

A Context-based Investigation into Source Use by Information Seekers

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Abstract. An important question in information seeking behavior is where people go for information and why information seekers prefer to use one source type over the other when faced with an information-seeking task or need for information. Prior studies have paid little attention to contingent variables that could change the cost-benefit calculus in source use. They also defined source use in one way or the other, or considered source use as a monolithic construct. Through an empirical survey of 352 working professionals in Singapore, this study carried out a context-based investigation into source use by information seekers. Different measures of source use have been incorporated, and various contextual variables that could affect the use of source types have been identified. The findings suggest that source quality and access difficulty are important antecedents of source use, regardless of the source type. Moreover, seekers place more weight on source quality when the task is important. Other contextual factors, however, are generally less important to source use. Seekers also demonstrate a strong pecking order in the use of source types, with online information and face-to-face being the two most preferred types.

Keywords. context; source use; frequency, amount, order; source choice; source preference; information seeking behavior; cost/benefit; source quality; least effort; accessibility; seeker-source-information need framework

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Introduction

As human beings, we have an unending thirst for information. People now get information from multiple sources such as friends and colleagues, books and online sources, and do not necessarily depend upon a single source. The knowledge of how a person seeks information from various sources is important in an organizational setting. It can help managers to ensure that employees have easy and unhindered access to their most preferred information sources in carrying out their day-to-day tasks. For information systems designers, in order to design systems that work harmoniously with humans, one has to understand their information behavior (Fidel & Pejtersen, 2004).

The questions, “How does a seeker choose an information source?” and “Why does a seeker prefer one source over the other?” have triggered a lot of research interest in the field of organizational behavior and information science (Chakrabarti *et al.*, 1983; Fidel & Green, 2004; Morrison & Vancouver, 2000; O’Reilly, 1982; Swanson, 1987; Vancouver & Morrison, 1995; Xu *et al.*, 2006; Zimmer, Henry & Butler, 2008). Two theories have played an important role in the question of source preference – the principle of least effort and the cost-benefit framework. The least-effort principle asserts that people prefer sources that are easily accessible, and pay less attention to source quality (e.g. Anderson *et al.*, 2001; Chakrabarti *et al.*, 1983; Culnan, 1983; Gerstberger & Allan, 1968; Yitzhaki & Hammershlag, 2004). The cost-benefit framework regards source quality as more important than accessibility (Ashford, 1986; Morrison & Vancouver, 2000; Swanson, 1987; Vancouver & Morrison, 1995).

While research on this question is increasing, there are a few important research gaps that studies so far have not filled. First, prior studies paid little attention to contingent variables that could change the cost-benefit calculus in source use. An exception in this regard was Morrison and Vancouver (2000), which incorporated need for achievement,

an intrinsic inclination of the seeker to pursue achievement, in their study. Xu *et al.* (2006) considered task importance as a moderator of source quality and accessibility. Yet, a more comprehensive picture of how contextual factors moderate the cost-benefit calculus is still missing.

Second, past studies defined source use in one way or the other, or considered source use as a monolithic construct. For example, Xu *et al.* (2006) used self-reported ‘preference’ as a dependent variable. Other quantitative studies (e.g. Morrison & Vancouver, 2000; O’Reilly, 1982; Zimmer, Henry & Butler, 2008) used frequency of information seeking from a specific source, percentage of time spent on the source, or their average as a measure of source use. In this study, we recognize three distinct aspects of *source use*: 1) the frequency of source use, 2) the percentage of time spent on a source, and 3) the order of using a source. We contend that these three aspects should not be considered monolithic. While they may follow a similar cost-benefit calculus, the impact of cost and benefit on them is not necessarily uniform.

To fill these research gaps, we carried out an in-depth empirical survey of 352 working professionals in Singapore. Our research question is, “*Where do people go for information and how do they decide on the use of an information source when faced with an information-seeking task?*” Specifically, we seek to investigate the antecedents of source use across source types in information seeking. The dependent variable is source use. The study is based on the seeker-source-information need framework (Xu *et al.*, 2006). However, we enrich it with a more comprehensive set of contextual variables. We extend the framework to multiple source types. We also redefine the relationship between seeker and source and the cost elements to suit the cross-source context.

The rest of the paper is organized as follows. We first review the literature and propose our hypotheses. After that, an empirical survey study is reported. We report on the

questionnaire design, survey process, and data analysis. Finally, we discuss the findings and the theoretical and practical implications of these findings.

Literature Review and Model Development

Information seeking occurs in a context. The Seeker-Source-Information Need Framework (Xu *et al.*, 2006) can be regarded as a framework to identify relevant elements in a seeker's context. This framework identifies the seeker, the source, and the information need (which is often the result of the task at hand, especially in an organizational context) as three essential elements that every information-seeking instance has. Attributes of these elements work together and interact with each other to define the actual context of an instance. Based on that, we will identify the key attributes related to 1) the source of information, 2) the seeker, as well as 3) the task or problem situation that brings about information need. We define information seeking context as the state defined by the combination of these attributes at any given time. However, other variables arising out of the social context of the seeker, such as the work environment, also shape the context.

SOURCE

An *information source* is a repository that carries and provides knowledge or information (Christensen & Bailey, 1997; Xu *et al.*, 2006). While *source* and *channel* are often 'bundled', past studies have used both terms synonymously (Bystrom & Jarvelin, 1995; Case, 2007; Gerstberger & Allen, 1968; Hardy, 1982; Swanson, 1987). We differentiate between an information source and a channel and adopt Xu *et al.* (2006)'s definition of channel as the mode-of-communication in the way content is delivered from source to receiver, such as face-to-face, phone or email.

Sources can be categorized as:

- 1) *[Inter]personal* or relational (e.g. Rulke *et al.*, 2000) or human, i.e., colleagues, friends, supervisor, internal and external experts, etc. and
- 2) *Impersonal* or non-relational (e.g. Rulke *et al.*, 2000) or non-human, i.e., manuals, journals, books, libraries, digital libraries, Google search, etc.

Other classifications differentiated sources within an organization (internal) or outside its boundaries (external) (Choo, 1994).

While source and channel are distinct concepts, a particular type of source often entails a set of most effective access channels. For example, online documents are often searched, while a colleague can be accessed both face-to-face and via a phone call. Reaching out to a source entails using one channel or the other. Thus, when a seeker makes a source choice decision, the channel decision is often implicitly made.

We further identify two dimensions of channel: 1) physical-electronic and 2) synchronous-asynchronous. The physical-electronic dimension refers to the use of a physical or electronic medium for information transfer, and the synchronous-asynchronous dimension refers to the synchronicity of communication. Together with the interpersonal-impersonal classification of sources, the combination of the three dimensions leads to the following six types of sources: 1) face-to-face, 2) letters/snail mails, 3) phone/online chat, 4) email/online forum, 5) books/manuals and 6) online information. For example, face-to-face is interpersonal, physical and synchronous, while email/online forum is interpersonal, electronic and synchronous. Table 1 illustrates the dimensional combinations of each type. While Table 1 does not provide an exhaustive combination of all dimensions, these six types obviously represent the major source types in use today. In this study, a *source type* is defined as a combination of the three

dimensions. This study focuses on five of these types, excluding letters/snail mails, because these are rarely used for information seeking in organizations today.

“Insert Table 1 here”

This study focuses on a seeker’s use from among a set of typical sources from these source types. It is important to note that a source is an instance of a source type. Recognizing that seekers often make the source decision and channel decision simultaneously, we ask subjects to choose among the typical information sources from each of the five types in a seeking task (a snippet from the questionnaire is shown later in the paper, in Figure 2). When the subject identifies a typical source from each type, they are likely to identify the best option within that type of source. Hence, our notion of source use essentially refers to the use of typical sources in each source type. This conceptualization has the advantage of avoiding a countless list of sources and maintaining the coverage of all source types. It also allows us to better generalize our findings from use of individual sources to the use of source types.

RESEARCH MODEL AND HYPOTHESIS

Figure 1 shows the research model. Based on the seeker-source-information need framework, we identify three key characteristics of the source, i.e., quality, access difficulty and communication difficulty. We identify the inherent lack of comfort as a key characteristic of the seeker-source relationship. We also identify task importance, urgency, and complexity as three key characteristics of the task at hand which gives rise to the seeker’s information need. In this section, we will explain how these factors work individually and interactively to shape a seeker’s source use behaviour.

“Insert Figure 1 here”

Source Quality pertains to the benefit aspect of an information source. Different researchers have identified different dimensions of source quality. These include

accuracy, relevance, specificity, reliability, timeliness, expertise of interpersonal sources, topicality, novelty, understandability and scope (O'Reilly, 1982; Swanson, 1987; Vancouver & Morrison, 1995; Xu & Chen, 2006). In this study, we define source quality as the novelty, reliability and relevant scope of information content the source carries for the task at hand (Xu & Chen, 2006). While individuals do not always use the highest quality information available, provided equal accessibility, individuals often prefer higher quality sources (Allen, 1984; Gerstenberger & Allen, 1968; Zimmer & Henry, 2007). Source quality affects the persuasive effect of knowledge on decision-making (Zimmer *et al.*, 2008). This finding holds irrespective of whether the seeker is using a knowledge management system or a consultant (Ko, Kirsch & King, 2005; Zimmer *et al.*, 2008). Empirical studies have generally supported this relationship (Ashford, 1986; Morrison & Vancouver, 2000). We thus, hypothesize:

H1: The perceived quality of an information source has a positive effect on the use of that source.

Access Difficulty. Access difficulty is the time and effort required, and the difficulty encountered in *reaching* a particular information source, i.e., the cost of establishing (but before using) the channel of communication with the source. With regard to interpersonal sources, access difficulty has been defined as *physical proximity* (Chakrabarti *et al.*, 1983; Culnan, 1983; Fidel & Green, 2004; Gerstenberger & Allen, 1968; McCreddie & Rice, 1999; Xu *et al.*, 2006) or social and cognitive availability (e.g. Zimmer & Henry, 2007; Zmud *et al.*, 1990). Zimmer, Henry and Butler (2008) made an important point that access to technology as a source is not the same as access to information. Similarly, our definition of access difficulty is the cost of *reaching* a particular information source, as opposed to the cost of using the source. Thus, it is a dynamic property of the source type in a particular circumstance, e.g., one may have face-to-face access to a coworker at one time or the other.

The hypothesis follows naturally from the least effort principle. It also follows from the cost-benefit framework (Hardy, 1982) where people will want to minimize the cost associated with using information. This has been characterized as the effort expended in gaining access to information (Gerstberger & Allen, 1968).

H2: The difficulty in accessing an information source has a negative effect on the use of that source.

Communication Difficulty. After the seeker has reached a type of source, the difficulty the seeker faces now is in communicating with the source. With regard to interpersonal sources, communication difficulty can be caused by *social risk* with interpersonal sources. For a technical source such as digital library, it could be *ease of use* (Chakrabarti *et al.*, 1983; Culnan, 1985; Hardy, 1982). It can also be caused by the lack of *understandability* of information content (Xu & Chen, 2006; Xu *et al.*, 2006). Thus, if the “conversation” with the source is painful or difficult, or if it is difficult to make the source understand or to extract useful information from it, then it is not likely to appeal to a seeker for use. In this study, we define *difficulty in communicating with an information source* as an overarching concept that describes the difficulty a seeker faces when conversing with a source. Since communication difficulty is a cost to the seeker in his cost-benefit calculation (Hardy, 1982) and since individuals tend to minimize the cost, and potential loss, associated with using information (Gerstberger & Allen, 1968), we, therefore, hypothesize:

H3: The difficulty in communicating with an information source has a negative effect on the use of that source.

TASK SITUATION

Besides the main cost-benefit variables, other contingencies could be regarded as contextual and contingent variables that serve to modify the cost-benefit calculus. The task situation that raises an information need is obviously the most imminent context. In

an organizational setting, this situation is often the work task. Various task attributes have been proposed to affect information seeking such as *complexity* or *uncertainty* (Bystrom & Jarvelin, 1995; Bystrom, 2002; Culnan, 1983; O'Reilly, 1982), *interdependency* (Campion *et al.*, 1993), *non-routineness* (Lawrence & Lorsch, 1967) and *task importance* (Xu *et al.*, 2006).

We look at three variables – *importance*, *urgency* and *complexity* of a task situation. In the project management literature, it is well known that time, cost and scope are the three main constraints of successful project implementation (e.g. Babu & Suresh, 1996; Harris, 1990; Khan, 2006). Correspondingly, urgency represents the time constraint, complexity represents the scope constraint, and cost demands a focus on the most important aspect of the project. Task-based information seeking, often an atomic element in project implementation, is likely to be driven by these constraints.

Importance of the Task Situation. Xu *et al.* (2006) define task importance as the importance of the outcome of the task to the seeker's well-being. Task importance is associated with increase in effort (Forsyth & Schlenker, 1977) and self-regulation (Lan, 2005). Lan (2005) found that students' self-regulation in the learning process or self-monitoring increased with task importance. Xu *et al.* (2006) cite the elaboration likelihood model to highlight the role of task importance in time spent on an information processing task. Given the limited cognitive capacity, the elaboration likelihood model (Petty & Cacioppo, 1986) posits that when a task is more personally relevant, a person is more likely to spend time on the information processing task, to carefully examine information and to look for useful content. The elaboration likelihood model has been shown to be applicable to information seeking (Cho & Boster, 2005; Posavac & Herzstein, 2003; Xu *et al.*, 2006). Thus, if a seeker considers a task or problem situation as important, the seeker will be more willing to incur physical and cognitive

cost, as well as social risk to solve the problem. Such a seeker is likely to put in extra effort (Forsyth & Schlenker, 1977) and conduct self-monitoring (Lan, 2005) to get quality information from a source. Thus, quality of the source would be important to such a seeker. We, therefore, hypothesize:

H4: The positive effect of the quality of an information source on the use of the source is higher when the task is more important to the seeker, as compared to when the task is less important.

Urgency of the Task Situation. Urgent tasks are those tasks that need to be accomplished sooner than later. Depending on available time, urgent tasks are, thus, accorded high priority by the seeker as compared to other tasks. Freed (1998) defines *task urgency* as the expected time available to complete the task before a specific, undesirable consequence occurs (which would occur if the task were to be deferred for too long). If a seeker is faced with an urgent task (which needs to be accomplished soon), the seeker will want to reach the most accessible source and avoid those of high access difficulty, so as to get the task accomplished within the stipulated deadline. Thus, we hypothesize:

H5: For a more urgent task, the difficulty in accessing an information source has a higher negative effect on the use of the source compared to a less urgent task.

A more urgent task would also incline actors towards channels with a real-time, synchronous response capability (Straub & Karahanna, 1998). All things being equal, urgent tasks would be predicted to show a strong association with synchronous channels such as face-to-face, telephone, etc. (Straub & Karahanna, 1998). A seeker faced with an urgent task will want to reach the source that is most easy to “converse” with and avoid communication difficulty. This is to get the task accomplished within the required timeframe.

H6: For a more urgent task, the difficulty in communicating with an information source has a higher negative effect on the use of the source, as compared to a less urgent

task.

Complexity of the Task Situation. The extent to which work features many courses of action leading to multiple, possibly conflicting, outcomes determines how complex it is (Campbell, 1988). Task complexity has been defined as the number of sources needed (O'Reilly, 1982), coordination and joint problem solving needed (Anderson *et al.*, 2001) or the amount of relevant external information needed (Culnan, 1983).

Higher levels of complexity will increase the cognitive load associated with a job, and thus increase its perceived intellectual demands (Gray & Meister, 2004), and make the required information increasingly tacit. More complex tasks require more, and often different, information (Zimmer & Henry, 2007). Zimmer, Henry and Butler (2008) argue using Shanon and Weaver (1949)'s mathematical theory of communication. They say that 'while individuals satisfice in their information gathering and act in other rationalizing ways, in instances where individuals seek additional information, the task they are trying to address could be an important determinant in the type of source used' (p.325). Bystrom's empirical research (Bystrom & Jarvelin, 1995; Bystrom, 1997, 2000) concludes that perceived task complexity is the principal determinant of information sources and the number of sources consulted (Courtright, 2007). Past literature has found that task complexity and uncertainty increase the number of sources searched or the total amount of information searched (Anderson *et al.*, 2001; Ashford, 1986; Bystrom, 2002; Culnan, 1983). Task complexity has also been found to affect the use of a source throughout a task lifecycle (Bystrom, 2002; Kuhlthau, 1999). Thus, we hypothesize:

H7: The complexity of the task at hand has a positive effect on the use of the information source.

It follows from Dennis and Valacich (1999)'s theory of media synchronicity that high synchronicity (high feedback) is required for tasks that require developing a shared

meaning for information between the source and the seeker. When the information being sought has a high degree of tacitness (i.e. the task is complex), it requires the source and the seeker to be able to communicate interactively and develop a shared meaning for information before the source can adequately give the required information to the seeker. When a task requires a piece of knowledge that is more 'hands-on' or difficult to codify (complex task), the immediacy of feedback of the source being chosen becomes very important. Zimmer and Henry (2007) argue that when easily codified information is needed (arising out of a simple task), one would choose an impersonal source whereas when information was needed that is difficult to codify (arising out of a complex task), an interpersonal source would be chosen. Thus, if a seeker is engaged in a complex task that requires information with a high degree of tacitness, the seeker will choose a source with the least associated costs, such as one with high immediacy of feedback (high synchronicity), i.e., a source that the seeker finds the easiest to communicate with.

H8: The negative effect of communication difficulty with the source on the use of the source is higher when the task at hand is complex compared to when the task is less complex.

SEEKER-SOURCE RELATIONSHIP

The use of a source is also contingent on the seeker-source relationship (Xu *et al.*, 2006). For human or interpersonal sources, the seeker-source relationship involves the *social risks* (e.g., embarrassment, loss of face and revelation of incompetence (Ashford, 1986), the source's *willingness to share* and *level of closeness*. Seeking information from interpersonal sources might reveal ignorance on the part of the seeker or make the impression of exploiting the interpersonal source, instead of investing one's own time first (Binz-Scharf & Lazer, 2006). Dispositional factors in the seeker's personality such as reciprocation wariness (Lynch *et al.*, 1999) also play a role. For impersonal sources such as the library or search engines, one's *comfort level in using the system*, *system-knowledge*, or *computer-efficacy* would affect their use of the source (Dimitroff, 1992;

Hoelscher & Strube, 1999; Wildemuth, 2003). Considering the various forms of seeker-source relationship, we propose the seeker's *inherent lack of comfort* with the source as an overarching variable that affects source use.

H9: The inherent lack of comfort with a source has a negative effect on the use of the information source.

OTHER CONTEXTUAL VARIABLES

Besides the imminent context imposed by information need and the seeker-source relationship, the seeker-source-information framework suggests that other factors related to the seeker and more general environment might affect source use.

Seeker. Most seeker attributes are relatively stable across different information seeking instances. For example, a seeker's learning orientation (Gray & Meister, 2004), age, gender, education, tenure in work role, tenure in position (Gray & Meister, 2004; Tesluk & Jacobs, 1998) would not vary much from one instance to another. Among these variables, learning orientation is about how much people believe that their competence can be improved (Steele-Johnson *et al.*, 2000), and thus they 'persist, escalate effort, engage in solution-oriented self-instruction, and report enjoying the challenge' (Brett & VandeWalle, 1999, p.864; Gray & Meister, 2004). Learning orientation is likely to have a direct effect on the amount of source use, regardless of a particular information seeking instance (Gray & Meister, 2004). We included these variables as control variables. We also included *task self efficacy* to measure the prior knowledge one has regarding the search task. However, since a prior study (Xu *et al.*, 2006) has found this variable to be insignificant, we include it as a control variable.

Environment. The environment the seeker is surrounded by may be of an organizational, social, cultural or even technological nature. The knowledge management literature has widely acknowledged the importance of a favorable *learning environment* that fosters

learning in an organization (e.g. Agarwal *et al.*, 1997; Alavi & Leidner, 2001; Carmen *et al.*, 2006; Chen & Lin, 2004). A learning environment generally encourages a seeker to search for more information. We include learning environment as a control variable in our study. At a more granular level, *team size* is also captured as a control variable. This is because team size could affect the amount of information available to a seeker. Again, learning environment and team size are relatively stable across information seeking instances.

Methodology

As the constructs in our model deal with perceived attributes of the seeker or the context of search, a survey was conducted to test our hypotheses.

INSTRUMENT DEVELOPMENT

Whenever available, the measurement items for this study were adopted from prior literature, else new items were developed (all listed in

Table 3). The questionnaire uses the seven-point Likert scale (1=strongly disagree, 7=strongly agree). Particularly in designing items to measure the frequency of source use, we used three items for a perceptual measure of use (USE1-3) and one item for the recall of past behavior (USE4). We also included an item each to measure the percentage of time spent on a source (USE5) and the order of using a source (USE6). We treated these as different aspect of use.

In developing the survey questionnaire, we first validated the construct validity, and then a pilot study was conducted to further validate the instrument. Finally, a confirmatory analysis was conducted for the data collected from the main study.

Construct Validity. Verification of construct validity followed three steps. First, experienced researchers in the field were consulted to discuss the wording of each item. The instrument was revised based on the feedback collected. Second, we adopted a two-stage item-sorting procedure recommended by Moore and Benbasat (1991). In the first stage, four judges (graduate students) who were not informed of the research model and constructs were invited to sort all items into an unrestricted number of categories. They were also asked to name each category. The four judges correctly placed 87% of the survey items into their rightful construct piles. They were interviewed to reveal how they understood each item. Ambiguous items were altered. On the suggestion of judges, 5 items (IMP4, CFT6, CMM1, CMM3 and USE1) were added after the first round of sorting. In the second round of structured sorting, another four judges were given the name of constructs. They were asked to determine which construct each item best conformed to. This time, all judges correctly placed 91% of items in the correct construct piles. For items that were placed in the wrong categories, further changes were made to remove ambiguity. One item (QUA6) was added. Finally, a pre-test was conducted to fine-tune the instrument, whereby the survey was administered on 12 graduate students. They were asked to comment on their understanding of each item after filling out the survey. Minor revisions were made based on their feedback.

Pilot study. After construct validity, a pilot test was conducted on a sample of 110 respondents to verify and finalize the survey instrument. The pilot test was done on a working population. Each respondent was paid a remuneration of S\$10 for their participation. From these, valid responses for each source type were obtained as follows: onlineInfo 103; book/manual 98; email/forum 101; phone/chat 101; and face2face 106.

The context of information seeking as described in the questionnaire was as follows. We first ask the respondent to specify a task situation the respondent is involved in currently,

and that is expected to continue for at least a few months. We then ask the seeker to recall a specific problem of the task where he or she had to look for information from one or more sources. Then we ask the respondent to specify a typical source of information for each of the five source types. Figure 2 shows a snippet from our survey questionnaire.

“Insert Figure 2 here”

We then ask the respondent to evaluate the five typical sources. They evaluated the source quality, access difficulty, communication difficulty, inherent lack of comfort (as well as the different aspects of use) pertaining to all five sources. They also evaluated task importance, urgency, complexity and other control variables.

To validate the convergent and discriminant validity of the instrument, psychometric analysis was performed as per the procedure recommended by Anderson and Gerbing (1988). Exploratory Factor Analysis (EFA) with varimax rotation was performed on the pilot data (using SPSS 16.0). The rotated component matrix for the pilot dataset corresponding to the source type onlineInfo is listed in Table 2. Tables for the other 4 source types are not listed due to space constraints. Only the first three items of USE (perceived frequency) that used the Likert scale were included for EFA. As expected, more factual measures of USE did not load together with perceptual measures, and were excluded from EFA. The number of latent factors extracted with eigenvalue greater than 1 corresponded correctly to the number of constructs. The extracted factors together explained more than 79% of the variance. All items loaded correctly on their respective constructs. Therefore, the same instrument was used for the main study.

“Insert Table 2 here”

Table 3 reports the items used in the questionnaire.

“Insert Table 3 here”

MAIN DATA COLLECTION

As there was no change in the questionnaire after the collection of pilot data, we moved on to the main data collection. The target population of this study is working people. The study population is the group of working Singapore professionals between the ages of 19 to 61 (majority between 20 and 40) who used a computer for their work. Our sample consisted largely of professionals working in various parts of Singapore, including the Central Business District, the offices in the West, East, North and Central parts of Singapore, and Science Park, with the permission from the Institutional Review Board of the University. Each respondent was paid S\$10 as an incentive to participate. Each completed questionnaire was checked to ensure that the survey was completely filled and there is no missing data.

Places where office employees gathered to eat were used for collecting survey data. Such an environment mandated the use of convenience sampling. In a typical food court, almost everyone eating at a particular point in time was approached. The response rate was 40%. The total number of respondents was 352 (valid responses were 346 after dropping six incomplete or erroneous questionnaires). A small percentage of the respondents (8.81%) chose not to answer questions pertaining to all the five source types, as they did not use all the source types. This led to slightly different sample sizes for the data pertaining to the five types of sources. Table 4 lists the demographic data of survey respondents.

“Insert Table 4 here”

Data Analysis and Results

For the main survey, we conducted the Confirmatory Factor Analysis (CFA) and hypothesis testing using Hierarchical Linear Modeling (HLM for Windows 6.06). Five separate data sets were created corresponding to the 5 types of sources studied.

DESCRIPTIVE STATISTICS

A summary of descriptive statistics about the subjects' rating combined with Cronbach's α is reported in Table 5 for the data set, as well as each of the 5 source types. As the results show, the Cronbach's α of each latent variable for all source types is greater than 0.8, which indicates that the measurement items are reliable (Nunnally & Bernstein, 1994).

“Insert Table 5 here”

Table 6 lists the ranking of sources based on the average score of each construct pertaining to the source. Mean values are listed within parentheses. The order of ranking implies that people perceived face-to-face sources to be of the best quality and book/manual the least. Email/forum is most difficult to access, while onlineInfo is the easiest to access. Book/manual is also the most difficult to “communicate” with, while face2face is the easiest. People use face2face most often and book/manual the least. They are most comfortable with onlineInfo, but least with phone/chat.

“Insert Table 6 here”

MEASUREMENT MODEL

The purpose of the measurement model testing is to ensure high construct convergent and discriminant validities. Confirmatory Factor Analysis (CFA) was conducted using LISREL 8.80. Three items (CMP4, ORT1, CMM1) were dropped during CFA.

“Insert Table 7 here”

After removing the unsatisfactory items, the results of convergent validity analysis were satisfactory. The results for onlineInfo are illustrated in Table 7. For all five source types, the results showed that all the standardized factor loadings are statistically significant. The CFR (composite factor reliability) values and Cronbach's Alphas are greater than 0.7. AVEs (average variance extracted) are all greater than 0.5 (greater than 0.6 in all, but one,

cases). These indicate that the convergent validity of this study is satisfactory. Our models for the five source types also achieved satisfactory model fit (highest RMSEA=0.5, lowest NFI=0.92, lowest CFI=0.96, lowest IFI=0.96, lowest RFI=0.92, highest SRMR=0.53, lowest GFI=0.79).

Discriminant validity was checked based on the construct correlation table. Table 8 shows the correlation table for variables for onlineInfo source type. For all source types, the diagonal line elements are the square root of corresponding AVE, which are all greater than their correlations with other constructs. This indicates that the requirement of discriminant validity is fully satisfied.

“Insert Table 8 here”

HYPOTHESIS TEST

Given acceptable convergent and discriminant validities, the test of the hypotheses was carried out using hierarchical linear modeling (HLM). The data in our study is hierarchical in nature because we collect data at two different levels, i.e., we asked each subject to evaluate five types of sources. The Level-1 coefficients (see Table 9) included variables pertaining to each source a subject evaluated. These variables are quality (QUA), access difficulty (ACC), communication difficulty (CMM) and seeker's level of comfort with source (CFT). Four dummy variables 'o' (onlineInfo), 'b' (book/manual), 'e' (email) and 'p' (phone) were also included as control variables to indicate the type of source under evaluation, with face2face serving as a benchmark. The Level-2 variables included the control variables team size (TMSIZE), role tenure (RTENU), gender (GENDER), age (AGE), education (EDUC), seeker's learning orientation (ORT), seeker's task self efficacy (EFF), environment (ENV), as well as task importance (IMP), task urgency (URG) and task complexity (CMP). Level-2 variables did not vary within the sources a subject evaluated. In the survey questionnaire, we sought different aspects of

the dependent variable ‘use of information source’ from the respondent. USE1, USE2 and USE3 deal with the user’s perception of the frequency of use. They were averaged to form usePerceptual. USE4 is a recall of the frequency of use and was denoted useFrequency. USE5 seeks to study the percentage of time each source is used and was denoted useAmount. USE6 seeks to find out the order of using each source and was denoted useOrder. For each case, the model specified (in equation format) is listed in Table 9.

“Insert Table 9 here”

Table 10 below lists the results of HLM analysis for both the perceptual (frequency) and behavioral aspects (frequency, amount, order) of source use.

“Insert Table 10 here”

Table 11 below summarizes the result of hypothesis testing.

“Insert Table 11 here”

For the control variables, the direct effects of task importance and task urgency were found to be insignificant across all aspects of use. The effect of the demographic variables gender, age, role tenure, team size, as well as the seeker’s task self efficacy and learning orientation were also found to be insignificant. Education level was found to have a negative effect on perceived frequency of use, but no effect on the other behavioral measures of use. The effect of learning environment on perceived frequency of use was found to be significant, but insignificant for the behavioral measures of use.

Since subjects chose a source among five types, the set of available sources formed a context of source pool for the decision. The dummy variables to indicate each type of source can be interpreted as the general tendency in using a type of source, apart from the tendency demanded by the particular task circumstance and sources. Table 12 shows the

findings of the general effect of each source type (as compared to face-to-face) on different aspects of source use.

“Insert Table 12 here”

Discussion of Findings and Limitations

Quality and Accessibility. What is the relative importance of source quality and accessibility in the use of an information source? The verdict from our study is very clear about source quality. When contextual variables defined in our research model are taken into consideration, the effect of source quality on source use is strongly significant. The finding holds across all aspects of source use and across all source types.

Effect of access difficulty on source use was not supported for the perceived frequency of use and amount of use, while it was supported for other aspects of use. The insignificance of access difficulty to perceived frequency could be due to the inaccuracy of perceptive measure of frequency. Accessible sources do appear to be used earlier and more frequently. However, the amount of time spent could be further complicated by the mode of communication. Accessibility does not necessarily imply more time of source use.

Communication Difficulty. Communication difficulty was found to be significant only to the perceived frequency of use, but not for any other behavioral measure of use. Since behavioral measures are more reliable, in general, communication difficulty shall be regarded as insignificant to source use. A plausible reason is that people are used to “conversing” with various information sources. Hence, no source type is considered as a barrier in information extraction.

Seeker-Source Relationship. Lack of comfort with a source was found to have a significant negative effect on the order of use of the source, the amount of time a source is

used, but not on frequency of use. This finding holds whether the frequency of use was measured perceptually (though close to significance; $p < 0.06$) or by recall. Seekers seem to prefer to approach sources they are more comfortable with first and spend more time with them. Yet, they use sources they are less comfortable with as frequently as other sources.

Task Characteristics. As hypothesized, task importance was found to make quality a more important factor in source use. Other task characteristics received only partial support at best.

Task complexity was supported for both perceived and behavioral measures of frequency of use, but not supported for amount of use and order of use of a source. Complex tasks make seeker approach a source more frequently. At the same time, the seeker might be accessing other sources as well; the distributed attention to other sources makes the effect on the order of use and percentage of time used insignificant.

Task complexity did not moderate communication difficulty, suggesting that a complex task does not necessarily impose a higher requirement for ease of communication with a source.

The interaction between task urgency and access difficulty was found to have no effect on use. This is probably due to the different time scales for task urgency and access difficulty. Usually, the time horizon for task completion is much longer than the time needed to access a source. Future research should make the time scale commensurable to test the moderating effect.

Task urgency did have a significant moderating effect with communication difficulty on frequency of use, probably because interaction with a source takes much more time to resolve an information need. This makes the time scale of communication more

commensurable with task urgency. The moderator effect was insignificant to percentage of time and order of use, suggesting that for urgent tasks, seekers did not change their pecking order of source types, nor the percentage of time spent on each source.

Since the control variables were insignificant, we will not discuss them further. Of particular interest is ranking the general pecking order of source types for all measures of source use. Table 13 reports the result.

“Insert Table 13 here”

An interesting distinction comes forth between the perceived and behavioral aspects of use. We find that for the perceived frequency of source use, the respondents rank the source types in the order of face-to-face, phone/chat, onlineInfo, email/forum and book/manual (from most used to least used). However, all behavioral measures of use show the order to be onlineInfo, face2face, phone/chat, email/forum and book/manual (most used to least used). The behavioral measures are closer to reality, and considered more accurate than perceptual measures. A plausible explanation for the perceptual bias of face-to-face might be due to the salience of interaction through this channel, making it more vivid in memory and easily retrieved. Nevertheless, based on behavioral measures, we can conclude that with the increased availability of online data, people use online information sources the most, followed by face-to-face and phone. Books and manuals are the least used.

LIMITATIONS AND FUTURE RESEARCH

It is important to note the limitations of this survey study. First, the study was based in Singapore. Here, a large majority of the sample was highly educated and had an easy access to high-speed internet. Whether the findings would differ in settings where access to online information is limited would be important to consider. Therefore, the

representativeness of the sample shall be restricted to the study locale. Second, the study incorporated knowledge workers across a wide range of professions. Future studies should compare the findings with that of employees in specific professions such as medical professionals, lawyers, educators, etc. Third, in the survey, the respondents had all the 5 source types listed before them. In a real-life setting, a person might not readily make a choice keeping all the sources before him/her. They would choose sources among the types that come to their mind. Fourth, while we identified the main source types based on the combination of three sets of source characteristics, i.e., interpersonal-impersonal, physical-electronic and synchronous-asynchronous, we did not exhaust all combinations. Future studies could investigate the effect of other source types and restrict the source types to a smaller set to control for the extraneous variation introduced by source types. Finally, alternative data collection method can be used. A survey helped us get a large amount of information from people in a non-threatening manner – especially subjective information related to attitudes and opinions. However, survey engenders the risk of getting careless feedback from respondents, and the lack of a full in-depth story as one could possibly get in a well-designed qualitative study. We believe careful diary keeping is a very useful method of data collection for such a study, which could provide an in-depth qualitative analysis of source choice behavior.

Implications and Conclusions

There are important theoretical implications of this study. First, our study makes an important conceptual clarification in information seeking behavior research. Particularly, different aspects of source use are measured, including perceived frequency, behavioral frequency, percentage of time, and order of use. While some of these measures have been investigated before (Morrison & Vancouver, 2000; O'Reilly, 1982; Xu *et al.* 2006; Zimmer, Henry & Butler, 2008), we treat them as separate variables in our analysis. Our

data did indicate that the effect of antecedents varies nontrivially to these measures. This finding reveals the complexity of the notion of source use, which past research has overlooked. An antecedent (e.g. access cost) could be significant to one aspect of use (e.g. behavioral measure of frequency), but insignificant to the other (e.g., percentage of time).

Second, our study enriches current theories such as the cost-benefit framework and the seeker-source-information need framework (Xu *et al.*, 2006) by resolving the conflicting findings of the importance of cost (accessibility) and benefit (quality) components. Our findings suggest that source quality is clearly important for all source types, and not just in the case of interpersonal sources as found in previous studies (e.g., Xu *et al.*, 2006). As for cost, we found that the effect of access difficulty varies according to the measure of source use. This effect is insignificant to the perceived frequency of use and the percentage of time. However, the effect of access difficulty is significant to the behavioral measure of frequency of use and to the order of use. If behavioral measure of frequency is considered more reliable, the findings suggest that seekers use accessible sources as an earlier resort, and more frequently, although they might not spend more time in total on accessible sources. Upon comparing to the constant significance of quality, our findings suggest accessibility promotes quick and shallow usage of a source. While past research has found the importance of quality and accessibility (Swanson, 1987; Vancouver & Morrison, 1995; Xu *et al.*, 2006; Yitzhaki & Hammershlag, 2004), our study not only extends them to more types of information sources, but also reveals their importance to different aspects of use.

Third, this study shows that source quality is particularly important when the task is important. The interaction effect is positively significant. This result conflicts with the unexpected prior finding that people pay less attention to quality when task is important (Xu *et al.*, 2006). Our finding is consistent with theoretical reasoning. Our finding could

be more reliable than the prior one (Xu *et al.*, 2006) because we have covered a larger range of source types, hence have a larger variance in source quality to make the interaction effect between quality and task importance.

Fourth, this study enriches the context view of Information Seeking behavior. It has tested context variables related to the search task characteristics (importance, urgency, and complexity), the seeker (e.g. learning orientation, self efficacy, and personal background variables), the environment (learning environment, team size), and the seeker-source relationship (inherent lack of comfort with the source). Moreover, our analysis using hierarchical linear modeling would methodologically treat the set of available source types as a context of a particular use behavior. As Ingwersen and Jarvelin (2005) point out, taking context in isolation doesn't work. 'In IS&R, *actors* and other components function as context to one another in the interaction processes' (p.19). We found that (1) contextual variables are generally insignificant to source use (except for task importance which has demonstrated consistent interaction effect with quality); (2) even for context variables that had a significant effect (e.g. task complexity and inherent lack of comfort with source), their effects hinge on the measure of source use; (3) the available source types themselves demonstrate a strong "pecking order", with online information being the first source to be tried, the most frequently used, and the most time devoted to, followed by face-to-face. Email/forum and books/manuals are the two source types last resorted to. Our findings suggest that although context is an important issue in information seeking research, when it comes to source type use, seekers seem to follow the pecking order rather than tailoring the source use to a particular task circumstance. This could be due to a strong habit established in past experience with each source type. That being said, we do not deny the flexibility of seekers in choosing particular sources (e.g., colleagues or websites). Our findings pertain only to the use of source types.

Our study also points to important practical implications. First, this study concurs with past research that organizations should improve the quality and accessibility of information sources, be it domain experts, digital documents, or a distant consultant accessed via telephone. Second, moderating effect of task importance suggests that managers should prepare quality information for important tasks of an organization and make it easily available to seekers when needed. Third, because of the pecking order in information seeking, it is important for organizations to codify knowledge and make it available to online search. While some knowledge is not codifiable, it is important to use online systems to point seekers to the other relevant sources such as experts in the organization or from outside.

In conclusion, this study carried out a context-based investigation into source use by information seekers. We sought to address the issue of why information seekers prefer the use of some source types when there is an information need. We have incorporated different measures of source use, and identified various contextual variables that could affect the use of source types. We conducted an empirical survey study of 352 working professionals in Singapore. Our findings suggest that source quality and access difficulty are important antecedents of source use, regardless of the source type. Moreover, we find that seekers place more weight on source quality when the task is important. Other contextual factors, however, are generally less important to source use. Seekers also demonstrate a strong pecking order in the use of source types, with online information and face-to-face being the two most preferred types. We suggest that future research should differentiate different aspects of source use, and practitioners should recognize the pecking order in source use to make quality information more accessible to seekers.

Acknowledgement

This research is supported by the National University of Singapore research grants R-253-000-049-112 and R253-000-057-112. Along with the first author, the second author is the corresponding author as well.

References

- Agarwal, R., Krudys, G. and Tanniru, M. (1997, Mar). Infusing learning into the information systems organization, *European Journal of Information Systems*, 6(1), 25-40.
- Alavi, M. and Leidner, D.E. (2001, Mar). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly*, 25(1), 107-136.
- Allen, T.J. (1984). *Managing the flow of Technology*. Cambridge, MA: MIT Press.
- Anderson, C.J., Glassman, M., McAfee R.B. and Penelli, T. (2001). An investigation of factors affecting how engineers and scientists seek information. *Journal of Engineering and Technology Management*, 18, 131-155.
- Anderson, J.C. and Gerbing, D.W. (1988) "Structure equation modeling in practice: A review and recommended two-step approach", *Psychological Bulletin*, 103(3), p.411-423.
- Ashford, S.J. (1986). Feedback-seeking in individual adaptation: A resource perspective. *Academy of Management Journal*, 29, 465-487.
- Babu, A.J.G. and Suresh, N. (1996, Jan). Project management with time, cost, and quality considerations. *European Journal of Operational Research*, 88(2), 320-327.
- Binz-Scharf, M.C. and Lazer, D. (2006). Searching for Answers: Knowledge Sourcing Strategies. Paper prepared for presentation at the Annual Meeting of the Academy of Management (Aug 11-16, Atlanta, GA), *The Institute for Quantitative Social Science, Harvard University*, Retrieved Sep 10, 2010 from http://www.iq.harvard.edu/blog/netgov/BinzScharf_Lazer_AoM2006.pdf
- Brett, J.F. and VandeWalle, D. (1999). Goal orientation and goal content as predictors of performance in a training program. *Journal of Applied Psychology*, 84(6), 863-873.
- Bystrom, K. (1997). Municipal administrators at work: Information needs and seeking (INandS) in relation to task complexity: A case study amongst municipal officials. In *Proceedings of an International Conference on Research in Information Needs, Seeking and Use in Different Contexts*, 125-146.
- Bystrom, K. (2000). The effects of task complexity on the relationship between information types acquired and information sources used. *New Review of Information Behavior Research*, 1, 85-101.
- Bystrom, K. (2002). Information and information sources in tasks of varying complexity. *Journal of the American Society for Information Science and Technology*, 53, 581-591.
- Bystrom, K. and Jarvelin, K. (1995). Task complexity affects information seeking and use. *Information Processing and Management*, 31(2), 191-213.
- Campbell, D.J. (1988). Task Complexity: A review and analysis. *Academy of Management Review*, 13, 40-52.
- Campion, M.A., Medsker, G.J. and Higgs, C.A. (1993). Relations between work group characteristics and effectiveness. *Personnel Psychology*, 46, 823-850.
- Carmen, C.-O., de la Luz, F.-A. M. and Salustiano, M.-F. (2006). Influence of top management team vision and work team characteristics on innovation: The Spanish case. *European Journal of Innovation Management*, 9(2), 179.
- Case, D.O. (2007). *Looking for information: A Survey of Research on Information Seeking, Needs and Behavior (Second Edition)*. Oxford, UK: Academic Press.
- Chakrabarti, A.K., Feineman, S. and Fuentevilla, W. (1983). Characteristics of source, channels, and contents for scientific and technical information systems in industrial R&D. *IEEE Transactions on Engineering Management*, 30, 83-88.
- Chen, C.-J., and Lin, B.-W. (2004). The effects of environment, knowledge attribute, organizational climate, and firm characteristics on knowledge sourcing decisions. *R&D Management*, 34(2), 137-146.
- Cho, H. and Boster, F.J. (2005). Development and validation of value-, outcome-, and impression-relevant involvement scales. *Communication Research*, 32, 235-264.

- Choo, C.W. (1994). Perception and use of information sources by chief executives in environmental scanning. *The Library & Information Science Research*, 16, 23-40.
- Christensen, E.W. and Bailey, J.R. (1997). A source accessibility effect on media selection. *Management Communication Quarterly*, 10(3), 373-388.
- Courtright, C. (2007). Context in Information Behavior Research. *Annual Review of Information Science and Technology (ASIST)*, 41, 273-306.
- Culnan, M.J. (1983). Environmental Scanning: The effects of task complexity and source accessibility on information gathering behavior. *Decision Sciences*, 14(2), 194-206.
- Culnan, M.J. (1985). The dimensions of perceived accessibility to information: Implications for the delivery of information systems and services. *Journal of the American Society for Information Science*, 36, 302-308.
- Davis, F.D. (1989, Sep). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340.
- Dennis, A.R. and Valacich, J.S. (1999). Rethinking Media Richness: Towards a Theory of Media Synchronicity. *Proceedings of the 32nd Hawaii International Conference on System Sciences* (Jan 5-8, 1999, Maui, Hawaii), 1-10.
- Dimitroff, A. (1992). Mental models theory and search outcome in a bibliographic retrieval system, *Library & Information Science Research*, 14(2), 141-156.
- Fidel, R. and Green, M. (2004). The many faces of accessibility: Engineers' perception of information sources. *Information Processing and Management*, 40, 563-581.
- Fidel, R., and Pejtersen, A.M. (2004). From information behavior research to the design of information systems: The Cognitive Work Analysis framework. *Information Research*, 10(1). Retrieved Sep 10, 2010 from <http://informationr.net/ir/10-1/paper210.html>
- Forsyth, D.R. and Schlenker, B.R. (1977, Jun). Attributing the causes of group performance: Effects of performance quality, task importance, and future testing. *Journal of Personality*, 45(2), 220-236.
- Freed, M. (1998). Managing Multiple Tasks in Complex, Dynamic Environments. In *Proceedings of the 1998 National Conference on Artificial Intelligence* (Madison, Wisconsin), American Association for Artificial Intelligence.
- Gerstenberger, P.G. and Allen, T.J. (1968). Criteria used by research and development engineers in selection of an information source. *Journal of Applied Psychology*, 52(4), 272-279.
- Gray, P.H. and Meister, D.B. (2004). Knowledge sourcing effectiveness. *Management Science*, 50(6), 821-834.
- Hardy, A.P. (1982). The selection of channels when seeking information: Cost/benefit vs. least-effort. *Information Processing & Management*, 18 (6), 289-293.
- Harris, S.Y. (1990, May). Successful Project Management Employs Many Variables. *American School & University*, 62(9).
- Hoelscher, C. and Strube, G. (1999). Searching on the Web: Two types of expertise. In *Proceedings of the 22nd International Conference on Research and Development in Information Retrieval (SIGIR'99)* (Berkeley, CA, Aug), 305-306.
- Ingwersen, P. and Jarvelin, K. (2005). *The Turn: Integration of Information Seeking and Retrieval in Context*. Dordrecht, The Netherlands: Springer.
- Jarvenpaa, S.L., Tractinsky, N. and Saarinen, L. (1999). Consumer Trust in an Internet Store: A Cross-Cultural Validation. *Journal of Computer-Mediated Communication*, 5(2).
- Khan, A. (2006, Jun). Project Scope Management. *Cost Engineering*, 48(6), 12-16.
- Ko, D.-G., Kirsch, L.J. and King, W.R. (2005). Antecedents of knowledge transfer from consultants to client in enterprise systems implementations. *MIS Quarterly*, 29 (1), 59-85.
- Kuhlthau, C.C. (1999). The role of experience in the information search process of an early career information worker: Perceptions of uncertainty, complexity, construction, and source. *Journal of the American Society for Information Science*, 50, 399-412.
- Lan, W. (2005, Feb). Self-Monitoring and its Relationship with Educational Level and Task Importance. *Educational Psychology*, 25(1), 109-127.
- Lawrence, P. and Lorsch, J. (1967). *Organizations and Environment*. Cambridge, MA: Harvard University Press.
- Lord, M.D. and Ranft, A.L. (2000). Organizational Learning About New International Markets: Exploring the Internal Transfer of Local Market Knowledge. *Journal of International Business Studies*, 31(4), 573-589.
- Lynch, P., Eisenberger, R. and Armeli, S. (1999). Perceived organizational support: Inferior versus superior performance by wary employees. *Journal of Applied Psychology*, 84(4), 467-483.

- McCreadie, M. and Rice, R.E. (1999). Trends in analyzing access to information. Part II. Unique and integrating conceptualizations. *Information Processing and Management*, 35, 77-99.
- Moore, G.C. and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an Information Technology Innovation. *Information Systems Research*, 2(3), 173-191.
- Morrison, E.W. and Vancouver, J.B. (2000). Within-person analysis of information seeking: The effects of perceived costs and benefits. *Journal of Management*, 26, 119-137.
- Nunnally, J.C. and Bernstein I.H. (1994) *Psychometric Theory* (Third Edition), New York: McGraw-Hill.
- O'Reilly, C.A., III (1982). Variations in decision makers' use of information sources: The impact of quality and accessibility of information. *Academy of Management Journal*, 25 (4), 756-771.
- Petty, R.E. and Cacioppo, J.T. (1986). Communication and persuasion: Central and peripheral routes to attitude change. New York: Springer-Verlag.
- Posavac, S.S. and Herzstein, M. (2003). The role of decision importance and the salience of alternative in determining the consistency between consumers' attitudes and decisions. *Marketing Letters*, 14, 47-57.
- Rulke, D.L., Zaheer, S. and Anderson, M.H. (2000). Sources of managers' knowledge of organizational capabilities. *Organizational Behavior and Human Decision Processing*, 82(1), 134-149.
- Shanon, C. and Weaver, W. (1949). *The Mathematical Theory of Communication*. Urbana: University of Illinois Press.
- Steele-Johnson, D., Beauregard, R.S., Hoover, P.B. and Schmidt, A.M. (2000). Goal orientation and task demand effects on motivation, affect and performance. *Journal of Applied Psychology*, 85(5), 724-738.
- Straub, D. and Karahanna, E. (1998, Mar-Apr). Knowledge Worker Communications and Recipient Availability: Toward a Task Closure Explanation of Media Choice, *Organization Science*, 9(2), 160-175.
- Swanson, E.B. (1987). Information channel disposition and use. *Decision Science*, 18, 131-145.
- Tesluk, P.E. and Jacobs, R.R. (1998). Towards an integrated model of work experience. *Personnel Psychology*, 51, 321-355.
- Vancouver, J.B. and Morrison, E.W. (1995). Feedback inquiry: The effect of source attributes and individual difference. *Organizational Behavior and Human Decision Process*, 62, 276-285.
- Wildemuth, B.M. (2003). The Effects of Domain Knowledge on Search Tactic Formulation. *Journal of the American Society for Information Science and Technology*, 55(3), 246-258.
- Xu, Y. (C.), Tan, C.Y. (B.) and Yang, L. (2006). Who Will You Ask? An Empirical Study of Interpersonal Task Information Seeking. *Journal of the American Society for Information Science and Technology*, 57(12), 1666-1677.
- Xu, Y. and Chen, Z. (2006). Relevance judgment—What do information users consider beyond topicality? *Journal of the American Society for Information Science and Technology*, 57, 961-973.
- Yitzhaki, M. and Hammerslag, G. (Jul 2004). Accessibility and use of information sources among computer scientists and software engineers in Israel: Academy versus industry. *Journal of the American Society for Information Science and Technology*, 55(9), 832-842.
- Zander, U. and Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities: an empirical test. *Organization Science*, 6(1), 76-92.
- Zimmer, J.C. and Henry, R.M. (2007). Antecedents to Relational and Nonrelational Source use: An Exploratory Investigation. In *Proceedings of the 40th International Conference on System Sciences (HICSS'07)* (Waikoloa, Hawaii, Jan 3-6).
- Zimmer, J.C., Henry, R.M. and Butler, B.S. (2008). Determinants of the Use of Relational and Nonrelational Information Sources. *Journal of Management Information Systems*, 24(3), 297-331.
- Zmud, R.W., Lind, M.R. and Young, F.W. (1990). An attribute space for organizational communication channels. *Information Systems Research*, 1(4), 440-457.

Table 1. Simplified view of source/channel types along dimensions.

	Physical		Electronic	
	Synchronous	Asynchronous	Synchronous	Asynchronous
Interpersonal	Face-to-face	Letter / snail mail	Phone / online chat	Email / online forum
Impersonal	Book / manual		Online information	

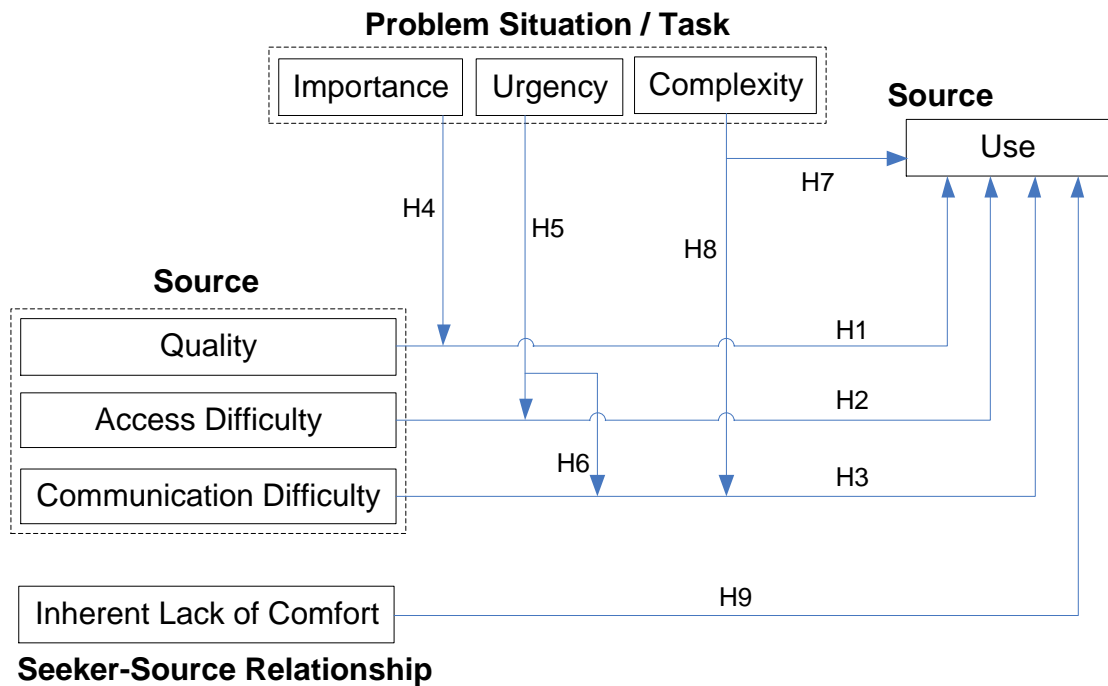


Figure 1. Research Model.

To get information to solve the above **specific problem/part of the task**, think of a **typical source of information** for each of the following types of sources. If you happen to choose the same person for Q32-36, think of the difference in meeting the person face-to-face, reaching through phone/chat and through email/forum/blog.

Type of source	Specify name or nickname
32. The person with whom you would typically (or could) discuss this problem face to face , e.g., Mr. A	(MyFace2FaceSource)
33. The person with whom you would typically (or could) discuss this problem on phone or online chat , e.g., Miss B (or Mr. A on phone)	(MyPhone/ChatSource)
34. Typical person to email or post online queries about the problem, e.g., Mr. C (or Mr. A on email), or Mr. D in an online forum	(MyEmail/ForumSource)
35. Typical book/manual/report to help in the problem, e.g., Book-A	(MyBook/Manual)
36. Typical online/electronic information source to help in the problem, e.g., Google, company digital library, intranet, etc.	(MyOnlineInfoSource)

Figure 2. Respondent asked to choose a typical source for each source type.

Table 2. Rotated Component Matrix for pilot data for onlineInfo (N=103).

	Component										
	1	2	3	4	5	6	7	8	9	10	11
IMP1	.484	-.028	-.114	.296	.186	-.102	-.086	.202	.070	.608	-.116
IMP2	.497	.037	-.142	.238	.137	-.165	.004	.190	.057	.584	-.028
IMP3	.198	.008	.006	.331	.163	-.162	-.008	.159	.137	.781	-.003
IMP4	.346	.005	-.074	.383	.271	-.091	-.016	.168	.055	.683	.055
IMP5	.205	.047	.029	.398	.317	-.137	.014	.186	.058	.714	.013
CMP1	.063	.118	.135	.207	-.042	.168	.041	-.024	.724	.147	-.014
CMP2	.061	-.040	.099	.086	.025	.031	.157	.169	.848	.118	-.021
CMP3	-.140	-.099	.163	.081	-.046	.042	.032	.013	.841	-.072	.048
CMP4	.283	-.149	-.103	.171	.215	-.141	.083	.043	.553	.143	.025
CMP5	.091	-.004	.232	.183	-.174	.115	.002	-.115	.721	-.052	.124
URG1	.263	.123	.121	.742	.108	-.234	.038	.117	.004	.132	-.006
URG2	.085	.129	.076	.883	.180	.007	.062	.121	.049	.054	.023
URG3	.069	.060	-.083	.832	.061	.016	-.058	.078	.182	.240	.001
URG4	.103	.051	-.054	.869	-.024	.018	.061	.025	.194	.200	.016
URG5	.117	-.012	-.100	.858	.085	-.026	.007	.017	.240	.174	.052
EFF1	.189	.058	-.060	.096	.860	-.023	.014	-.057	.028	.103	.013
EFF2	.223	.034	-.063	.134	.856	-.074	.013	.154	.089	.083	-.021
EFF3	.164	-.012	-.084	.079	.894	-.039	-.092	.107	-.037	.137	-.011
EFF4	.261	-.036	-.161	.032	.685	-.011	-.110	.314	-.111	.165	.103
EFF5	.180	.014	-.189	.066	.855	-.039	-.026	.144	-.126	.110	-.050

ORT1	.762	.128	-.109	.131	.289	-.215	-.015	.169	.122	.107	-.075
ORT2	.832	-.017	-.172	.135	.247	-.107	-.040	.215	.079	.072	.170
ORT3	.867	-.021	-.194	.126	.178	-.115	.029	.111	.017	.083	.135
ORT4	.810	-.024	-.110	.100	.188	-.148	.025	.087	-.037	.208	.142
ORT5	.787	.153	-.062	.128	.191	-.114	-.026	.119	.034	.312	.018
ENV1	.387	.222	-.125	.116	.290	-.140	-.124	.576	.116	-.032	-.090
ENV2	.279	.278	-.236	.091	.186	-.082	.052	.660	.076	.082	-.087
ENV3	.251	.286	-.047	.110	.225	-.094	.004	.756	.005	.106	.118
ENV4	.063	.276	-.130	.053	.132	.092	.142	.785	-.051	.155	.110
ENV5	.103	.171	-.060	.115	.010	.072	.017	.833	.036	.222	.123
QUA1o	.079	.843	-.145	.177	.041	-.019	-.082	.154	-.125	-.077	.137
QUA2o	.143	.826	-.083	.130	.044	-.064	-.054	.115	-.021	-.141	.112
QUA3o	-.064	.793	-.038	.009	.054	-.187	.174	.058	.071	.043	.036
QUA4o	.119	.837	.043	.048	-.018	.000	-.146	.153	-.105	-.014	.119
QUA5o	-.034	.810	-.136	-.044	.048	.011	.013	.224	-.021	.122	.177
QUA6o	-.051	.825	-.009	.029	-.084	.147	-.105	.162	.040	.115	.155
ACC1o	-.090	.124	.182	.028	.066	.755	.023	.042	.043	-.065	.029
ACC2o	-.186	-.065	.252	-.014	-.073	.860	.141	-.014	-.026	-.049	-.015
ACC3o	-.099	-.028	.174	.039	-.009	.818	.209	-.004	.090	-.172	-.011
ACC4o	-.102	-.081	.230	-.101	-.166	.847	.178	-.047	-.005	-.019	-.072
ACC5o	-.157	-.096	.178	-.165	-.049	.748	.130	-.019	.162	-.067	.009
CMM1o	-.073	.005	.270	.046	.009	.114	.691	.123	.192	-.087	.084
CMM2o	-.041	-.051	.211	-.007	-.022	.201	.823	.106	.123	.043	.230
CMM3o	.089	-.023	.173	.056	-.124	.132	.874	-.054	-.025	-.050	-.071
CMM4o	.087	-.048	.186	.061	-.048	.107	.898	.016	.011	-.009	-.099
CMM5o	-.085	-.042	.136	-.045	.027	.092	.828	-.039	.032	.055	-.062
CFT1o	-.048	-.005	.806	.082	-.075	.047	.161	-.121	.090	-.115	.003
CFT2o	-.184	-.080	.796	.024	-.070	.279	.141	-.147	-.037	.029	-.040
CFT3o	-.081	-.057	.802	-.055	-.173	.246	.212	-.049	.135	.083	-.022
CFT4o	-.137	-.071	.756	-.129	-.122	.179	.235	-.008	.160	.003	-.109
CFT5o	-.146	-.111	.811	-.014	-.060	.272	.213	-.064	.146	-.060	.087
CFT6o	-.165	-.144	.689	-.025	-.137	.327	.255	-.143	.247	-.120	.059
USE1o	.142	.260	.015	.115	-.002	.098	-.057	.038	.009	-.169	.839
USE2o	.032	.220	-.054	.021	.054	-.003	.024	.075	.077	-.001	.907
USE3o	.144	.329	.023	-.075	-.078	-.188	.047	.100	.055	.195	.663
Eigenvalue	13.810	7.340	5.333	3.586	2.748	2.391	2.049	1.903	1.843	1.489	1.191
%OfVariance	25.108	13.345	9.697	6.520	4.996	4.347	3.726	3.461	3.351	2.707	2.165
Cumulative%	25.108	38.453	48.150	54.670	59.665	64.012	67.738	71.198	74.549	77.256	79.422

Table 3. Items for Constructs.

Pertains to / Construct (Abbreviation)		Items	Item wording	References
Task	Importance – IMP	IMP1	The task is an important part of my duty.	Xu <i>et al.</i> (2006)
		IMP2	The task is important to my performance.	
		IMP3	The task means a lot to me.	
		IMP4	I give a lot of weightage to this task.	
		IMP5	I really value this task.	
	Complexity – CMP	CMP1	It has been a challenge for me to understand the task.	Adapted Zander & Kogut (1995); Lord & Ranft (2000)
		CMP2	I spend a long time learning how to do the task.	
		CMP3	The task is so complex and difficult to understand.	
		CMP4*	This task requires me to consider so many aspects.	
		CMP5	The aspects of the task unclear to me are many.	
	Urgency – URG	URG1	I have an approaching deadline to finish this task.	Self-developed
		URG2	The deadline for this task is really close.	
		URG3	This is a very urgent task.	
		URG4	I need to finish this task soon.	
		URG5	There is a pressing need to get this task done soon.	
Seeker	Task Self Efficacy – EFF (control variable)	EFF1	I consider myself an expert in doing this task.	Adapted Xu & Chen (2006); Xu <i>et al.</i> (2006)
		EFF2	I can tell a lot about how to do this task.	
		EFF3	I know this task very well.	
		EFF4	I can logically analyze this task.	
		EFF5	I have good knowledge about this task.	
	Learning Orientation – ORT (control variable)	ORT1*	I always push myself to learn more.	Self-developed
		ORT2	I am willing to select a challenging work assignment that I can learn a lot from.	Gray & Meister (2004)
		ORT3	I often look for opportunities to develop new skills and knowledge.	
		ORT4	I enjoy challenging and difficult tasks at work where I'll learn new skills.	
		ORT5	I continuously work towards upgrading my knowledge and skills.	Self-developed

Environment	Learning Environment - ENV (control variable)	ENV1	In my organization, we always ask each other for work-related knowledge.	Self-developed	
		ENV2	In my organization, everyone around me feels free to ask for information s/he needs.		
		ENV3	In my organization, I am encouraged to ask for anything I do not know.		
		ENV4	Most colleagues in my organization are ready to share their knowledge.		
		ENV5	My organization has a learning culture.		
Source	Quality - QUA	QUA1	[] has knowledge that is potentially applicable to the problem.	Xu & Chen (2006); Xu <i>et al.</i> (2006)	
		QUA2	[] has knowledge that is relevant to the problem.	O'Reilly, 1982; Xu <i>et al.</i> (2006)	
		QUA3	[] has novel (new) knowledge related to the problem.	Adapted Xu & Chen (2006); Xu <i>et al.</i> (2006)	
		QUA4	[] has reliable knowledge relevant to the problem.	Self-developed	
		QUA5	[] has broad/wide knowledge related to the problem.	Xu & Chen (2006); Xu <i>et al.</i> (2006)	
		QUA6	[] has deep knowledge related to the problem.	Self-developed	
	Access Difficulty - ACC	ACC1	I would have to spend a lot of time to gain access to [].	Self-developed	
		ACC2	It would be very hard to get to [].		
		ACC3	It would take a lot of effort to reach [].		
		ACC4	It would take too long to get to [].		
		ACC5	It would not be easy to approach [].		Adapted Xu <i>et al.</i> (2006)
	Communication Difficulty - CMM	CMM1*	While using [] for my problem, the "conversation" with [] is painful.	Self-developed	
		CMM2	While using [] for my problem, it is difficult to "converse" with [].		
		CMM3	While using [] for my problem, it is difficult to explain to [].		
		CMM4	While using [] for my problem, it is difficult to make [] understand most of the time.		
CMM5		While using [] for my problem, it is difficult to extract useful information from [].			
Seeker-Source	Inherent Lack of Comfort - CFT	CFT1	I would be nervous to use [] for information in solving this problem.	Adapted Ashford (1986); Xu <i>et al.</i> (2006)	
		CFT2	I would be embarrassed to use [] for information.		
		CFT3	I might be thought as incompetent if I use [] for information.		
		CFT4	I would not feel comfortable using [] for this problem.	Self-developed	
		CFT5	Using [] will not be nice for my image (the way another person(s) sees me).		
		CFT6	Using [] will not be nice for my self-image (the way I see myself).		
Source	Use - USE (dependent variable)	Frequency	USE1	Among all the sources of information available to me, I used [] a lot for problem-solving information.	Adapted Xu <i>et al.</i> (2006)
			USE2	I used [] very often for problem-solving information.	Adapted Jarvenpaa <i>et al.</i> (1999)
		USE3	How frequently did you use the following sources for this specific problem/part of the task? (very infrequently... ..very frequently)	Adapted Zimmer & Henry (2007)	
		USE4	I used [] (several times a day; about once a day; several times a week; about once a week; about once in 2-3 weeks; less than (once in 2-3 weeks); didn't use at all)	Adapted Davis (1989)	
	Amount (%)	USE5	For this specific problem/part of the task, indicate the approximate percentage of time you used each source (the TOTAL must sum up to 100%)	Adapted Zimmer & Henry (2007)	
		Order	USE6	For this specific problem/part of the task, indicate the order in which you used each source from 1 st (first used), 2 nd , 3 rd , 4 th , 5 th (last used) or NA (not used for this problem).	Self-developed

* Items CMP4, ORT1, CMM1 and USE4 were dropped after Confirmatory Factor Analysis

Table 4. Demographic Data.

N	346 (valid response for at least 1 source type; total respondents 352)				
N/source type	onlineInfo 336	bookManual322	emailForum 334	phoneChat 333	face2face 341
Industry	banking/ finance 26.3% (91)	software/ tech. 19.94% (69)	education 12.72% (44)	manufacturing 10.12% (35)	others 30.92% (107)
Company size	>500 employees 51.45% (178)	101-499 empl 16.47% (57)	1-19 employees 13.01% (45)	50-100 empl. 9.83% (34)	20-49 empl. 9.25% (32)
Team size	1-5 persons 38.73% (134)	6-10 persons 27.17% (94)	11-20 persons 17.63% (61)	21-50 persons 10.69% (37)	> 50 persons 5.78% (20)
Singapore location	Central Business District 47.97% (166)	West Singapore 31.8% (110)	East Singapore 6.94% (24)	North Singapore 4.34% (15)	Others 8.96% (31)
Organizational tenure	0 to 1 year 43.06% (149)	>1 to 2 years 21.97% (76)	>2 to 5 years 21.39% (74)	>5 to 10 years 8.09% (28)	>10 years 5.49% (19)
Role	Executive 60.40% (209)	Middle Mgmt. 28.90% (100)	Admin/Support 5.49% (19)	Top Mgmt. 3.76% (13)	Temp./Intern 1.45% (5)
Role tenure	0 to 1 year 56.65% (196)	>1 to 2 years 23.41% (81)	>2 to 5 years 13.01% (45)	>5 to 10 years 4.62% (16)	>10 years 2.31% (8)
Gender [#]	Male 73.12% (253)		Female 26.88% (93)		
Age	Ages 20-29 58.67% (203)	Ages 30-39 30.06% (104)	Ages 40-49 8.96% (31)	Ages 50-59 1.73% (6)	<20 or >60 0.58% (2)
Nationality	Singaporean 49.71% (172)	Indian 20.52% (71)	Malaysian 8.67% (30)	Chinese 5.78% (20)	Others 15.34% (53)
Education	Graduate 53.76% (186)	Postgraduate 32.37% (112)	Diploma 9.25% (32)	Grade 10/12 3.76% (13)	Polytechnic 0.87% (3)
Primary language	English 81.79% (283)	Chinese 9.83% (34)	Tamil 2.31% (8)	Hindi 1.16% (4)	Others 4.91% (17)

[#]As no purposeful gender bias was exhibited between approaching males or females for filling out the questionnaire, the skewed gender distribution (only 26.88% female respondents) might reflect the distribution of males versus females in professional jobs (requiring use of a computer) in Singapore.

Table 5. Descriptive Statistics and Reliability Analysis.

PropertyOf Construct	Task situation			Seeker/Actor		Env.	Source				SkrSrc	
	IMP	CMP	URG	ORT*	EFF*	ENV*	QUA	ACC	CMM	USE 1-3	CFT	
No. of Items ⁺	5	4	5	4	5	5	6	5	4	3	6	
Mean \bar{x} (1-7 scale)	All	5.837	4.241	5.008	6	5.029	5.573					
	O	5.822	4.232	4.993	5.986	5.011	5.538	4.73	3.042	3.607	4.752	2.449
	B	5.843	4.251	5.031	5.991	5.033	5.559	4.159	3.613	3.78	3.873	2.554
	E	5.837	4.249	5.023	5.982	5.02	5.57	4.611	3.619	3.565	4.4	2.846
	P	5.83	4.239	5.02	5.988	5.026	5.562	4.703	3.599	3.373	4.67	3.035
	F	5.844	4.233	5.001	5.988	5.017	5.565	5.196	3.55	3.133	5.166	2.927
Standard Deviation	All	1.223	1.631	1.618	1.105	1.258	1.293					
	O	1.232	1.622	1.604	1.11	1.268	1.302	1.712	1.951	2.001	2.052	1.819
	B	1.226	1.613	1.586	1.108	1.274	1.292	1.74	1.88	1.917	1.866	1.779
	E	1.233	1.625	1.603	1.107	1.267	1.295	1.474	1.742	1.689	1.627	1.824
	P	1.234	1.63	1.612	1.106	1.266	1.301	1.668	1.784	1.743	1.722	1.869
	F	1.224	1.623	1.613	1.108	1.259	1.299	1.569	1.935	1.85	1.733	1.904
Reliability (Cronbach's α)	All	0.923	0.824	0.93	0.941	0.935	0.911					
	O	0.925	0.822	0.928	0.944	0.935	0.909	0.92	0.909	0.908	0.864	0.941
	B	0.924	0.822	0.927	0.943	0.938	0.912	0.919	0.926	0.907	0.848	0.936
	E	0.924	0.821	0.929	0.944	0.936	0.912	0.906	0.916	0.898	0.769	0.934
	P	0.924	0.822	0.932	0.944	0.936	0.91	0.915	0.914	0.922	0.836	0.936
	F	0.924	0.82	0.93	0.941	0.935	0.91	0.926	0.913	0.922	0.854	0.938

* Control variables

⁺ Final number arrived at after Confirmatory Factor Analysis (perceived frequency of USE indicated)
all = all records (N=352); o = onlineInfo (N=336); b = book/manual (N=322);
e = email/forum (N=334); p = phone/chat (N=333); f = face-to-face (N=341)

Table 6. Ranking of sources on different parameters.

Property of	Construct	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Source	Quality	f (5.196)	o (4.73)	p (4.703)	e (4.611)	b (4.159)
	Access Difficulty	e (3.619)	b (3.613)	p (3.599)	f (3.55)	o (3.042)
	Communication Difficulty	b (3.78)	o (3.607)	e (3.565)	p (3.373)	f (3.133)
	Use (perceived frequency)	f (5.166)	o (4.752)	p (4.67)	e (4.4)	b (3.873)
Seeker/ Source	Lack of comfort	p (3.035)	f (2.927)	e (2.846)	b (2.554)	o (2.449)

o = onlineInfo; b = book/manual; e = email/forum; p = phone/chat; f = face-to-face. The value in parentheses indicates the mean level of each source type in terms of a criterion (e.g., quality).

Table 7. Convergent Validity Analysis for onlineInfo (N=336).

Property of	Construct (Item nos.)	Smallest T-value	Smallest Standard Loading	AVE	Cronbach's alpha	CFR
Task/Problem Situation	IMP (1-5)	17.08	0.79	0.714	0.925	0.926
	CMP (1,2,3,5)	11.63	0.62	0.546	0.822	0.826
	URG (1-5)	14.24	0.69	0.726	0.928	0.929
Seeker/ Actor	EFF* (1-5)	16.74	0.78	0.753	0.935	0.938
	ORT* (2-5)	19.96	0.87	0.811	0.944	0.945
Environment	ENV* (1-5)	15.32	0.74	0.671	0.909	0.911
Source (online Info)	QUA (1o-6o)	15.41	0.74	0.663	0.920	0.922
	ACC (1o-5o)	13.11	0.65	0.673	0.909	0.911
	CMM (2o-5o)	17.01	0.79	0.712	0.908	0.908
	USE (1o-3o)	13.34	0.67	0.702	0.864	0.874
Seeker-Src.	CFT (1o-6o)	17.11	0.79	0.729	0.941	0.942

*control variables

Table 8. Discriminant Validity Analysis for onlineInfo (N=336).

	Mean	S.D.	IMP	URG	CMP	EFF	ORT	ENV	QUAo	ACCo	CMMo	CFTo	USEo [#]
IMP	5.822	1.232	0.845										
URG	4.993	1.604	0.38***	0.852									
CMP	4.232	1.622	0.19**	0.3***	0.739								
EFF	5.011	1.268	0.41***	0.18**	-0.17**	0.868							
ORT	5.986	1.11	0.58***	0.23***	0.010	0.44***	0.900						
ENV	5.538	1.302	0.5***	0.18**	0.070	0.34***	0.46***	0.819					
QUAo	4.73	1.712	0.110	0.060	0.010	0.17**	0.18**	0.27***	0.814				
ACCo	3.042	1.951	-0.090	0.16**	0.22***	-0.050	-0.090	0.010	-0.080	0.821			
CMMo	3.607	2.001	-0.040	0.060	0.13*	-0.020	-0.060	-0.030	-0.2***	0.38***	0.844		
CFTo	2.449	1.819	-0.17**	0.070	0.22***	-0.110	-0.2***	-0.18**	-0.14*	0.51***	0.5***	0.854	
USEo [#]	4.752	2.052	0.05	0.01	0.04	0.07	0.2***	0.17**	0.62***	0.000	-0.13*	-0.13*	0.838

Correlation is significant at the *** 0.001 level ** 0.01 level * 0.05 level (2-tailed)
[#] Perceived frequency of use (USE1-3)

Table 9. Model specified (in equation format) for HLM analysis.

<p>Level-1 Model (variables that change for each source) $Y = B_0 + B_1*(QUA) + B_2*(ACC) + B_3*(CMM) + B_4*(CFT) + B_5*(O) + B_6*(B) + B_7*(E) + B_8*(P) + R$</p> <p>Level-2 Model (fixed variables across sources) $B_0 = G_{00} + G_{01}*(TMSIZE) + G_{02}*(RTENU) + G_{03}*(GENDER) + G_{04}*(AGE) + G_{05}*(EDUC) + G_{06}*(IMP) + G_{07}*(CMP) + G_{08}*(URG) + G_{09}*(EFF) + G_{010}*(ORT) + G_{011}*(ENV) + U_0$ $B_1 = G_{10} + G_{11}*(IMP);$ $B_2 = G_{20} + G_{21}*(URG);$ $B_3 = G_{30} + G_{31}*(CMP) + G_{32}*(URG)$</p>
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+ predictor centered around its group mean * predictor centered around its grand mean

Table 10. Results from HLM analysis.

Final estimation of fixed effects (with robust standard errors)

Group/ Hyp.	Independent Variable	usePerceptual		useFrequency		useAmount		useOrder		
		Std. Coeff.	P-value	Std. Coeff.	P-value	Std. Coeff.	P-value	Std. Coeff.	P-value	
Source	H1 QUA	0.622***	0.000	0.467***	0.000	0.655***	0.000	0.670***	0.000	
	H2 ACC	-0.054	0.187	-0.218***	0.000	-0.103	0.074	-0.128*	0.018	
	H3 CMM	-0.079*	0.044	-0.007	0.868	-0.070	0.205	-0.096	0.068	
	Dummy	onlineInfo	-0.163	0.117	0.299*	0.011	0.742**	0.001	0.341	0.072
		book/manual	-0.620***	0.000	-0.779***	0.000	-1.139***	0.000	-1.138***	0.000
email/forum		-0.392***	0.000	-0.195	0.082	-0.926***	0.000	-0.687***	0.000	
	phone/chat	-0.155*	0.037	-0.062	0.496	-0.697***	0.000	-0.521***	0.000	
Task- Source	H4 IMP * QUA	0.074*	0.042	0.112*	0.018	0.105*	0.034	0.143**	0.005	
	H5 URG * ACC	0.001	0.978	0.029	0.331	0.014	0.733	0.035	0.369	
	H6 URG * CMM	-0.003	0.912	-0.069*	0.012	-0.061	0.127	-0.023	0.533	
	H8 CMP * CMM	0.021	0.421	0.021	0.451	0.009	0.817	0.050	0.165	
Task	IMP	-0.057	0.349	-0.027	0.705	-0.024	0.765	0.001	0.960	
	URG	-0.018	0.621	0.006	0.887	0.016	0.734	-0.021	0.140	
	H7 CMP	0.094*	0.020	0.110**	0.010	0.075	0.106	0.006	0.647	
SkSrc	H9 CFT	-0.115+	0.058	-0.094	0.158	-0.179*	0.018	-0.185*	0.018	
Seeker/Actor	Control	ORT	0.036	0.488	0.018	0.821	-0.068	0.352	0.002	0.930
		EFF	0.090	0.078	0.038	0.524	0.079	0.224	-0.003	0.860
		Role Tenure	-0.001	0.281	-0.001	0.500	-0.001	0.671	0.000	0.293
		Gender	0.198	0.083	0.160	0.242	-0.077	0.586	-0.060	0.168
		Age	0.011	0.178	0.017	0.098	0.006	0.583	-0.001	0.820
		Education (R)	-0.118*	0.048	0.020	0.740	0.098	0.115	0.010	0.599
Env	ENV	0.185***	0.000	0.049	0.434	0.027	0.654	0.030	0.128	
	Team Count	0.041	0.299	0.025	0.598	0.025	0.603	0.011	0.572	

Final estimation of variance components

S.D.	0.676	0.845	0.684	0.019
Variance component	0.457	0.713	0.468	0.000
Df	334	334	334	334
chi-square	868.340	928.655	519.112	78.202
P-value	0.000	0.000	0.000	>.500
level-1 S.D.	1.172	1.387	2.030	1.811
level-1 var. component	1.374	1.923	4.120	3.279

+ p<0.06 (close to significance) * p<0.05 **p<.01 ***p<.0001

Table 11. Summary of Hypothesis Testing.

H1	"The perceived quality of an information source has a positive effect on the use of that source"	Strongly supported across all source types
H2	"The difficulty in accessing an information source has a negative effect on the use of that source"	Supported for the behavioral measure of frequency of use and of first use; Not supported for perceived frequency of use and amount of use.
H3	"The difficulty in communicating with an information source has a negative effect on the use of that source"	Supported for perceived frequency of use; Not supported for behavioral aspects of use
H4	"The positive effect of the quality of an information source on the use of the source is higher when the task is more important to the seeker, compared to when the task is less important"	Supported for all aspects of source use (both perceptual and behavioral)
H5	"For a more urgent task, the difficulty in accessing an information source has a higher negative effect on the use of the source compared to a less urgent task"	Not supported
H6	"For a more urgent task, the difficulty in communicating with an information source has a higher negative effect on the use of the source compared to a less urgent task"	Supported for the behavioral measure of frequency of use; Not supported for other behavioral (useAmount, useOrder) and perceptual aspects of use (usePerceptual)
H7	"The complexity of the task at hand has a positive effect on the use of the information source"	Strongly supported for frequency of use (both perceived & behavioral); Not supported for first or most use
H8	"The negative effect of communication difficulty with the source on the use of the source is higher when the task at hand is complex compared to when the task is less complex"	Not supported
H9	"The inherent lack of comfort with a source has a negative effect on the use of the information"	Supported for useAmount and useOrder and close to being supported (p<0.06) for

Table 12. Effect of each source type as compared to face-to-face on source use.

OnlineInfo	Online information is used more frequently, and for a higher percentage of time, as compared to face-to-face. Online information may be deduced to be slightly more popular as first choice ($p=0.072$, almost significant) as compared to face-to-face.
Book/manual	Book/manual is used less (frequently, lesser amount of time, chosen later) as compared to face-to-face.
Email/forum	Email/forum is chosen after face-to-face, is used for a lesser percentage of time and perceived to be used less frequently as compared to face-to-face. In behavioral measure of frequency of use too, email/forum is likely to be used less compared to face-to-face, as the effect is close to significance ($p=0.082$).
Phone/chat	As compared to face-to-face, phone/chat is used for a lesser amount of time, chosen later and is perceived to be used less frequently as compared to face-to-face. However, the negative effect of phone/chat (as compared to face-to-face) on the objective measure of use frequency was not found to be significant.

Table 13. Ranking of source types on different aspects of use.

Rank	usePerceptual	useFrequency	useAmount	useOrder
1	face2face	onlineInfo	onlineInfo	onlineInfo#
2	phone/chat	face2face	face2face	face2face
3	onlineInfo#	phone/chat#	phone/chat	phone/chat
4	email/forum	email/forum#	email/forum	email/forum
5	book/manual	book/manual	book/manual	book/manual

Relationship not significant with respect to face-to-face