q22. How did this recommendation affect your behavior, decision, and/or thought?

Q23. Please provide any other comments if you have any (optional).

Appendix 3

Instruments—Dissertation

The following instruments are the updated version for this dissertation study. Except for several questions, all procedures and most questions remained the same as the Pilot 2. Some questions in the semi-structured interview are migrated to the diary template because those questions are a short answer questions and easier to answer at the moment as soon as respondents receive a recommendation. According to this study purpose, some words in sentences of the self-assessment of trust tendency have been revised from the original sentences in Appendix 1 and 2, which are used in the organization behavior research.

Appendix 3.1. Introductory Meeting:

Pre-Survey & Diary Study Introduction—Dissertation

Thank you very much for your participation. The purpose of this study is to explore how people actually seek and receive recommendations in daily life and how they evaluate those recommendations. Participation in this study will involve three separate sessions: (1) this introductory meeting (total duration: about 30 minutes) including online pre-survey (estimated response time: 5 minutes; can be completed after or during this meeting upon your choice); (2) one-week (i.e., seven consecutive days) diary recording about your recommendation experiences (estimated response time for one entry: 5 minutes); and (3) one-hour post-diary interview for in-depth investigation.

During this introductory meeting, you will sign up an informed consent form, and briefly learn what this study is about. Next, you will receive an online pre-survey by email, which asks about your basic demographic information and self-evaluation of trust

tendency. Then, the definition of each term in a diary template will be explained as well as how to use an online diary survey form will be instructed.

In a follow-up email, you will receive an online diary link, which will lead you to the diary template in a survey format. Please save the link to your favorite in your browser on computers and a smart phone. Then you can use this link every time you input your recommendation experience and evaluation.

During the following ONE WEEK, you will record your recommendation experience on this given diary template when you seek recommendations to solve your issues or accomplish your task. If possible, please try your best to record your experiences as soon as you have. Otherwise, please set some time aside at the end of every day to input recommendations you sought during the day. During the diary participation week, a reminder email and/or text will be automatically sent to you to remind you of recording your recommendation experiences every day.

After your one-week diary session is completed, the investigator will review the records for data analysis. For further investigation and/or clarification about your data, the researcher will contact you and schedule a post-diary interview with you. The post-diary interview will take about one hour. Specific dates, times and places of the interviews will be scheduled at your convenience. The post-diary interview can be either in person or through Skype, and will be audio-recorded.

[Each term in the diary template will be explained while showing the diary survey form.]

Pre-Survey (Online)—Dissertation

The entry questionnaire session consists of the following parts: (1) basic demographics, (2) self-assessment of propensity to trust, and (3) instruction of recording a diary entry.

PART 1. Demographics (Online)—Dissertation

Q1. *Gender*: What is your gender? Please check one.

- (1) Female (2) Male (3) Prefer not to answer

Q2. *Age*: Which category below includes your age? Please check one.

- (1) 18-24 years old
- (2) 25-34 years old
- (3) 35-44 years old
- (4) 45-54 years old
- (5) 55 years or older
- (6) Prefer not to answer

Q3. *Academic Status*: Which of the following categories best describes your academic status? Please check or write one.

- (1) Undergraduate student
- (2) Master student
- (3) Ph.D. student
- (4) Other (please specify)

Q4: *Education*: What is the highest degree or level of school you have completed? If you are currently enrolled, indicate the highest degree you have already received. Please check or write one.

- (1) High school graduate, diploma or the equivalent (for example: GED)
- (2) Some college credit, no degree
- (3) Associate degree
- (4) Bachelor's degree
- (5) Master's degree
- (6) Professional degree
- (7) Doctorate degree

(8) Other (please specify)

Q5. *Field of Study*: What is your current field of study (please specify)? Please write your major(s). _____

PART 2. Self-Assessment of Trust Tendency—Dissertation

Please read each statement in this self-assessment. Using the response scale below, please check one that indicates the extent to which you agree or disagree with that statement. This instrument has eight statements. Please choose and check only one for each statement.

1. I tend to trust online reviews from users on the web.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

2. I tend to trust people, even those whom I have just met for the first time.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

3. Most recommendations about products from anonymous people are commercials.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

4. Most people would tell a lie if they could earn a benefit.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

5. I am usually cautious with people until they show their trustworthiness.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

6. When my acquaintances tell a doubtable story, I will consider that maybe it really did happen even though I don't believe the story.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

7. Most people pretend to be more honest than they really are.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

8. I believe that most people are generally trustworthy.

Strongly disagree--Somewhat disagree--Neither agree nor disagree--Somewhat agree--Strongly agree

PART 1. Demographics

PART 1. Demographics

Education: What is the highest degree or level of school you have completed? If currently enrolled, highest degree received already. Please check or write one.

- ☐ High school graduate, diploma or the equivalent (for example: GED)
- ☐ Some college credit, no degree
- ☐ Associate degree
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional degree
- ☐ Doctorate degree
- ☐ Other (please specify)

Current Study: Please write the department you are currently in, and your area of study in the text box.

Age: Which category below includes your age? Please check one.

- ☐ Younger than 18 years old
- ☐ 18-24 years old
- ☐ 25-34 years old
- ☐ 35-44 years old
- ☐ 45-54 years old
- ☐ 55 years old or older

Figure 18 Screenshot of a pre-survey (part 1) form: An example of a computer screen

PART 2: Self-Assessment of Trust Tendency
 Please read each statement in this self-assessment. Using the response scale below, please check one that indicates the extent to which you agree or disagree with that statement. This instrument has eight statements. Please choose and check only one for each statement.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
1. I tend to trust online reviews from users on the web.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I tend to trust people, even those whom I have just met for the first time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Most recommendations about products from anonymous people are commercials.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Most people would tell a lie if they could earn a benefit.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I am usually cautious with people until they show their trustworthiness.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. When my acquaintances tell a doubtful story, I will consider that maybe it really did happen even though I do not believe the story.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Most people pretend to be more honest than they really are.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I believe that most people are generally trustworthy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 19 Screenshot of a pre-survey (part 2) form: An example of a computer screen

Current Study: Please write the department you are currently in, and your area of study in the text box.

Age: Which category below includes your age?
 Please check one.

☐ Younger than 18 years old
☐ 18-24 years old
☐ 25-34 years old
☐ 35-44 years old
☐ 45-54 years old

Figure 20 Screenshot of a pre-survey form: An example of a mobile phone screen

PART 3. Instruction of Diary Entry—Dissertation

Thank you again for agreeing to participate in this study. By another email, you will receive a link to a diary template in a survey format. This survey form is the diary in which you are asked to record your everyday experience over the next ONE-WEEK period about recommendation you receive and/or ask for. You should try to make an entry for each recommendation experience in each day. This can be done either immediately after the experience, or at the end of the day. If at all possible, recording immediately after having recommendations would be preferred, so that you can take advantage of fresh memory with sufficient details.

Recommendation and Source of Recommendation: Notions and Examples

3-1 Recommendation

A “*recommendation*” is a form of advice with respect to the course of an action or a decision. People have recommendations either through directly asking for them, or being offered without having elicited them from another (person/entity). A “recommendation” can be a piece of suggested information that you receive from algorithmic systems (i.e., machine-generated recommendations), or from people around you (i.e., human-based recommendation) via either direct communication in person or technology-mediated communication, such as texting, emails, SNS, or websites.

Some examples of recommendations are as follows:

- (1) Suggested information or advice received from people around you through face-to-face interaction or technology-mediated interaction (e.g., your thesis/dissertation advisor may recommend to read a research article or to take a specific course, or your teammate may recommend programming codes (or software) to enhance your project performance);

- (2) Recommended products or services by peer users in websites, blogs, news media, YouTube, TripAdvisor, and so on. For instance, bloggers often recommend certain products after using them;
- (3) Advices which are related to your situation. For instance, a server at a restaurant may recommend a dish from the menu;
- (4) Recommended information from social review sites such as TripAdvisor, Amazon, Yelp, Netflix, and the like. For instance, Netflix shows users' ratings and reviews, and you could choose one of Netflix recommended movies;
- (5) And the like... Please do not limit your entries to the above examples.

3-2 Source of Recommendation

A “*source of recommendation*” or a recommender could be human or non-human (i.e., system) that provided a recommendation.

Some examples of sources of recommendation are as follows:

- (1) Human sources such as friends, family, and acquaintances;
- (2) People you know online such as members of an online community and websites, bloggers, etc.;
- (3) You may also include anonymous people from social Q&A sites such as Yahoo Answers! or any recommendation services;
- (4) Socially generated sources such as user ratings, user likes in Yelp, Netflix, Movielens, TripAdvisor, Library Thing, IMDb, Expedia, etc.;
- (5) Website's generated recommendation sources such as Amazon, News media websites, etc.;
- (6) And the like... Please do not limit your entries to the above examples.

For the next ONE WEEK, please try your best to record your recommendation experiences as soon as you have them. Otherwise, please plan to set some time aside for recording a diary entry at the end of every day in each day. Please look up the notes in each question to see the meaning of each term in the questionnaire.

In case of having several recommendations for one situation or issue, you can choose one of the followings:

1) Separate submission

You can fill each recommendation in a separate diary form. Each submission indicates one recommendation you received. You could have several

recommendations regarding the same issue. In this case, please record each recommendation and submit separately. For instance, you plan to purchase a car. Your friend recommends Honda Civic, your mom recommends Ford Taurus, and the Consumer Reports suggests Hyundai Sonata. Then, you may record these incidents in three separate diaries. Please record not only human recommenders but also non-human recommenders such as recommender systems (i.e., algorithmic suggestions), recommendation services, or other websites. For example, if Kelley Blue Book suggested 10 best lists for compact cars, you may consider it as recommendations from a website.

2) Merged submission

Another option is that you can fill all recommendations you received in one diary form by listing all you have had. In this case, you should indicate who (or what) gave which recommendation. In this way, we can recognize which recommendation originated from whom or what.

If you have any questions while filling in the diary or need to make any corrections after a submission, please feel free to contact the investigator at eunbaik@rutgers.edu or eunjungbaik@gmail.com. At any time, you can exclude information that is private or confidential from the diary. Please do not make a record in the diary for any recommendation experience that you feel should be private.

Again, thank you very much for your participation.

You will receive a reminder every day. Please provide your contact number and email address.

Appendix 3.2. Diary Survey (Online)

—Dissertation

PART I. Recommendation Experience

Q I-1. *Date (MM/DD/YY)* you received or encountered the recommendation. Please write the date.

Q I-2. *Time of the day* you received or encountered the recommendation. Please choose one.

- (1) Morning (5 AM—Noon)
- (2) Afternoon (Noon—5 PM)
- (3) Evening (5 PM—9 PM)
- (4) Night (9 PM—5 AM)

Q I-3. *The problem, issue at hand, or situation* that led you to ask for a recommendation.

Please write in the text box.

Note: Please record what question (or incident) or which situation you had regarding your recommendation need. In case that you receive a recommendation without asking for one, please explain the situation why the source gave you that recommendation. For instance, "others who bought this also bought [something else]," or "these are recommended for you."

Q I-4. *Familiarity of the Issue or Topic You Had:* How familiar are you with the problem or issue you had?

If you received a recommendation without asking, please write how familiar you are about the topic or theme of the recommendation you received.

- (1) Extremely familiar
- (2) Very familiar
- (3) Moderately familiar
- (4) Slightly familiar
- (5) Not familiar at all

Q I-5. *Source(s) of the Recommendation* (e.g. father, cousin, friend, office colleague, police officer, Amazon, Netflix, blogger, writer, online nickname, person's nickname, or

company's name...). List ALL sources that provided you with the recommendations if you choose to a merged submission for multiple recommendations.

Note: You may encounter various **recommenders** such as friends, acquaintances, anonymous people, Websites, personal networks, peers in an online community, peers in a website, etc. Please record who or what gave you this recommendation. Names of persons are not required; please just record your relationship with the person, e.g., friend, advisor, roommate, etc.

Q I-6. *Medium used*: Please write how you interacted with the sources. For instance, in person, email, mobile phone, phone texting, chatting, laptops, desktops, threads in websites, comments in a blog, etc.

- (1) In person (face to face)
- (2) Desktop computer. Please list any application/website used: _____
- (3) Laptop computer. Please list any application/website used: _____
- (4) Mobile phone browser. Please list any application/website used: _____
- (5) Mobile phone apps. Please list any application/website used: _____
- (6) Mobile phone texting. Please list any application/website used: _____
- (7) Mobile phone (Verbal communication)
- (8) Landline phone
- (9) Other medium. Please list any medium you used: _____

Q I-7. *Brief Description about the Received Recommendation*. In case of multiple recommendations, please indicate who (or which) gave you each recommendation.

Note: Please write briefly about what the recommendation was about. For instance, a product name, a name of hotel, things to do in a travel place, where to eat, what to eat in a specific restaurant, research papers related to your research topic, and so on.

Q I-8. *Whether to accept* the recommendation.

- (1) Accept
- (2) Not accept
- (3) I don't know or have not decided

Q I-9. Please write why you decided to accept, not to accept, or to be indecisive of this recommendation.

Q I-10. Please write what *the most important aspect* is to make this decision in this situation.

Q I-11. *Other Sources*: Did you consulted with any other people or websites for this problem or situation?

- (1) Yes
- (2) No

If yes in Q I-11, please write what other sources were: _____

Q I-12. Please carefully recall your recommendation experiences and make sure this is the only one to report now. Do you have another recommendation to record?

- (1) Yes, I have another one.
- (2) No, this is the only one that I have now.

[If the answer is Yes in Q I-12, another set of a diary form (the same set as the above Q I-1-Q I-12) will appear on the screen up to 3 more entries. In case of No, the survey will be terminated.]

PART II. Recommendation Evaluation

Problem-related Evaluation

Q II-1. How long have you been involved in or thought about this problem or issue?

- (1) Years (2) Months (3) Weeks (4) Days (5) Hours (6) Minutes (7) Not remember

Q II-2. How do you perceive the level of uncertainty in this problem or issue? Please choose one.

Extremely uncertain—somewhat uncertain—Neither certain nor uncertain—Less uncertain—Not at all uncertain

Q II-3. Please indicate how risky it is if you accept this recommendation.

Extremely risky—somewhat risky—Neither risky nor safe—Less risky—Not at all risky

Recommendation-related Evaluation

Q II-4. How trustworthy is this recommender's recommendation for this issue? Please check one.

Extremely trustworthy—Somewhat trustworthy—Neither trustworthy nor untrustworthy—Less trustworthy—Not at all trustworthy

Recommender-related Evaluation

The following questions are associated with your relationship with the source(s) of recommendation(s) in your diary. Please answer each question based on your perception.

Q II-5. How strong relationship do you have with this recommender? Please choose one.

Very strong—somewhat Strong—Neither strong nor weak—Somewhat weak—Very weak

Q II-6. How long have you known this recommender? Please choose one.

Very long—Somewhat long—Neither long nor short—Somewhat short—Very short

Q II-7. How often do you contact with this recommender on average? Please choose one.

- (1) Everyday
- (2) Several times per week
- (3) Once or twice a week
- (4) Several times per month
- (5) Once or twice a month
- (6) Several time per year
- (7) Once or twice a year
- (8) Several time per years
- (9) Never

Q II-8. How close are you with this recommender? Please choose one.

Very close—Somewhat close—Neither close nor distant—Somewhat distant—Not at all close

Q II-9. How trustworthy is this recommender in terms of the recommendation you received? Please choose one.

Extremely trustworthy—Somewhat trustworthy—Neither trustworthy nor untrustworthy—Less trustworthy—Not at all trustworthy

Q1. **Date (MM/DD/YY)** you received or encountered the recommendation. Please write the date.

Q2. **Time of Day** you received or encountered the recommendation. Please check a time frame, and also indicate when you interacted the corresponding source(s) or recommender(s) in the text box.

☐ Morning (5 AM—Noon) - Recommender(s):

☐ Afternoon (Noon—5 PM) - Recommender(s):

☐ Evening (5 PM—9 PM) - Recommender(s):

☐ Night (9 PM—5 AM) - Recommenders:

Q3. **The Problem, Issue at hand, or Situation** that led you to ask for a recommendation. Please write in the text box *what question (or incident) or which situation you had regarding your needs for recommendation(s)*.

Q4. **Brief Description of Received Recommendation:** In case of multiple recommendations, please indicate who gave you which recommendation.

Note: Please write briefly what the recommendation was about. For instance, a product name, a name of hotel, things to do in a travel place, where to eat, what to eat in a specific restaurant, research papers related to your research topic, etc.

Q5. **Source(s) of the Recommendation:** List all sources interacted for this issue for recommendations (e.g. father, cousin, friend, office colleague, restaurant server, police officer, Amazon, Netflix, blogger, writer, online nickname, person's name, company's name, etc.)

Note: You may encounter various recommenders such as friends, anonymous people, Websites, personal networks, peers in an online community, peers in a website, etc. Please record who or what gave you this recommendation, that is, where, or from whom, the recommendation comes. A name of person is not required, and just recording a relationship is okay.

Figure 21 Screenshot of a diary template (Q1~Q5): An example of a computer screen

Q6. Medium used: How did you interact with the source(s) or recommender(s)? In the text box, please check a medium and specify the corresponding source(s) in case you have multiple sources.

☐ In person (face to face). Please list with whom you interacted:

☐ Desktop computer. List the corresponding source(s) and any application or website and:

☐ Laptop computer. The corresponding source(s) and any application or website:

☐ Mobile phone. Any application, texting, voice, or website used and the corresponding source(s):

☐ Landline phone:

☐ Other medium. Please specify any medium you used:

Q7. How familiar are you with the problem or issue you had?

	Very familiar	Somewhat familiar	Neither familiar nor unfamiliar	Somewhat unfamiliar	Unfamiliar
Familiarity of the Issue You had	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8. How long have you had this problem or issue, approximately?

	Years	Months	Weeks	Days	Hours	Minutes	Not remember
Duration of the Issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9. How uncertain were you about resolving this problem or issue before you received the recommendation(s)? Please choose one.

	Very uncertain	Somewhat uncertain	Neither uncertain nor certain	Somewhat certain	Very certain
Uncertainty Level in the Issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q10. How risky is your problem or issue? How much risk do you perceive in this issue? Please choose one.

	Very risky	Somewhat risky	Neither risky nor safe	Somewhat safe	Very safe
Risk Level in the Issue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11. Whether to accept the recommendation(s)? In the text box, please indicate which recommendations are accepted or not accepted.

☐ Accept whose recommendation(s):

Figure 22 Screenshot of a diary template (Q6~Q11): An example of a computer screen

☐ Not accept whose recommendation(s):

☐ I don't know or Not decided whose recommendation(s):

Q12. For each source, please briefly write **why you decided** to accept, not to accept, or to be indecisive of this recommendation.

Q13. Please write what are the **most important aspects** to make this decision in this situation?

Q14. **Recommendation Evaluation:** How trustworthy is this source's recommendation for this issue? Please check one after indicating which source's recommendation you are evaluating.

	Trustworthiness of the Received Recommendation				
	Very trustworthy	Somewhat trustworthy	Neither trustworthy nor untrustworthy	Somewhat untrustworthy	Untrustworthy
Recommendation1: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommendation2: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommendation3: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommendation4: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommendation5: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15. **Recommender Evaluation:** How trustworthy is this recommender for this issue? Please check one after indicating which source's recommendation you are evaluating.

	Trustworthiness of Source or Recommender				
	Very trustworthy	Somewhat trustworthy	Neither trustworthy nor untrustworthy	Somewhat untrustworthy	Untrustworthy
Recommender1: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender2: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 23 Screenshot of a diary template (Q12~Q15): An example of a computer screen

Trustworthiness of Source or Recommender					
	Very trustworthy	Somewhat trustworthy	Neither trustworthy nor untrustworthy	Somewhat untrustworthy	Untrustworthy
Recommender3: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender4: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender5: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16. Frequency of Relationship: How often do you contact with the source(s) or recommender(s) on average? Please check frequency, and also indicate how often you interacted the corresponding source(s) or recommender(s) in the text box.

☐ Everyday:

☐ Several times per week:

☐ Once or twice a week:

☐ Several times per month:

☐ Once or twice per month:

☐ Several times per year:

☐ Once or twice per year:

☐ Several times per years:

☐ Never:

Q17. How strong relationship do you have with this recommender? Please choose one after specifying the source or recommender in the text box.

Strength of Relationship with the Source or Recommender						
	Very strong	Somewhat Strong	Neither strong nor weak	Less strong	Not strong	N/A
Recommender1: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender2: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender3: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender4: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 24 Screenshot of a diary template (Q16~Q17): An example of a computer screen

Recommender5:

☐ ☐ ☐ ☐ ☐ ☐

Q18. **How long** have you known, as you perceived, this recommender? Please choose one after specifying the source or recommender in the text box.

Perceived Duration of Relationship with the Source or Recommender

	Very long	Somewhat long	Neither long nor short	Somewhat short	Very short	N/A
Recommender1: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender2: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender3: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender4: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender5: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q19. **How close** are you with this recommender? Please choose one after specifying the source or recommender in the text box.

Closeness of Relationship with the Source or Recommender

	Very close	Somewhat close	Neither close nor distant	Somewhat distant	Very distant	N/A
Recommender1: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender2: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender3: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender4: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recommender5: <input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20. Did you consult with any other people, sources, or websites for this issue besides recommenders you mentioned previously?

☐ Yes. Please write what other sources are:

☐ No

Q21. Please carefully recall your recommendation experiences and make sure this is the only one to report now. Do you have another recommendation to record?

☐ Yes, I have more. **Please use the diary link again** for another entry after submitting this form.

☐ No, this is the only one I have now.

Figure 25 Screenshot of a diary template (Q18~Q21): An example of a computer screen

Recommendation Diary

Q1. **Date (MM/DD/YY)** you received or encountered the recommendation. Please write the date.

Q2. **Time of Day** you received or encountered the recommendation. Please check a time frame, and also indicate when you interacted the corresponding source(s) or recommender(s) in the text box.

Morning (5 AM—Noon) - Recommender(s):

Afternoon (Noon—5 PM) - Recommender(s):

Evening (5 PM—9 PM)

Figure 26 Screenshot of a diary template (Q1~Q2): An example of a mobile phone screen

Appendix 3.3. Semi-Structured Post-Diary Interview

—Dissertation

This interview is for in-depth investigation and/or data clarification after reviewing participants' data that are submitted. The estimated time for this interview is around one hour. This interview will be verbal conversation, and some questions are in multiple choice forms. Please answer the following questions based on your recommendation experience in your diary records.

Relationship with Recommendation Sources (self-perception)

Q1. *Perceived Shared Interests*: Do you share interests with this recommender, in general? Please explain what your shared interests are with this recommender, in general.

Q2. *Perceived Similarity*: How do you perceive similarity with this recommender? For instance, age, ethnicity, neighbor, education, organizational foci, etc.

Recommendation-Related

Q3. How would you decide this trustworthiness of recommendation? What aspects did you consider to decide to accept or not to accept the recommendation? Why is this recommendation meaningful and significant?

Recommender (Source)-Related

Q4. Did your relationship with this recommender affect your decision to accept this recommendation or not? In what way? How did the relationship with the recommender affect your decision or thought?

Q5. *Other Sources*: [Did you consult with any other sources (e.g., people, website, etc.) for this problem or issue? This question was previously asked in the diary, but the following questions are asked for further understanding.]

Why did you choose this person, website, or another source (e.g., books, media, etc.) as the recommender for your problem over other sources?

Q6. *Other Sources*: If you ask a recommendation regarding this problem, where or who would you ask? Please name three people or places you would contact or interact to get a recommendation.

After Receiving the Recommendation

Q7. How did this recommendation affect your behavior, decision, and/or thought?

Q8. Please provide any other comments if you have any (optional).

Appendix 4

Final Codebook (Qualitative Analysis)

Table 49 shows the final coding scheme with definitions used to qualitatively analyze the diary records and interview transcripts.

Table 49
Overall Coding Scheme

Main Category	Sub-Category		Definition
1. Recommendation Needs	1.1 Functional Factors	Affective Need	<ul style="list-style-type: none"> • Needs for transitions from negative to positive mental states. Emotional support, confirmation acquisition, confidence gaining, and risk and uncertainty reduction.
		Cognitive Need	<ul style="list-style-type: none"> • Needs for others' knowledge due to participant's gap or lack of knowledge about given situations or problems. • Needs for second-hand knowledge such as opinions, experiences with similar situations (situational similarity), subjective ideas, suggestion for alternatives.
	1.2. Temporal Factors	Short-term	<ul style="list-style-type: none"> • Need for immediate use. Situations in which participants have to make quick decisions; better or best solutions within time constraints
		Long-term	<ul style="list-style-type: none"> • Need for future use (or planning). • Browsing stage, collecting advices or ideas for future events
2. Situation Evaluation	2.1. Risk (Vulnerability)		<ul style="list-style-type: none"> • Any risk-related comment in a situation or a problem. • Importance of the problem, both explicitly and implicitly • Degrees of risk: from none to high. • e.g., risk on financial loss, risk on bad grades or test results.
	2.2. Uncertainty		<ul style="list-style-type: none"> • Any uncertainty-related comment in the situation or problem • Uncertainty in problem solving or decision making. • Degrees of uncertainty: very certain to very uncertain

	2.3. Topic Familiarity	<ul style="list-style-type: none"> • Any comment in terms of how familiar a participant is with a problem or a task topic. • How much knowledge a participant has about the topic of a problem at hand (pre-knowledge) • How familiar with a recommendation need situation • example keywords: don't know about; first-timer; novice
3. Social Factor	3.1. Social Tie	<ul style="list-style-type: none"> • Social relationships such as closeness, strength, contact frequency, duration of relationship, etc. • Self-perception of tie with a source or recommender. How strong or close relationship a participant has and how frequently he/she contacts with a recommender?
	3.2. Homophily	<ul style="list-style-type: none"> • Status, value, and situation homophily
4. Recommendation (Content) -Trustworthiness	4.1. Accuracy	<ul style="list-style-type: none"> • Being correct or precise
	4.2. Balance	<ul style="list-style-type: none"> • Taking into account different opinions and presenting information in a fair and reasonable way. • Different or opposite elements are equally proportionated. • Degree of balance: how much skewed toward one side. • Unbiased: showing no prejudice for or against something.
	4.3. Consistency	<ul style="list-style-type: none"> • Overall trend or pattern in reviews: how overall contents/ideas in various sources, reviews, & comments converge to or diverge from a certain viewpoint (e.g., positive or negative) • Concurrence: similar or same contents appear in many places. • e.g., what most reviewers say about a certain aspect of a product
	4.4. Credibility	<ul style="list-style-type: none"> • Includes reliability & believability • Convincing • Recent or up-to-date recommendation

	4.5. Description or Presentation Quality	<ul style="list-style-type: none"> • Quality of writing or expression: how well-written and/or well-described • Attractive or interesting • Entices a recipient's curiosity. • Detailed or specified • Clarity • Offering visual cues such as photos, videos, etc.
	4.6. Plausibility	<ul style="list-style-type: none"> • Reasonable • Understandable
	4.7. Quality of Entity	<ul style="list-style-type: none"> • Indicating or implying the quality of recommended entities (e.g., products, items, etc.)
	4.8. Quantifiable Cues	<ul style="list-style-type: none"> • Popularity such as number of clicks, views, or people purchased. • Number of comments or reviews. • Rankings: any ranked item offered by a website or system. • Ratings: scores (e.g., number of stars) given by users.
5. Recommender (Source) - Trustworthiness	5.1. Anonymity	<ul style="list-style-type: none"> • Anonymous or unknown • e.g., I don't know who are recommenders; thus I don't trust them.
	5.2. Authority	<ul style="list-style-type: none"> • Recommender's power to influence a recipient, especially because of a recommender's commanding manner. • Recommender's power or right to make decisions, and enforce obedience on the recipient.
	5.3. Benevolence	<ul style="list-style-type: none"> • Positive intention, no reason to harm. • Good will/intention that the recommender has when providing a recommendation • A recommender will act in the best interest of the recipient. • Includes integrity (i.e., extent to which the recipient perceives the recommender as acting in accordance with a set of values and norms shared with, or acceptable to, the recipient) • Truthfulness of a recommender or a source

	5.4. Competence (Expertise)	<ul style="list-style-type: none"> • Ability, talent, skill, knowledge, or proficiency in the topic. • Expertise in the areas of recommendation needs. • Degree (including lack) of competence or expertise. • Recommender with appropriate credentials • Recommender's Experience – Focusing on a source's direct and/or indirect experiences about issues when evaluating the trustworthiness of a recommender
	5.5. Personality (Characteristics; Ethos)	<ul style="list-style-type: none"> • Personal characteristics or personality of a recommender such as hard-working, well-organized, patient, level-headed, kind, friendly, etc. • Recommender's personal background • Attitude toward a recipient or problem: Recommender's settled way of thinking or feeling about a recipient, typically one that is reflected in a person's behavior.
	5.6. Reputation	<ul style="list-style-type: none"> • Broader population's beliefs or opinions on a recommender or a source. • Widespread belief that a recommender has.
6. Recipient's Factors (Trustworthiness)	6.1. Congruence	<ul style="list-style-type: none"> • The recommendation is similar or in line with a recipient's pre-knowledge, pre-thought or pre-concept. • Match with the recipient's prior knowledge. • In line with the recipient's lifestyle or preference
	6.2. Previous Interaction/Experience with Source	<ul style="list-style-type: none"> • The recipient's past experience or interaction with the source or recommender in terms of any recommendations • e.g., previously, the recipient had positive or negative outcomes with the recommender's suggestion. • Included only when mentioned by a recipient.

7. Other Factors -Accept or Reject	7.1. Consequence of Recommendation	<ul style="list-style-type: none"> • Levels of positive (e.g., satisfactory or beneficial) or negative (e.g., harmful, loss, or risky) impacts • Potential harm
	7.2. Feasibility of Recommendation	<ul style="list-style-type: none"> • How easily or conveniently a recommendation can be followed. • Do-ability: possible or easy to carry out. • Also can be related to capability. • Includes feasibility associated with location, money (i.e., affordability), and time.
	7.3. Personal Preference of Recipient	<ul style="list-style-type: none"> • Subjective likes or dislikes
	7.4. Relevance of Recommendation	<ul style="list-style-type: none"> • Closely connected or appropriate for the situations or problems • On topic
	7.5. Usefulness of Recommendation	<ul style="list-style-type: none"> • Useful or helpful
8. Recommendation Use Activity	8.1. Affective Change	<ul style="list-style-type: none"> • Emotion after accepting/rejecting a recommendation, such as sadness, satisfaction, happiness, confidence, relief, etc.
	8.2. Further Searching	<ul style="list-style-type: none"> • Seeking other recommendations for various reasons. • Cross-referencing or cross validation: Any activities or behavior associated with comparing information on other sources or recommenders
	8.3. Decision Making	<ul style="list-style-type: none"> • When a recipient makes a decision about the recommendation need after accepting/rejecting recommendations. • Recommendation needs may be independent of accept/reject of recommendations.
	8.4. Problem Solving	<ul style="list-style-type: none"> • The recommendation received is used in the process of problem solving.

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