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Effects of information importance and distribution on information exchange in team decision making

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ABSTRACT

EFFECTS OF INFORMATION IMPORTANCE AND DISTRIBUTION ON INFORMATION EXCHANGE IN TEAM DECISION MAKING

by
Babajide James Osatuyi

Teams in organizations are strategically built with members from domains and experiences so that a wider range of information and options can be pooled. This strategic team structure is based on the assumption that when team members share the information they have, the team as a whole can access a larger pool of information than any one member acting alone, potentially enabling them to make better decisions. However, studies have shown that teams, unlike individuals, sometimes do not effectively share and use the unique information available to them, leading to poorer decisions. Research on information sharing in team decision making has widely focused on the exchange of shared or unshared information in the hidden profile paradigm, neglecting the role of information importance. Informational influence theory holds that the importance of information may affect how information is processed for making decisions in teams.

This study investigates information exchange processes to understand how teams can effectively exchange and use information available to them to make better decisions. The specific research question concerns the extent to which importance and distribution of information is associated with its exchange during discussion in distributed teams. Data are collected in a laboratory study involving subjects interacting with a computer-mediated decision support system.

The results show that the importance of information, the distribution and the interaction of importance and distribution have significant main effects on information exchange. Teams tend to exchange a higher proportion of the more important information compared to the less important information. A third dimension is introduced to measure information distribution—partially shared information—and is found to have a strong main effect on information exchange. It is also found that the extent to which team members exchange more important information during discussion strongly correlates with the tendency to improve team performance. It is also found that task complexity is negatively correlated with information exchange performance. Teams tend to exchange a smaller proportion of information when working on complex tasks, compared to when working on simple tasks.

This dissertation makes contributions in three areas. Firstly, a theoretical model is developed that allows for the investigation of the joint relationship of the importance of information and its distribution in team decision-making. Secondly, this work introduces a new approach to investigate information sharing, exchange and use in decision-making teams. Others can apply this approach fruitfully in investigating similar phenomena outside of the current domain. Finally, this work improves the understanding of information sharing and exchange processes in relation to the distribution of information and its importance.

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by
Babajide James Osatuyi

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CHAPTER 1

INTRODCUTION

1.1 Objective

Teams or groups are often assembled to engage in decision-making tasks or to give advice to superior personnel in an organization (Hackman & Kaplan, 1974). For instance, personnel selection decisions usually require input from a selection committee rather than a single hiring manager (Mesmer-Magnus & DeChurch, 2009). An advantage of using groups in such situations is that teams have access to a larger pool of expertise and knowledge than do individuals. However, prior research has shown that groups, unlike individuals, sometimes do not effectively exchange and use the unique information available to some members in the team, leading to poorer decisions (Stasser & Titus, 1985b). This tendency has been called *biased information sharing* in the information sharing literature (*ibid.*).

Numerous studies have explored information exchange in teams with a focus on how information is shared among team members before discussion, referred to as information distribution (e.g., Dennis, 1996; Mesmer-Magnus & DeChurch, 2009; Stasser & Titus, 1985b; Todd & Benbasat, 1992; Winquist & Larson Jr., 1998). Dennis (1996) defined information distribution as the possible ways that information may be available to all group members (shared information); to more than one but not all group members (partially shared information); or to only one member (unshared information). This study adopts Dennis's (1996) definition of information distribution to investigate whether it is associated with information exchange during group discussions.

Information exchange has been defined as the extent to which each team member mentions a piece of information available for making a decision in a group discussion (Dennis, Tyran & Vogel, 1997; Stasser, Stewart & Wittenbaum, 1995). Information exchange have been shown to increase the pool of information to a group for making informed decisions (Mesmer-Magnus & DeChurch, 2009). In this dissertation, information exchange by mentioning a piece of information in the group discussion is the focus of investigation.

Informational influence theory (Shaw, 1981) holds that the importance of information may affect how information is processed for making decisions in teams. Importance is defined by the Merriam Webster online dictionary as "the quality or state of being important," and more generally to "mean a quality or aspect having great worth or significance." Importance is further discussed as "implying a value judgment of the superior worth or influence of something or someone." Similarly, Steinel et al. (2010a) view a piece of information as important to the degree that it is relevant to the problem at hand. In the context of problem solving, importance of information can be referred to as its utility toward the achievement of an objective. Utility of information for a decision is the essence of the definition intended in this study, but this research will use the more widely understood term "importance." Importance of a piece of information is formally defined in this research in terms of its relevance to making an optimal decision. For example, a piece of information can be important for making a decision (e.g., "Relevant job experience of a job applicant"), or it can be less important (e.g., "Favorite color of an applicant").

This dissertation argues that the importance and distribution of a piece of information are relevant characteristics in the context of information exchange and team decision-making. The approach to assessing the importance of information as well as distributing pieces of information in this dissertation is an improvement on the existing approach, details of which will be discussed in Chapter 4.

1.2 Research Problem

Assume a situation where two or more people are working together to satisfy a shared information need. Such a situation may be a group of faculty members deciding on what students to admit into their doctoral program; a couple looking to buy a house; a triage team responding to accident victims, or a software development team deciding on system requirements. A difficulty common to most of the scenarios described above is the lack of complete exchange of information among members of those teams, leading to inefficient utilization of all the information available to them to make effective decisions. Although the aim of bringing teams together is for members to use knowledge from diverse experiences, studies have shown that team members tend to exchange only information already known to all members (e.g., Dennis, 1996; Stasser, Taylor & Hanna, 1989; Stasser & Titus, 1985b; Stasser, Vaughan & Stewart, 2000; Todd & Benbasat, 1992). The information sampling paradigm is a key model in the information sharing literature that was developed to explain how groups share (exchange, in the terminology used in this study) information during discussions (Stasser & Titus, 1985b). The information sampling paradigm posits that the distribution of information, i.e., shared (information known by all team members) or unshared (information known to only an individual in the team) impacts information exchange during team discussions (Stasser &

Titus, 1985b). Other studies have proposed several possible explanations ranging from social motivation of team members (Steinel, et al., 2010a) to the kind of task used for the experiments as factors that may explain the biased information exchange dynamics during team discussions (Todd & Benbasat, 1992).

Central to the objective of this research is the investigation of the association of information importance and information distribution with information exchange in a distributed team environment, leading to the first two research questions (RQs),

RQ1: To what extent does the importance of information correlate with its exchange during team discussions?

RQ2: To what extent is the distribution of information among team members associated with information exchange in team discussions?

In this dissertation, team members discussed and exchanged information through the use of a group support system (GSS) that supports text discussion among members in different locations. Besides text, the GSS can provide decision support tools to gather individual assessments such as ratings or rankings of alternatives and to display them in a clear table. In this dissertation, for half of the group discussions, a tool is used to display the set of individual group member's information importance ratings and preferences before discussion.

Task complexity, defined as ranging from simple to complex, is related to the amount of information available to a group to take into account in making a decision (Wood, 1986). The degree to which the number of criteria available to evaluate decision alternatives is few or more has been shown to influence information exchange in a group discussion (Parks & Cowlin, 1995; Wood, 1986), leading to the last research question:

RQ3: Does the complexity of the task seem to interact with the visibility of importance ratings in the GSS to mediate the exchange process in any way?

The above research questions were investigated to understand how teams exchanged information available to them to make decisions. A discussion of the significance of this research is presented in the next section followed by an outline of the scope of this dissertation.

1.3 Significance of the Proposed Research

In the course of positioning this study in the extant information exchange literature, factors that may shape the solution of hidden profile tasks emerge and are grouped into four categories: information properties (Stasser & Stewart, 1992; Stasser, et al., 1995), human factors (e.g., De Vries, Van Den Hoof & De Ridder, 2006; Fulk, Heino, Flanagin, Monge & Bar, 2004), technology (e.g., Dennis, 1996; Greitemeyer & Schulz-Hardt, 2003; Toma & Butera, 2009; Winquist & Larson Jr., 1998), and task characteristics (Laughlin, 1980). A description of how these factors may associate with information exchange processes and the resulting team performance resulted in the development of a comprehensive framework of important factors that should be considered in the information exchange paradigm to explain group dynamics and behavior. This framework contributes to the understanding of the possible factors that may relate to information exchange processes as well as the outcome of team performance. The study described in this dissertation instantiated a portion of the framework to guide the investigation of the association of both information distribution and importance with information exchange and team performance during team discussions.

Studies in the group support systems (GSSs) paradigm explore how to reduce costs attached to utilizing the full potential of information in ubiquitous interactions that hinge on the exchange of information. Factors such as mixed social motives, design of the technology aid, and pre-discussion preference (e.g., Dennis, 1996; Greitemeyer & Schulz-Hardt, 2003; Toma & Butera, 2009; Winquist & Larson Jr., 1998) have been found to influence information exchange. Dennis (2010) used perceptive measures to show that, in deciding to contribute information, participants assess the importance of information and the social implication of the contribution. A systematic approach is taken in this dissertation to investigate how participants assess importance of information both at the individual and the team level of analysis. This approach is taken to provide a clear understanding of the mechanics and sub-processes involved with processing information before and during discussions among team members during decision-making.

While the issue of information exchange across distributed entities has attained considerable attention lately, much research is needed to address some of the fundamental issues in this field such as the design of experiments in the information-sampling paradigm. This dissertation presents a new approach for investigating hidden profile tasks with more practical implications than the classical information sampling paradigm (Stasser & Stewart, 1992; Stasser, et al., 1995). A detailed discussion of the approach that modifies the traditional information-sampling paradigm is presented in Chapters 3 and 4.

1.4 Summary

This chapter builds an argument for the need for a re-evaluation of existing information exchange models that explain the observed biases in information exchange during group discussions. The rest of this dissertation is organized as follows. A review of related studies used to formulate the research model is presented in Chapter 2. Chapter 3 describes the research framework that results from the review of related literature in Chapter 2. Chapter 4 describes the design of the study to test the usefulness of the theoretical research framework, with a focus on the new approach in the methodology employed. A description of the group decision support system design used in this study is presented in Chapter 5. Chapter 6 reports the result of pilot studies to validate the group decision support system and task pretests. The results of the experiments are presented in two chapters: Chapter 7 reports on the descriptive results and Chapter 8 reports on tests of hypotheses. Finally, discussion of the results and the implications of this study for theory and practice as well as extensions of the study conclude this dissertation in Chapter 9.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter builds an argument that existing information processing models and theories are not yet sufficient to explain observed biases in information exchange. This research proposes to fill the gap in the literature by reexamining the association of information importance with team information exchange performance, in conjunction with the relationship of different degrees of distribution of information prior to discussion. This review will broaden the understanding of which factors one might consider to improve information exchange among decision makers working collaboratively.

In addition, a review is presented of various group support systems (GSSs) studies that use hidden profile tasks (where the best solution is not obvious until initially unshared information is exchanged) to investigate the effects of information processing on team and task performance. The classic "information sampling paradigm" most frequently used to study information exchange is described. While this review is by no means exhaustive, it aims to provide enough depth to form a basis for the research outlined in this dissertation, which uses hidden profile tasks, a modification of the information sampling paradigm, and a group support system (GSS).

2.2 Information Processing and Problem Solving

To gain a deeper and wider understanding of the effects of information processing, many researchers have focused on their impact on an end goal such as the quality of solution provided to a problem, or improvement to task performance processes (Stasser, 1992; Toma & Butera, 2009; Vakkari, 1999). The earliest work on understanding information processing as it affects problem solving dates back to the late 1970s when Herbert Simon proposed a theory of human problem solving (Simon, 1977; Simon & Reed, 1976; Simon & Simon, 1978). The theory is rooted in information processing models that explain the underlying processes of problem solving: described as an interaction between an information-processing system, the problem solver, and a task environment. Newell and Simon (1972) proposed a framework for problem solving behavior comprised of three components: information processing system, task environment, and problem space—described as a way in which the problem solver views the task environment in approaching the task. This suggests that the problem of information exchange in teams may be attributed to the lack of fit between the task chosen by the researchers and the strategy employed by the participants. Similarly, echoing Todd and Benbasat (1992), conflicting results for the impact of group support systems on decision quality may be partly as a result of a mismatch of the problem task and the strategy predefined in the system design.

The next section reviews research that explores the use of group support systems to support information exchange among teams solving a problem collaboratively. This review demonstrates the gap in the group support systems literature in explaining and understanding information exchange in a group of decision makers working on hidden profile tasks.

2.3 Group Support Systems and Information Processing

A secondary objective of this work is to investigate how computer mediated information exchange may address issues identified in prior studies as possible hindrances to teams' information processing. The earliest work on understanding the ways in which the use of group support systems (GSS) impact task performance dates back to the 1980s and 1990s by researchers at the University of Minnesota, the University of Arizona (Dennis, George, Jessup, Nunamaker Jr & Vogel, 1988; Nunamaker Jr, Dennis, Valacich, Vogel & George, 1991), and New Jersey Institute of Technology (NJIT) (e.g., Fjermestad, 2004; Fjermestad & Hiltz, 1998; Hiltz, Dufner, Holmes & Poole, 1991; Hiltz, Johnson & Turoff, 1991; Ocker, Hiltz, Turoff & Fjermestad, 1995, 1996; Turoff & Hiltz, 1982). While studies conducted in Minnesota and Arizona focused on face-to-face, time synchronous groups, those conducted at NJIT pioneered the study of the impact of GSS on distributed groups in the synchronous and asynchronous conditions. Since then, researchers have explored, in great detail across several domains, the impact of using GSS in problem solving. Some reported negative effects (e.g., Dennis, 1996; Todd & Benbasat, 1991, 1992), while others reported positive effects (e.g., Dennis, 1996; Fjermestad & Hiltz, 1998; Hiltz, Dufner, et al., 1991; Hiltz, Johnson, et al., 1991; Turoff & Hiltz, 1982).

In addition, GSS's usually include some sort of voting or rating tool as a decision aid. GSS may add process structure to a team meeting through the use of a detailed agenda, which a team facilitator may employ to steer the team during discussion (Dennis, Tyran, et al., 1997). This suggests that GSS can be useful for focusing the team's attention on the task at hand.

In several meta-analyses of cumulative experimental studies comparing GSS with no-GSS, GSS showed positive effects for quantity and quality of decisions and equality of participation but mixed results on the effect of GSS on time taken, consensus, and participant satisfaction (Benbasat & Lim, 1993; Dennis, Barbara & Vandenberg, 1996; Fjermestad, 2004). Effects of GSS were moderated by a variety of contextual variables. For instance, if quantity of ideas were an explicit decision making goal, participants would use the GSS to facilitate productivity in terms of the number of ideas generated (Wood & Nosek, 1994).

Dennis' (1996) study which was described in the previous section for example, reports that teams that used GSS in solving a hidden profile task exchanged 50% more information than non-GSS teams, providing sufficient information to enable them to identify the optimal decision. However, only one of the GSS teams came to the optimal decision.

In a related study, Todd and Benbasat (1992) conducted two experiments to investigate the extent of information use by unaided decision makers and users of a decision aid designed to support preferential choice problems. The results of the two experiments indicate that subjects with a decision aid did not use more information than those without one (Todd & Benbasat, 1992). This finding contradicts the traditional assumption in the GSS literature that if decision makers are provided with expanded processing capabilities they will use them to analyze problems in more depth and, as a result, make better decisions (Todd & Benbasat, 1992). A possible explanation for poor decisions made by teams with visual aids is inefficient information exchange (e.g., Larson Jr., Christensen, Franz & Abbott, 1998; Todd & Benbasat, 1992).

Findings from the studies reviewed in this section indicate that although the use of GSS can enhance efficient information exchange, more design research is needed to ensure that GSS actually does facilitate information exchange—a necessary condition for improving information exchange in a team environment.

The next section reviews studies in the classical information-sampling paradigm that use hidden profile tasks to investigate information exchange bias among teams of decision makers.

2.4 Classical Information Sampling Paradigm: Hidden Profile Task Defined

Information sharing is a vital process through which team members collectively utilize their available informational resources to fulfill the team's objective. Information sharing has predominantly been studied in two main domains: mainly field studies examined knowledge sharing in organizational contexts and laboratory studies examined information exchange within the information sampling paradigm. Field studies examine technical and managerial solutions of the knowledge sharing problem with a focus on factors like usability of knowledge management systems, the role of organizational culture, commitment, culture, or leadership (De Vries, et al., 2006; Fulk, et al., 2004). Findings from these studies show that individuals may be reluctant to share their knowledge (Cabrera & Cabrera, 2002; Cress, Kimmerle & Hesse, 2006; Kalman, Monge, Fulk & Heino, 2002).

Laboratory studies on information sharing are typically done within the information-sampling paradigm (Stasser & Stewart, 1992; Stasser, et al., 1995; Stasser &

Titus, 1985b, 1987). This paradigm was developed to examine group decision making in a situation in which the distribution of information among group members is highly controlled. Individuals in the group receive pieces of information that would lead to arguments for and sometimes also against several candidates or options before entering a group discussion. Some pieces of information are given to all members, referred to as shared information; some are only given to one or more, but not all members, referred to as unshared information.

When individuals form a group, each member typically hold information that is relevant to the task but differs from or complements information held by others. Information asymmetry arises when not all group members have access to all the information relevant to the task—called a hidden profile task (Stasser, 1992). In a hidden profile task, within the information sampling paradigm, unshared information can be distributed in such a way that the best decision alternative is hidden from the members prior to discussion and can only be found if unshared information is completely exchanged. Although the benefits of sharing information in teams are intuitive, there is bountiful research that has used the information sampling paradigm and reported that teams are bad at solving hidden profiles because they do not pool enough unshared information (e.g., Gigone & Hastie, 1993; Mesmer-Magnus & DeChurch, 2009; Stasser & Titus, 1985b, 1987).

Typically, teams exchange more information under three conditions: when all members already know all the information available (complete information sampling); when members are collectively capable of making accurate decisions independently (informational independence), and when members are highly similar to one another (member similarity). A meta-analysis of extant information exchange studies demonstrates that information exchange can be enhanced by: structuring team discussions (Larson Jr., Christensen, et al., 1998); framing tasks as intellective; and promoting a cooperative team climate (Mesmer-Magnus & DeChurch, 2009). All three factors have been found to enhance teams' in-depth processing of information (Mesmer-Magnus & DeChurch, 2009). Structure in team discussions has been found to have similar effect in personnel selection interviews as on team information sampling, to the extent that it increases the team's retrieval of decision-relevant information (Conway, Jako & Goodman, 1995). These findings suggest that the assignment of importance to information being exchanged is necessary for effective information exchange in team discussions. However, there are only a few studies in the literature that investigate how the importance of information may influence exchange of information (Steinel, et al., 2010a).

This dissertation contributes to the information sampling literature and to the field of Information Systems by seeking to understand the association of information importance in addition to its distribution with the exchange of information, which may provide insights into how hidden profile tasks may be solved more efficiently in teams. As such, a new approach to designing studies in the information sampling paradigm that also controls for the importance of information exchanged (adapted from Steinel, et al., 2010a) is proposed in Chapter 4. Extant studies that investigated information exchange in the context of teams solving hidden profile tasks are presented in the next section.

2.5 Review of the Information-Sharing Literature

A seminal study conducted by Stasser and Titus (1985b) found that groups often make suboptimal decisions on tasks structured as "hidden profile." The study found that groups tend to discuss and incorporate into their decisions information that is shared (known to all group members) at the expense of information that is unshared (known to a single member of the group). Over the past two decades, this unsettling finding has stimulated much research that seeks answers to the questions such as: why and under what conditions will groups favor shared information over unshared information in their collective decisions? This section presents a review and critique of the literature on group information exchange that was initiated by the Stasser and Titus (1985b) study.

At least 35 studies (findings summarized in Table K.1 in Appendix K) that have used the information sampling paradigm, or a slight variation of it, have found a consistent result: groups seldom discover the hidden profile and discuss more shared than unshared information (Dennis, 1996; Faulmuller, Kerschreiter, Mojzisch & Schulz-Hardt, 2010; Franz & Larson, 2002b; Greitemeyer & Schulz-Hardt, 2003; Gruenfeld, Mannix, Williams & Neale, 1996; Jefferson, Ferzandi & McNeese, 2004; Lam & Schaubroeck, 2000; Larson, Christensen, Abbott & Franz, 1996; Larson, Foster-Fishman & Keys, 1994b; Lightle, Kagel & Arkes, 2009; Mennecke, 1997; Mesmer-Magnus & DeChurch, 2009; Parks & Cowlin, 1995; Stasser, et al., 1989; Stasser & Titus, 1987; Stasser, et al., 2000; Stewart & Stasser, 1995; Wittenbaum, 2000).

In addition, not only is shared information more likely than unshared information to be mentioned initially, but members are more likely to repeat shared information than unshared information after it is mentioned. The studies summarized in Table K.1 in

Appendix K are assessed in terms of their theoretical and methodological approach as well as key findings in each research endeavor. Wittenbaum et al., (2004) provided review of past group information-sharing literature, which is organized into seven types of factors that have been examined: 1) information type and distribution—this is the same as what is discussed as information distribution in this study, 2) task features—refers to whether the group task is a selection task where the group is expected to choose the best alternative (i.e., intellective task) or when the group decision is to make a judgment call (i.e., judgmental or preference task) , 3) group structure and composition—refers to the group size, norms and roles, 4) temporal features—the effect of time pressure and the timing of when shared and unshared information are introduced in group discussions, 5) member characteristics—refers to the expertise and control of individuals in the groups, 6) discussion procedures—information storage defined as either the use of memory or a discussion forum where information can be re-accessed and the structure of information provided, and 7) communication technology—variation of the use of a group support system among groups. Based on a review of the studies summarized in Table K.1, this study modifies Wittenbaum et al. (2004) organization of factors that have been identified in the literature and groups them into four categories: human factors such as team member characteristics, group structure and composition; information properties such as the distribution of information, importance of information, information use; task characteristics such as task type; and finally, technology factors such as group support systems used during group discussion.

2.6 Information Exchange

Information exchange (sometimes called information pooling or information sharing (Devine, 1999; Mennecke & Valacich, 1998)) simply refers to the act of exchanging information by means of discussion among team members. Information exchange is the key element in team decision making as it is a precursor for the team to be efficient in making an optimal decision effectively (Dennis, 1996). Dennis' (1996) study on information exchange and use in teams solving a hidden-profile task confirmed earlier findings that discussions among team members (both in GSS and non-GSS teams) were ill structured and focus on only a very few pieces of common information as reported in (Stasser & Titus, 1985b, 1987). A possible explanation for the lack of exhaustive information processing was attributed to the way the GSS was used in the study. Anonymity and delayed feedback in the GSS were also reported as possible factors that might have reduced the credibility of new information so that team members chose not to process it (Todd & Benbasat, 1991). A third explanation for lack of information processing by the team was that information in the GSS was less salient than verbally contributed information (see Dennis, 1996 for extensive review).

Normative influence theory, also referred to as social comparison theory, provides explanation for why information may not be fully exchanged in a team setting. The theory stipulates that team members may be socially motivated to conform to others' idea to preserve a favorable self-presentation (Myers & Lamm, 1976). This motivation may suggest a change in team members' initial preference to more closely match that of the others, either through coercion from others or choice of the individual team member (Hackman & Kaplan, 1974). Therefore, participants engaging in a team discussion to collaboratively solve a problem are likely to experience a consensus change after the discussion. In addition, on the basis of the assumption that GSS enhances the complete use of information exchange during discussion, team members will be likely to agree more on the team decision after team discussion (i.e., greater consensus change) (Dennis, 1996).

A recent study examined how three factors—social motivation, importance of information and distribution—influenced information exchange in group decision making (Steinel, et al., 2010a). The authors define social motivation in terms of an individual's readiness to share information at their disposal. Selfish individuals value independence, disregard other's ideas, and try to outperform their fellow group members. Pro-social individuals value group harmony and strive for the cooperative goal of reaching a consensus and making a high-quality group decision. In their study, information importance was assessed in terms of its relevance to the task of interest. However, the study neglected the impact of those two factors on information exchange processes and decisions made by teams, which are crucial to understanding strategic information exchange in teams. This research argues that knowledge of how information is exchanged in relation to its importance is crucial, especially in organizations where decisions made as a result may have implications for gaining or losing competitive advantage.

Evidently, not all information is equal in a team problem solving setting. Despite the obvious validity of this claim, team decision making research in the tradition of the information sampling paradigm has not focused on other aspects of information other than distribution—shared versus unshared (Steinel, et al., 2010a). As noted in this one study (Steinel, et al., 2010a) that had some methodological shortcomings that will be discussed in Chapter 4, a piece of information has two characteristics that are especially relevant in the context of strategic information sharing and team decision making, namely distribution and importance. These characteristics are not necessarily related in natural team decision-making settings. Independent of its distribution, information is also characterized by its importance to the problem at hand. Unlike in Steinel et al’s study, importance of information in this study is conceived in terms of its relevance to and utility for identifying an optimal alternative in a selection task as assessed by group members and domain experts. This dissertation will include an examination of the role that importance of information, a characteristic of information that has been hitherto neglected in the information exchange literature, has on decision making in teams. The next section describes terminologies that surface in the literature and will be used in this research to describe information exchange processes.

2.7 Information Exchange Processes

Studies that looked at information exchange spread across a large number of fields, including psychology, organizational behavior, human computer interaction and computer supported collaborative work (CSCW). Researchers have defined processes related to information exchange in terms of importance, use, distribution, sharing and exchange in both individual and team settings.

2.7.1 Information Importance

Studies have argued that the importance of information may affect how information is processed for making decisions during team discussion (Shaw, 1981; Steinel, Utz & Koning, 2010b). In the context of team decision-making intended in this study, importance of a piece of information is defined in terms of its relevance to selecting the best alternative from a pool of choices. Researchers have shown that the perceived importance of information can influence how team members feel about information exchanged by other team members during discussions (Steinel, et al., 2010b).

Van Swol (2007) showed that team members did not rate information that was mentioned during the discussion as more important than information not mentioned, and team members did not rate shared information they mentioned as more important than unshared information. She showed that team members did rate shared information other group members mentioned as more important than unshared information others mentioned. Participants did not rate their own information as more important than other's information, and information that was repeated was not rated as more important (*ibid.*). Nevertheless, the studies described above were conducted in a face-to-face environment where other exogenous factors may have contributed to how team members interacted during discussion. For example, turn taking during discussion could have either encouraged or discouraged team members to exchange information. Technology-mediated communication provides affordances, such as parallel communication, not present in a face-to-face environment, which may contribute to better processing and analysis of information discussed. It is therefore expected that participants' perception of the importance of information exchanged in a technology-mediated discussion will be enhanced, thereby influencing its use for decision-making. Based on the relationship that information exchange models espouse between the importance of a piece of information and its exchange during team discussion, it can be posited that the importance of information will influence whether or not it will be exchanged during team discussion, leading to Proposition 1:

- Proposition 1: Team members are more likely to exchange pieces of information that are more important than those that are less important.

2.7.2 Information Use

Information use refers to the act of utilizing information possessed by an individual to achieve a given goal (Dennis, 1996). The use of information is an incorporation process, during which information is indexed and stored (e.g., in human memory) for possible future access. In the context of team discussions, information use involves the accumulation of pieces of information in a discussion forum where team members can further analyze and process available information. Information use has been defined as the integration of information sought into the existing information base and its later retrieval (Dennis, 1996; Dennis, Hilmer, Taylor & Polito, 1997). During discussion, team members have been found to have a tendency to use information repeated more than once (Hertwig, Gigerenzer & Hoffrage, 1997). Van Swol et al. (2003a) speculated that participants are likely to assign more importance to information that was repeated than to information that is not repeated during discussion. Based on the studies reviewed above, it is expected that when team members validate information during discussion by repeating it, they are more likely to use it for making decisions.

Information use has also been characterized as information recall and use, defined as the integration of information sought into the existing information base and its later retrieval (Dennis, 1996; Dennis, Hilmer, et al., 1997). Information use generally involves the accumulation of information from several sources into a knowledge base that may be accessed by group members when needed. The knowledge base will be dictated by the mode of communication employed. In a computer mediated communication environment for instance, threaded posts and transcripts of conversation sessions during a team discussion becomes the knowledge base; in a face-to-face environment, video, audio recordings, or written minutes may be used to store knowledge for later retrieval. Since a group support system will be used in this study to investigate information exchange processes during group discussion, a discussion forum in the GSS will be used to store pieces of information mentioned during team discussions. Studies that explored the use of GSS in information exchange among groups (e.g., Dennis, 1996; Fjermestad & Hiltz, 1998; Hiltz, Dufner, et al., 1991; Hiltz, Johnson, et al., 1991; Turoff & Hiltz, 1982) show that group members tend to incorporate into their decision making procedure information mentioned more than once during discussion, leading to the next proposition:

- Proposition 2: Team members will be more likely to use pieces of information posted in the discussion forum repeatedly than those posted only once or not at all.

2.7.3 Information Distribution

Information distribution refers to how information is shared among team members before discussion (Dennis, 1996; Stasser & Titus, 1985b). It is useful to consider the distribution of information among members of a group, or within artifacts (such as information technology) that are controlled by individual group members. The information that members of a group hold can be distributed in a number of ways. Information known to all group members before discussion will henceforth be referred to as *shared*; information known by more than one but less than all group members before group discussion will be labeled as *partially shared*, and information known by only one group member before group discussion will be referred to as *unshared*. Most studies in the information-sampling paradigm classify any information that is not shared with or available to all group members, as unshared, even if all but one of the group members has it. The research program that examines the impact of highly controlled distribution of information among groups making a decision is known as the *information-sampling paradigm*. As group members share information (e.g., through discussion), changes in the distribution of information have been attributed to a number of factors. For example, the extent to which groups perceive their task to be intellective versus a judgment task has been found to increase the discussion of unshared information (Dennis, 1996). In related research, transitive memory, especially with respect to knowledge about group members' area of expertise, has also been found to increase exchange of unshared information (Dennis, 1996).

Despite its potential benefits, there is a growing body of evidence to suggest that groups exchange (discuss) much less of their unshared information during open group discussion than they do of their shared information (e.g., Larson Jr., Christensen & Abbott, 1996; Larson Jr., Foster-Fishman & Franz, 1998; Larson Jr., Foster-Fishman & Keys, 1994). In addition, when shared and unshared information have different decisional implications, the alternative eventually selected by the group tends to be the one suggested by their shared information (e.g., Christensen, et al., 2000; Larson Jr., Christensen, et al., 1998) leading to the next proposition:

- Proposition 3: Team members will be more likely to discuss the alternative favored by shared information than unshared information.

Overall, research abounds that shows that teams are bad at solving hidden profile tasks because they do not pool enough unshared information. This phenomenon has been explained by various biases in the information processing literature (e.g., Brodbeck, Kerschreiter, Mojzisch & Schulz-Hardt, 2007; Mojzisch, Schulz-Hardt, Kerschreiter, Brodbeck & Frey, 2008; Todd & Benbasat, 1992; Van Swol, Savadori & Sniezek, 2003b). For example, the effort bias states that teams strive for effort reduction rather than decision quality (Todd & Benbasat, 1992), and the evaluation bias shows that team members evaluate shared or preference-consistent information as more important and credible than unshared or preference-inconsistent information (e.g., Greitemeyer & Schulz-Hardt, 2003; Mojzisch, et al., 2008). Most notably, information bias (e.g., Larson Jr., et al., 1996; Larson Jr., Foster-Fishman, et al., 1998; Larson Jr., et al., 1994) shows that team members tend to discuss information already known to all team members (shared information) rather than that known to a subset of the team (partially shared information) or one member of the team (unshared information). Thus, in sum, this dissertation argues that information bias will favor the exchange of shared information compared to both partially shared and unshared information, leading to the next proposition:

- Proposition 4: Teams will be more likely to exchange shared information than partially shared and unshared information.

Individual attitudes such as pre-discussion preferences have been found to impact how information is exchanged in team discussions (Stasser & Titus, 1985b; Winquist & Larson Jr., 1998). Team members are often motivated to defend or support their initial preference, so the information they choose to contribute often favors the preferences or attacks an alternative (Stasser & Titus, 1985b). The tendency to only exchange preference-consistent information during team discussion can thus be expected to consequently affect the quality of decision made by the team, leading to the next proposition:

- Proposition 5: Team members will be more likely to discuss information consistent with their pre-discussion preference than information inconsistent with their pre-discussion preference.

2.8 Task Characteristics, Group Support Systems, and Information Exchange

Another objective of this work was to investigate how characteristics of the group task correlated with information exchange in virtual teams. A meta-analysis of hidden profile studies reports that characteristics of group task are associated with information exchange and hidden profile solution (Wittenbaum, et al., 2004). Group members tend to collectively exchange more information during discussion than when they select from decision alternatives (Hollingshead, 1996; Stewart & Stasser, 1995). Parks and Cowlin (1995) found that when group members choose among decision alternatives, they exchange less information as the number of alternatives increases. Similarly, Stasser and Stewart (1992) found that when members view the hidden profile task as solvable (i.e., intellective) they share information more thoroughly and choose the best alternative more often than when members think the group decision is a matter of judgment (i.e., judgmental). In related studies, task demonstrability, defined as the as the extent to which a decision task is solvable or has a right answer has been shown to influence exchange of information in teams (Laughlin, 1980).

There is some evidence that complex tasks typically contain more pieces of information than simple tasks (Baron, 1986; Payne, 1982; Wood, 1986). Related research also posits that due to the high cognitive involvement in solving complex tasks, groups engaging in solving complex decision making tasks tend to brainstorm more than exchange information in order to simplify the task as a first step to solving the problem (Crossland, Wynne & Perkins, 1995; Robinson & Swink, 1994; Speier, Vessey & Valacich, 2003; Swink & Robinson, 1997). Miles (1980) showed that the complexity of a group problem depends on several factors such as, the amount of data, clarity of goals, the perceived intensity of consequences and the clarity in the process of evaluating impacts of solutions. This study used the amount of information pieces available to teams for discussion as a measure for task complexity in line with prior research (e.g., Bui & Siviasankaran, 1990; Wood & Nosek, 1994). The focus of this study is to examine the extent to which the joint effect of information importance and distribution of information relates to the complexity of task to somehow influence information exchange during group discussion. Task complexity, defined as ranging from simple to complex, is related to the amount of information available to a group to take into account in making a decision (Wood, 1986). The degree to which the number of criteria available to evaluate decision alternatives is few or more has also been used to measure task complexity and shown to influence information exchange in a group discussion (Bui & Siviasankaran, 1990; Hightower & Sayeed, 1995; Parks & Cowlin, 1995; Wood, 1986). This dissertation thus argues that complexity of the task that a team is working on is expected to influence how information about the task is exchanged during team discussion, leading to the next proposition:

- Proposition 6: Teams are likely to exchange smaller proportion of information when solving a complex task than when solving a simple task.

Group Support System (GSS) is used in this research to study whether a change in support of the group information exchange process will at least be as good as the current information exchange and decision making processes. The difference between this study and traditional hidden profile studies in which GSS supported groups are compared to face-to-face groups, is that information rating and candidate rank ordering modules are included in the communication process of the latter, as this reflects the reality of a personnel selection panel. The use of a GSS in this study is operationalized as the ability to control for the visibility of team members' rating of pieces of importance of information and rank ordering of alternative choices in a selection task. Wittenbaum et al. (2004) notes that structuring the group's task to aid information exchange is best done by having group members rank order the alternatives during discussion using a GSS. Thus the use of GSS to allow the rank ordering of decision alternatives and rating of individual pieces of information is expected to influence information exchange during discussion, leading to the next proposition:

- Proposition 7: Team members will exchange more information when they are able to view other team members' ratings of information importance than when they are unable to view other team members' ratings of information importance.

Based on other related research findings (e.g., Dennis, 1996; Todd & Benbasat, 1991, 1992) that show that GSS enhances information exchange during group discussions, it suffices to argue that team members are likely to find the use of a GSS to be helpful in breaking down a complex task in order for better processing and solution, leading to the last proposition:

- Proposition 8: Teams are more likely to rate the use of GSS as helpful for solving more complex tasks than less complex tasks.

2.9 Summary

This chapter reviewed previous work that explored information exchange processes among teams of decision makers. This review led to the development of propositions that explain how and when information exchange may impact human cognition and task performance in a social setting. The implication of the findings from these studies is that by providing an aid for identifying important information, more efficient support can be provided for information exchange among team members. The next chapter provides a theoretical framework that results from hypotheses synthesized from the literature reviewed in this chapter. However, a single study cannot include all the factors in the comprehensive theoretical framework, or test all of the propositions derived from prior research and theory, that are presented in this chapter. A reduced set of variables and hypotheses will be presented for this study.

CHAPTER 3

RESEARCH FRAMEWORK

3.1 Introduction

This chapter describes the research model that was developed from factors identified in the literature review. The research study described in this dissertation is in the domain of both exploratory and confirmatory research, similar to what Stebbins (2001) refers to as the region of *partially known phenomena*. This region is a combination of the generation of expected relationships between concepts based on relevant existing grounded theories through induction and hypotheses derived deductively from expected relationships among concepts identified from prior related studies that are then tested (Stebbins, 2001). This study is thus exploratory theory building as it builds on prior research to investigate whether the proposed model is useful to explain the relationships posited among the variables measured. The main goal of exploratory research is the production of inductively derived generalizations about the group, process, activity, or situation under study (Stebbins, 2001). In this study, hypotheses are also deductively synthesized based on the relationship between constructs that have a strong foundation in results of prior studies conducted within the information-sampling paradigm. Thus, the research approach in this study may be seen as a mix of exploratory and confirmatory research. Finally, this chapter proposes a research framework that will be used to test the hypotheses generated for this study.

3.2 Research Model

The research model has three main components: factors that may relate to information exchange processes, information exchange processes, and team performance. Four categories of factors that are important for understanding information exchange in team decision-making—human factors, information properties, technology, and task characteristics—are synthesized from the reviews presented in Chapter 2. Human factors are behavioral and social characteristics that shape how individuals interact with information such as pre-discussion preferences and opinions. Information properties are those instances that exist as a result of the distribution or other characteristics of the information. Characteristics such as importance of information may be associated with the amount of information that is exchanged in a social setting where behavioral factors might have a mediating effect on sharing as well. Technology factors refer to technology aids employed to exchange information. The ease of use of such technology enhanced information exchange may contribute to or frustrate effective exchange of information in a team setting (Todd & Benbasat, 1992). Finally, task charateristics that may mediate information exchange include the type of task (i.e., intellective or judgmental) or the complexity of the group task(Parks & Cowlin, 1995; Wood, 1986).

Information exchange processes consist of exchange behavior, perceived usefulness of GSS, and information use. Team performance will be assessed along two dimensions based on how well teams exchange information available to them to make effective decisions. Exchange performance will be measured by the extent to which information is shared i.e., the amount of information shared relative to the amount of information available to the team before discussion. Figure 3.1 shows the research framework and scope of this dissertation.

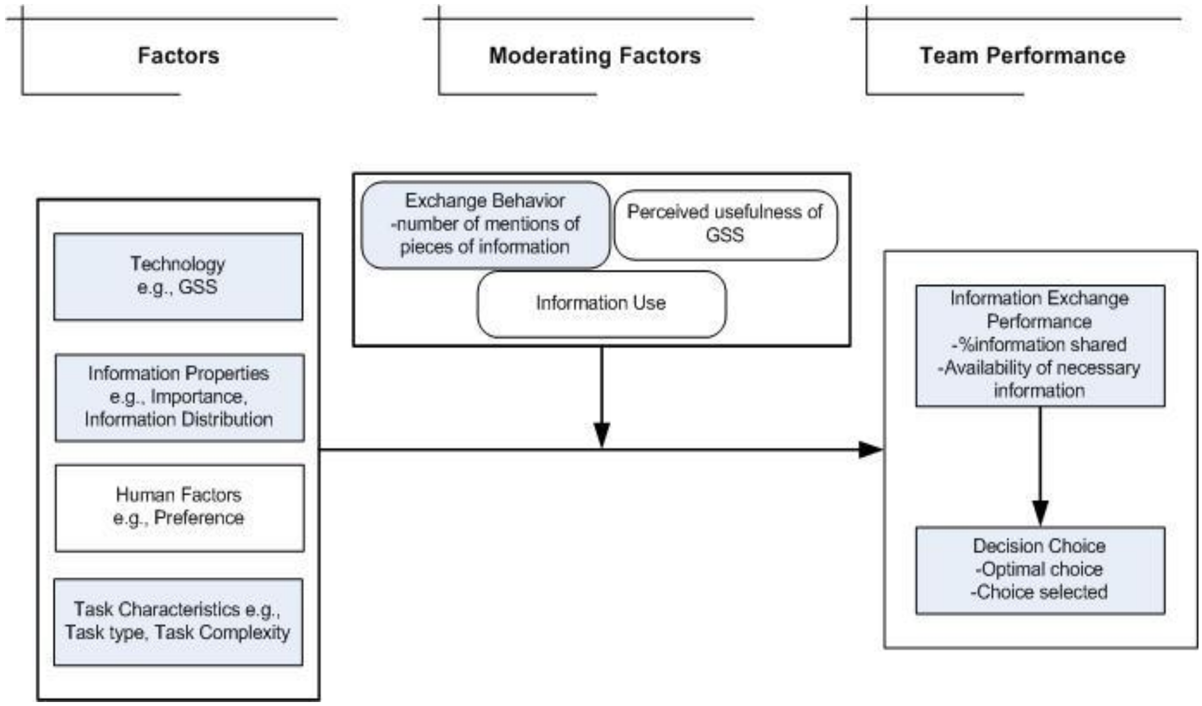


Figure 3.1 Research framework

The main independent variables of interest in this dissertation are two characteristics of information, information importance and information distribution. This research will also look at possible moderating effects of a GSS tool that provides shared importance ratings before discussion. The main dependent variable of interest in this study is overall information exchange performance by the end of the group discussion, which is defined as the proportion (%) of information available to the group, which is mentioned in the discussion at any time. For example, if there are eight pieces of information and only six are introduced into the discussion, this would result in 75 as the score for information exchange performance. Other dependent variables measured are whether all necessary information was exchanged by the end of the discussion; the actual decision choice made by the group, and; whether or not it was the "correct" choice. The availability of "necessary" information to select the correct choice by the end of the discussion was measured. The availability of "necessary" information is defined as the number of "important" information pieces that are mentioned during discussion in favor of the "correct" choice (Dennis, 1996; Stasser & Stewart, 1992). For that classification, subject matter experts rated each piece of information as "important" or "less important" for each of the three candidates in the selection task in the pretest. For example, when considering candidates for a Java programming position, 5-10 years of Java programming experience is considered "important" information, and biking as a hobby is considered a "less important" piece of information.

Information exchanged was classified by two characteristics:

1. The extent to which it is shared information (fully shared, partially shared, or unshared).
2. Whether the piece of information exchanged is relatively important or less important compared to the total set of information pieces.

While the focus of this dissertation is on the investigation of the impact of these two factors on information exchange, measures of human factors such as gender or other demographic information that may be related to decisions made in teams, for later analysis were also collected. Likewise, some measures that are related to decision-making performance were collected, for possible analysis later. This includes changes in choice preference and in assessments of the importance of the pieces of information, by the end of the discussion. Aspects of the GSS were included only to the extent that subjects will be asked for their overall impression of whether the GSS provided was a help or a hindrance, and easy or hard to use.

3.3 Hypotheses

Central to the objective of this research is the investigation of information properties, technology, and task characteristics that may be associated with the exchange of information during team discussions. This section synthesizes hypotheses supported by prior research to test expected relationships in the proposed research framework.

3.3.1 Information Visibility and Information Exchange

Prior studies show that, although GSSs enable teams to exchange more information, it does not help participants' ability to process it (Dennis, 1996; Todd & Benbasat, 1992). Information saliency (i.e., important information was not conspicuous) is one of the possible reasons provided for inhibited information processing in GSS groups. Information presented in GSS teams can be less salient and therefore more likely to be ignored (Dennis, 1996; Todd & Benbasat, 1992). The first set of hypotheses is generated based on the assumption that providing a tool that enables the rating of information importance individually and as a team, may help in reducing the uncertainty surrounding it (Todd & Benbasat, 1992). Group members have also been found to exchange more information when they are aware that information is also available to other group members, as a way of socially validating their shared information (Dennis, 1996; Lam & Schaubroeck, 2000), leading to the following hypotheses:

- **H1:** Teams that can view other team members' assessment of information importance will exchange a greater proportion of the more *important* information than teams that are not able to view other team members' assessment of information importance.

For H1, importance is rated by two sets of people: subject matter experts, and the members of the group. Members will see each other's importance ratings if they are in the experimental condition in which the GSS will display these. However, the expert ratings will be used in deciding whether a group exchanged "important" information and whether by the end, they had all the necessary information to make the correct decision in their hidden profile task.

The ability of team members to view other team members' ratings of pieces of information is also hypothesized to encourage more information exchange leading to the next hypothesis:

- **H2:** The overall exchange performance of teams that are able to view importance ratings of their team members will be higher than teams that are unable to view importance ratings of their team members.

3.3.2 Distribution and Importance of Information and Information Exchange

Reports from the classical information-sampling paradigm (e.g., Gigone & Hastie, 1993; Mesmer-Magnus & DeChurch, 2009; Stasser & Titus, 1985b, 1987; Steinel, et al., 2010a) suggest that participants will concentrate on exchanging shared information during team discussion. The information processing literature also suggests that the distribution of information and the salience of information may affect how and what information is exchanged for teams to make decisions (Dennis, 1996; Stasser & Stewart, 1992). There is consistent evidence that a greater proportion of shared and partially shared rather than unshared information is exchanged during team discussions (Cruz, Boster & Rodriguez, 1997; Schittekatte, 1996). This is explained based on Stasser et al. (1985b, 1987) finding that team members tend to exchange pieces of information that is known to more than one member, leading to the next set of hypotheses:

- **H3:** Teams will exchange more *shared* information compared to *partially shared* information.
- **H4:** Teams will exchange more *partially shared* information compared to *unshared* information.

The bias towards shared and partially shared information is mainly due to the fact that more participants hold shared information and also because participants are more likely to remember information mentioned in discussions repeatedly. Studies show that repeated discussion of information might suggest importance of that information, whether or not it is important indeed (Larson, et al., 1996; Larson, Christensen, Franz & Abbott, 1998; Van Swol, et al., 2003b). For example, Chernyshenko et al. (2003) found three characteristics that can increase the perceived importance of information in group discussions: whether it is shared or unshared, whether it is mentioned, and whether or not it is owned. Information owned is defined as the knowledge of information pieces to group members before discussion (Chernyshenko, et al., 2003). Furthermore, Greitmeyer and Schulz-Hardt (Greitemeyer & Schulz-Hardt, 2003) found that information supporting an individual's initial opinion is rated as more important.

Studies in the information-sampling literature reported that knowledge workers assess the importance of pieces of information when working in a team information before using it to solve a problem (Van Swol, 2007). Information foraging models proposed by Pirolli and Card (1999) espouse exchange and use of information based on its potential value to the group. Larson et al. (Larson, Foster-Fishman & Keys, 1994a) examined the effects of task importance and group decision making on the discussion behavior of decision-making groups and found that increasing the importance of the task slowed the rate at which information was brought forth during discussion. Based on these findings it is expected that team members are likely to mention a larger proportion of information that is considered important rather than less important information, leading to the following hypotheses:

- **H5:** Teams will exchange more *shared more important* information compared to *shared less important* information.
- **H6:** Participants will exchange more important information (as determined by the judges) than less important information.

3.3.3 Task Characteristics and Information Exchange

The nature of the task being solved has been cited as an important variable that may relate to reasons why groups seldom uncover hidden profiles (e.g., Larson, et al., 1994a; Mesmer-Magnus & DeChurch, 2009; Vakkari, 1999). For example, Franz and Larson (Franz & Larson, 2002a) found that the type of task used in the hidden profile study accentuated the exchange of information such that the more complex the task, the more group members tend to share information. Wood (1986) also showed that complex tasks tend to require more exchange of information during team discussion in order to break the task into simpler units.

Other studies have found that complex tasks require time and resources to process rather than more information exchange (Bui & Siviasankaran, 1990; Hightower & Sayeed, 1995; Wood & Nosek, 1994). For example, Wood and Nosek (1994) found that the completion time for solving complex tasks was less than that required for solving simple tasks, suggesting that teams spend more time processing information rather than discussing it to make better decisions. It is therefore predicted that complexity of task will reduce the attention given to exchanging pieces of information, thus:

- **H7:** There will be a strong negative relationship between task complexity and information exchange performance.

Studies in the information sampling paradigm that have explored groups solving hidden profile tasks established that when all the important information in favor of the optimal alternative is mentioned during discussion, the group is said to have all the necessary information needed to identify the correct choice (Dennis, 1996; Stasser & Stewart, 1992). Thus, it is hypothesized that:

- **H8:** There will be a strong positive relationship between information exchange performance and the possession of all the necessary information.
- **H9:** There will be a strong positive relationship between the exchange of necessary information and the selection of the optimal choice during discussion.

3.4 Summary

This chapter synthesized hypotheses from the review of literature in the information sampling paradigm. These hypotheses imply a model of information exchange among teams of decision makers working on a hidden profile task (see Figure 3.2). As stated earlier, factors affecting team information exchange processes are grouped into technology, information properties, and human factors. Information properties—information importance and information distribution—are manipulated in this model.

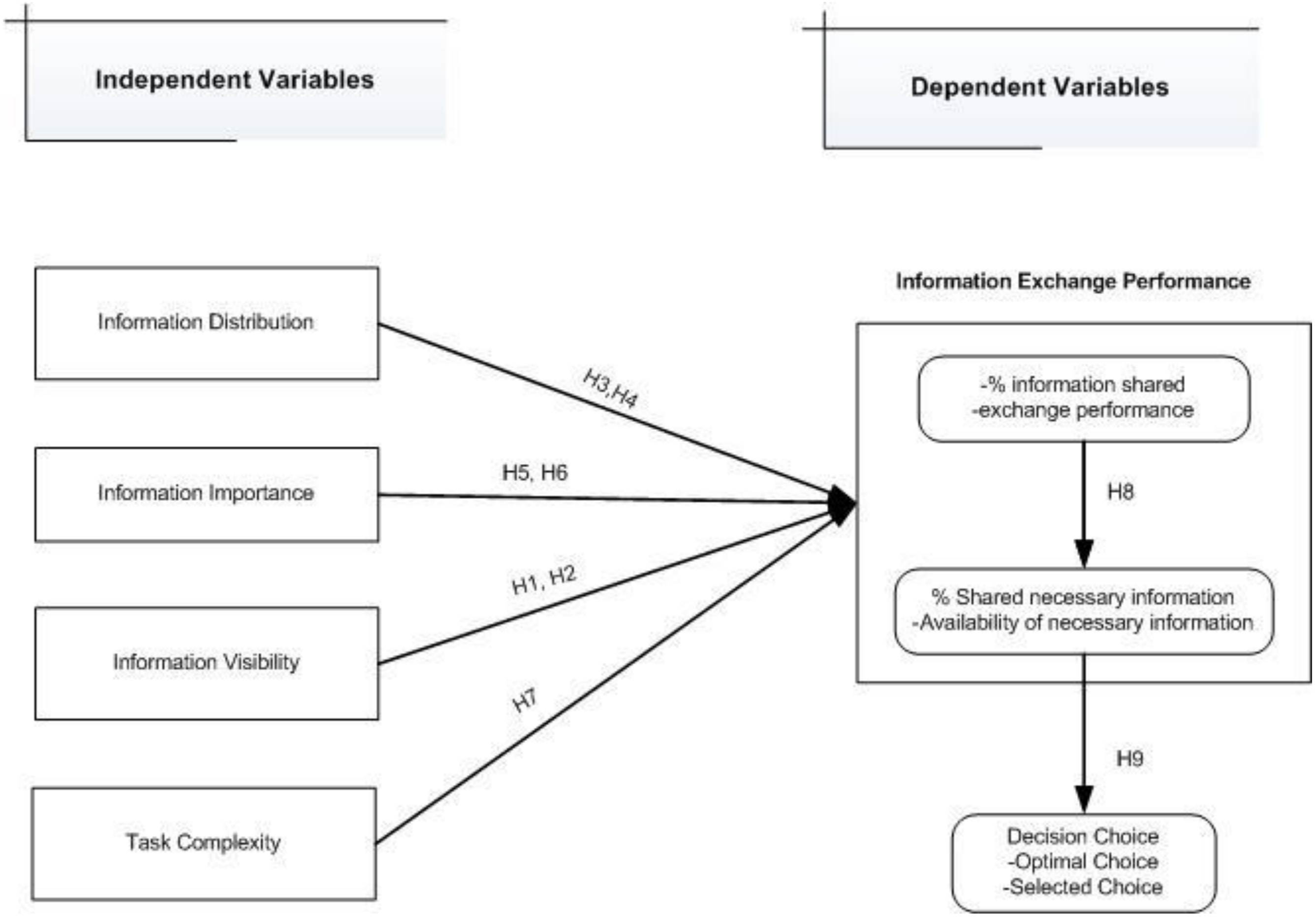


Figure 3.2 Theoretical model of team information exchange.

The proposed model will be evaluated in a computer-mediated decision making environment with control of the importance and distribution of information. The design of an experiment to test the hypotheses is described in the next chapter.

CHAPTER 4

METHODS

4.1 Introduction

The proposed model presented in Chapter 3 provides a framework for investigating a set of factors that might have a relationship with information exchange processes and consequently, the performance of teams during discussion. This chapter discusses in detail the study design and protocol for conducting this research.

4.2 Methodology

The study described in this dissertation seeks to enhance the information exchange paradigm introduced by Steinel et al., (2010a) that builds on the work of Stasser and Titus (1985a). The information exchange paradigm was developed from a combination of the information sampling paradigm with procedures from social dilemma research (see Steinel, et al., 2010a for an extensive review of the paradigm). This paradigm was developed to allow for the study of motivated processes in information exchange. There are four main limitations of Steinel's paradigm with regards to its effort to contribute to the understanding of the problem of solving hidden profile tasks in the information-sampling paradigm. Firstly, the methodology is designed such that participants only know what information is labeled as shared or unshared, important or unimportant. There was no actual information to be exchanged in the study. This dissertation argues that this approach is not reflective of a real life situation where importance and distribution of information is decided or discovered by participants before and during team discussion. Secondly, since no actual information was exchanged among team members, teams were randomly assigned a decision to mark the end of the experiment. This limits the assessment of decisions made in relation to the strategy employed by teams in exchanging information. Thirdly, any information that was not shared among all team members before group discussion is labeled as “unshared,” even if, for instance, 3 out of 4 group members had it. This study will distinguish partially shared information from unshared and fully shared information. Finally, although the focus of the paradigm was on investigating information pooling in terms of processes that motivate participants, it fails to assess decisions made as a result of the kind of pooling strategy employed by each team. Building on the limitations of both the information sampling paradigm and the Steniel et al., (2010a) study, this research will lay the groundwork for assessing decision quality and effectiveness of the group. This research therefore develops a new approach that allows studying information exchange processes during team discussions as described below.

Similar to the information sampling paradigm, participants were told that they have to make a team decision together with other participants and that each participant possesses a certain number of information pieces. Information held by participants in this approach is either *shared, partially shared, or unshared*. However, information importance is also varied. Thus, not only the quantity of exchanged information, but also its quality can be measured. Subject matter experts assessed importance of information pieces available to solve a chosen task for the study (see Appendix A). Unlike the classic information sampling paradigm experiments, participants do not know which information is shared, partially shared or unshared, and neither do they know whether a piece of information is more important or less important, until they judge it. Participants will receive a certain amount of information and decide how many and which pieces of information to exchange with the team.

4.3 Experimental Design

A controlled laboratory experiment employing a 2 (participant's information importance assessment: visible vs. invisible) 2 (task complexity: complex vs. simple) factorial design is employed to test the hypotheses. The "hiring" and "firing" tasks are personnel selection tasks developed for this research; in each case there are three candidates and pieces of information about each of these candidates. The operationalization of each factor at two levels will result in eight experimental treatments. Visibility of participant's assessment of the importance of information pieces will be varied between teams. Repeated measures is used, with each team working on two tasks. Order of task was counterbalanced i.e., each task was first or second for half of the teams (see Figure 4.1).

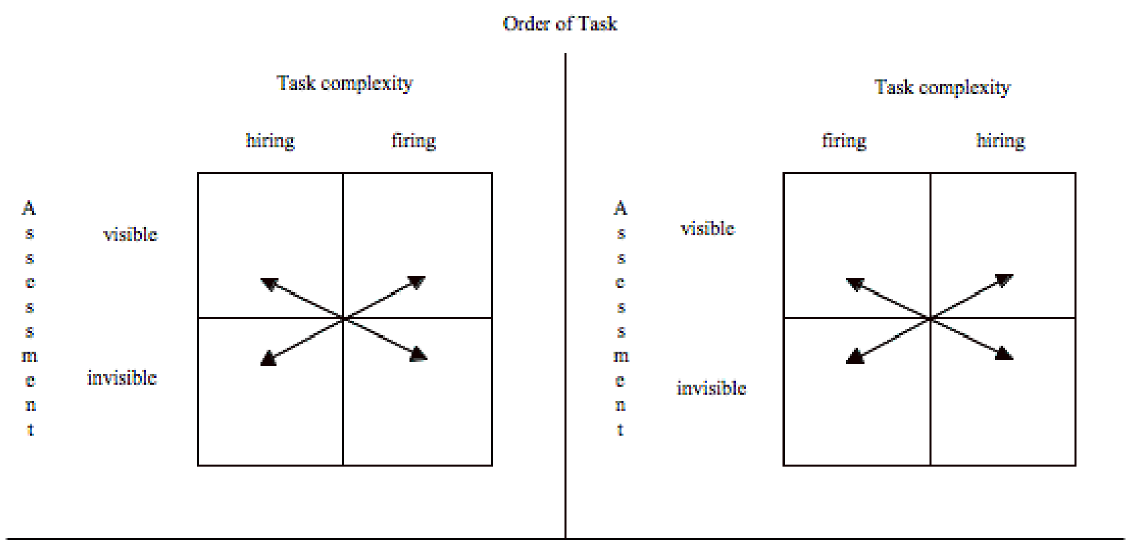


Figure 4.1 Experimental design.

On the left hand side of Figure 4.1 is the first ordering of the task where the hiring task comes before the firing task. On the right hand side of Figure 4.1 is the opposite case where the firing task was done before the hiring task. Pilot studies showed that two tasks are not too exhausting for the team. As expected, order of task did not affect the variables of interest. Also, the order of the visibility treatment did not interfere with information exchange in the pilot studies.

4.4 Procedure

Participants were assigned to teams based on their availability for a specific time, and a desire to balance team composition, especially among all the subjects available for a time slot. Random selection was made initially but then the total composition was reviewed to try to balance teams e.g., in terms of gender composition. Teams were randomly assigned to one of the eight treatments. Participants were told that they would be in a team with three other participants. In all conditions, participants worked on two different tasks (cases 1 and 2) in each experiment. The potential tasks that were initially considered for the experiments are:

Case 1: A personnel-selection task with (initially 7, now 8) pieces of information, where teams will make a decision about which of three candidates should be hired for a systems analyst position.

Case 2: A personnel-selection task with 16 pieces of information where teams will make a decision about which of three candidates should be laid off from a software development department in an IT firm.

Case 3: Cell phone design selection task with 7 pieces of information where teams will decide on three candidate designs a phone manufacturing company should release in response to the public need for social networking capabilities. Case 3 was initially considered as a task to be used for the experiment but was rejected after subject matter experts' rating (details are discussed in Chapter 6).

The experimental procedure varied depending on the treatment to which a team was assigned. All instructions to the teams throughout the study followed a written script (see Section 4.13). Before the experiment began, using the example of the hiring case, each participant received a total of 4 or 5 (3 shared, 1 (or none or 2) partially shared, 2 (or none or 1) unshared) of eight characteristics for each candidate and was told that the other participants also have some information that varied about each candidate. For the second case, each participant received a total of 10 of 16 characteristics for each candidate and was told that the other participants also have some information that varied about each candidate. The given reason for this is to simulate real decision making teams, which often consist of people with different points of view, as well as different sources and types of information about the candidates or issues in question (Larson, et al., 1994b). Unshared and partially shared information is distributed in such a way that the best decision alternative (perfect information about all; eight characteristics for case 1 and 16 characteristics for case 2) is hidden from the participants prior to discussion and can only be found if unshared information is efficiently exchanged (see Appendix D for full details of pre-discussion distribution of information).

Similar to the procedure in the traditional information sampling studies, shared, partially shared and unshared information about all the applicants was presented to participants at the beginning of the experiment. Participants were then given about 5 minutes to rate the perceived importance of each piece of information as well as to rank candidates based on the information provided to them before team discussion. Participants were then told that pilot studies show that it took about 25 minutes, for case 1, and about 35 minutes for case 2, to collectively rate the pieces of information and rank order the candidates in order of preference to be hired (case 1) or laid off (case 2). There was no time limit enforced for completing the experiment. Participants were then asked to make another individual decision (the same as or different from the team decision) in ranking the candidates, and to re-rate perceived importance of the pieces of information after the team discussion. Upon completion of each task, participants were asked to fill in an online post-case questionnaire (see Appendix C) to report several perceptions. Participants having worked on two tasks and filled out the corresponding post-case questionnaires marks the end of the experiment. At the end of the experiment, participants also filled in a post-experiment questionnaire (see Appendix D). They were then debriefed on the design and implications of the study.

4.5 Candidates and Information

The candidate options have 8 characteristics that may relate to their qualifications for being hired for a job position (case 1). In the case of the lay off ("firing") task (case 2), the candidate options have 16 characteristics that correspond to past experience and background information. These characteristics were provided to the participants at the beginning of each case. Participants independently assigned one of three rankings—1, 2, or 3—to each candidate before team discussion where 1 stands for first choice and 3 the third choice candidate. Information importance was rated on a 7-point Likert - type scale (1 being least important and 7 most important).

4.6 Participants

Participants for this study are students recruited from New Jersey Institute of Technology (NJIT). Participation was voluntary and students had the right to opt out at any time, even while performing the experiment. The use of student samples may be seen as a limitation of the study described in this dissertation. However, studies within the traditional information sampling paradigm did not find consistent differences between student groups and groups of professionals (Larson Jr., Christensen, et al., 1998). In addition, over half of NJIT graduate students come from countries other than the U.S., so that the teams formed can simulate multicultural teams. As an incentive, extra credit was offered to volunteers in return for their participation in the study.

4.6.1 Team Assignment and Number of Teams

Team size was four. However, five subjects were asked to appear for each experiment in order to have a greater probability that the necessary four subjects would report. On two occasions, a fifth subject arrived on time was given an observer role. A minimum of ten teams was assigned to each condition. Subjects were assigned to teams based on their availability for a common time, plus considerations of balancing teams as much as possible on the criteria of nationality and gender. The team was asked to elect a team leader for each experiment. Each experiment team worked on both cases, in a repeated measures design. Half of the teams undertook case 1 before case 2, and the other half worked on case 2 before case 1, in order to counterbalance the possible effect of the experiment sequence.

The experiment teams were randomly assigned to one of the eight treatment combinations (e.g., case 1, visible participant assessment) for the first case, using a systematic random sampling method. That is, there were four starting conditions. The condition for the first team was randomly chosen. Other teams were numbered in sequence as they were formed, with team 2 put in the next starting condition, so that an even number of teams per condition will be maintained. This is to make sure that the time or semester in which a condition is run is not confounded with experimental condition. For the second case, teams were in the opposite condition (e.g., case 2, invisible participant assessment).

4.7 Independent Variables

Information distribution was manipulated by the provision of information to participants. Appendix D shows the algorithm used to distribute information so as to ensure a hidden profile situation. Table 4.1 shows the information about candidates for the hiring task. Candidate information is classified according to the distribution and importance of each piece of information as well as by whether each piece of information is positive, negative, or neutral for each candidate. Judges validated the latter two characteristics.

Table 4.1 Hiring Task: Candidate Information Distribution

	Candidates		
Characteristic	**Amy**	**Bob**	**Chris**
Education, School, Major, Year of Graduation [M]	BSc, University of Michigan, Information Systems, May 2010 (+)	BSc, Carnegie Mellon Uni., Information Tech., June 2007 (+)	BSc, Monroe County College, Computer Science, March 2009 (-)
Programming language [MN]	Java, C++, DB Admin (+)	Pascal, C, Fortran (-)	C/C++, DB Admin, Java (+)
Personality [L]	Quiet (0)	Friendly (+)	Great communicator (+)
Age [L]	21 (0)	26 (+)	25 (+)
GPA [M]	3.9 (+)	3.0 (0)	2.2 (-)
Last 2 positions held, Duration [MN]	Customer Service, Jan08-Dec08; IT Helpdesk, Jun10—Present (0)	System Admin, Feb07-Mar09; IT Manager, April 09—Present (+)	Web Designer, Jan09-Mar09; Tech. Support, July10—Present (-)
Hobbies [L]	Biking (0)	Poker (-)	Bird-watching (0)
Community Service [L]	Emergency Rescue Squad (+)	City council (0)	Habitat for humanity (+)

*(+==positive, -==negative, 0==neutral), [M==more important, L==less important, MN=more important and necessary]

Importance of each category of information was determined by expert judges' ratings; the cutoff point was a rating of 4 in the 1 to 7 scale of importance, for "more important" vs. "less important" information.

Shared information was visible to all participants. Unshared information was visible only to one participant and partially shared information was visible to one or more, but not all participants. Subject matter experts were recruited as judges to determine the importance of criteria to be used in the experiment and rank them accordingly. Empirical cut-off points on the rating scale were established based on distribution of ratings, to term some of the information "more important" vs. "less important." Participants were informed that the importance and necessity of the criteria had been judged in an earlier study. The characteristics received by each participant were as evenly distributed across the experimental categories as possible (more important unshared or partially shared, more important shared, less important unshared or partially shared, less important shared). See Table E.2 in Appendix E for the classification of the distribution of information for the 16 characteristics of the “firing” case.

4.8 Dependent Variables

Information exchange performance (measured as the percentage of information exchanged during discussion relative to available information, and availability of necessary information), and decision choice are the two dependent variables measured in this study. Counting how many characteristics are exchanged from each of the six categories (the numbers of important shared, important unshared, important partially shared, less important shared, less important unshared and, less important partially shared characteristics) was used for scoring the provision of information. The group was asked to make a decision choice among the alternatives as a condition for ending discussion.

4.9 Measurement of Research Variables

The measures in this study were collected at the individual and group level of analysis, depending on the hypothesis being tested. A post-case questionnaire was administered immediately after each case in the experiment to assess participants’ perception of the extent to which they exchanged information as a team. Information exchange was measured by counting the frequency of information pieces posted during team discussion. Every mention is an exchange, even if it is the fourth or fifth time a team member mentions a piece of information in any context (e.g., assessing its importance, arguing that it weighs for or against a candidate). Information pieces exchanged can be one of three types related to distribution: unshared information, partially shared information and shared information. In relation to importance, each piece of information exchanged was classified as more important or less important. In addition, a post-case questionnaire was administered after the completion of each task to assess participants' perception of the tasks, including perceived complexity.

The number of teams that have sufficient information (enough of the necessary information mentioned in the discussion) to make the optimal decision, and actually make the optimal decision, is used to assess effective exchange of information. That is, a discussion is considered to contain sufficient information to identify the optimal alternative if all the available important information is mentioned at least once during the discussion. A score is calculated for each alternative based only on the information present in the discussion board to determine if the team had the necessary information to make the optimal decision. Chapter 5 presents results of a study that sought subject matter experts to rank order the candidates, which will be considered the optimal solution for the study. The judges also rated the importance of the pieces of information; those pieces of information that were rated as important are then considered to be necessary.

Information exchange is measured using the same procedure employed in Dennis' study of information sharing and use in groups (Dennis, 1996) as described below.

4.9.1 Information Exchange

The amount of shared, partially shared, and unshared information exchanged was measured at the group level by counting pieces of information in the group discussion transcripts. A rater counted only information that correctly matches the information in the task. For example, the task in case 1, says that the second candidate (Bob) graduated from

Carnegie Mellon University; if the participants say that Bob graduated from Harvard for example, that information will not be counted. In order to ensure reliability of coding results, a second rater was randomly assigned groups to code. Raters were trained until the inter-rater reliability was adequately high. Data from the first rater for each transcript was analyzed using ANOVA (Neter, 1985).

The extent to which discussion focuses on shared versus partially shared or unshared information was measured by examining the rater's data, comparing the number of pieces of information exchanged by the group to the number of pieces available (e.g., number of shared information exchanged/total number of available shared information * 100, equals the score of exchange of shared information). The same was done for partially shared or unshared data and then for the total of the pieces of information. The percentages produced for each group will be analyzed using repeated measures ANOVA.

The number of teams that contribute sufficient information on the discussion board to identify the optimal alternative was coded. This was coded as a zero-one variable using only those teams that had sufficient information to identify the optimal decision. Teams that mention all the "necessary" information during the discussion receive a one; teams that do not mention all the "necessary" pieces of information during discussion to select the correct choice receive a zero. This was analyzed at the team level using cross-tab analysis. Teams that select the optimal ("correct") choice receive a one; teams that do not select the optimal choice receive a zero. This was also analyzed at the team level using cross-tab analysis.

4.9.2 Other Outcomes

Perceived usefulness of the GSS used in this study was also measured. A post-experiment questionnaire was administered at the end of both tasks to assess participants' perception of the extent of how useful the GSS was to exchanging information during team discussion. This result was analyzed at the individual level using ANOVA, with group nested within treatment. The post-experiment questionnaire includes an item designed to measure perceived information usage (i.e., the degree to which participants thought about and used information contributed by others (see Appendix C for the measure). This result was analyzed at the individual level using ANOVA with group nested within treatment. Two other perceptual measures included on the post-experiment questionnaire, with scales of 1=low, 7=high are: ratings of the experimental procedures, and satisfaction with the system used for team discussion. The questions are presented in Appendix D. These were analyzed at the individual level using ANOVA with a group nested treatment term.

4.9.3 Summary of Measurements

Information exchange processes are measured by frequencies of pieces of information that are mentioned in the discussion board. Table 4.2 shows a summary for the hypotheses along with tests for these hypotheses.

Table 4.2 Summary of the Hypotheses and Tests

Hypothesis	Method	SAS Procedure
H1	Pearson Point-Biserial Correlation	%Biserial Macro
H2	Pearson Point-Biserial Correlation	%Biserial Macro
H3	Pearson Point-Biserial Correlation	%Biserial Macro
H4	Paired t-test	PROC TTEST
H5	Paired t-test	PROC TTEST
H6	Paired t-test	PROC TTEST
H7	Paired t-test	PROC TTEST
H8	Pearson Point-Biserial Correlation	%Biserial Macro
H9	Pearson Point-Biserial Correlation	%Biserial Macro

To test the research hypotheses related to information exchange, two-way ANOVA and cross-tab analysis was conducted. Statistical Analysis Software (SAS) was used to analyze data collected in this research study. SAS procedure PROC ANOVA was used to do the analysis of variance for the research design.

4.10 Protocol Analysis/System Testing

The group decision support system was tested for usability using protocol analysis, the "thinking out loud" method. Four subjects were used, performing the "practice" task that was to be used in training during the experiment (a ranking of preference among three desserts that could be served at an event on campus). Revisions were made to improve the system based on observation from the system test and the protocol analysis was repeated with at least two subjects on the revised versions.

Two groups of four each pre-tested the final system, following the instructions for one of the tasks. Participants were asked to “talk out loud” while trying to follow the instructions, to mention anything that is confusing or difficult for them in order to test the system with multiple users. Participants were also asked to complete the questionnaires, as a pretest. Revisions to procedures or the system suggested by the analysis were made before the pilot study.

4.11 Pilot Study

Four groups participated in a full pilot study of the experimental design and procedures (one for each starting condition), before scheduling groups in the main experiment. Preliminary statistical tests were performed to examine the distribution of options and the reliability and validity of the planned scales and reactions to the two tasks. Adjustments were made to procedures and the questionnaire where indicated. The total time necessary for the experiment with two tasks, completing the questionnaires and debriefing session was also noted to take about an hour thirty minutes.

4.12 Experiment Protocols

The process of the experiment in each session is designed as follows (see Appendix F).

1. Setup the simulated environment before the experiment.
2. Have subjects fill out their availability using an online scheduling tool.
3. Have subjects complete the online pre-experiment questionnaire (see Appendix B) and the online consent form (see Appendix B: Included in IRB) before assigning them to teams.
4. Assemble the team in a conference room to train them on how to use the tools designed for the experiment.
5. Welcome and introduction.

6. Assign team ID, participant number, and starting experiment treatment condition to each subject.
7. Guide teams to do the practice case.
8. Assign each participant to workstations located in different rooms so that they are unable to see or verbally communicate with each other during the experiment.
9. Teams do the first Case and then fill in the online post-case questionnaire (see Appendix C), then take a 5-10 minutes break before the second case.
10. Teams do the second Case and then fill in the online post-case questionnaire.
11. Have subjects complete the online post-experiment questionnaire (see Appendix C).
12. Re-assemble and debriefing (see Appendix H).

The total duration of the experiment (i.e., complete practice, two cases, and questionnaires) is estimated to be 1.5 to 2 hours. The case questionnaire should take about 10 minutes and the practice should take no more than 15 minutes.

The consent forms and questionnaires were encoded and stored under a private directory on an NJIT server (bjo4.njit.edu). Each subject has a consent form, one background questionnaire, two post-questionnaires and one post-experiment questionnaire. Subjects' registration IDs was used to identify their consent forms, background and post-experiment questionnaires. A case identifier was added to each post-case questionnaire to identify the case a subject had completed.

4.13 Summary

This chapter reviewed the methods employed in the analysis and design of the study described in this dissertation. This chapter discussed in detail, the study design and protocol for conducting the study described in this dissertation. The next section presents the design rationale for the system used for the research to address the research questions presented in Chapter 1.

CHAPTER 5

GROUP DECISION SUPPORT SYSTEM DESIGN

5.1 Introduction

The proposed framework in this study shows that the extent to which individuals in teams decide to exchange information may be explained by factors such as information distribution, information importance, and the technology used to share and discuss information. This chapter presents the design rationale of the group decision support system to explore the research questions of this dissertation.

5.2 Design Rationale for Team Information Exchange System (TIES)

GSS studies reviewed in Chapter 2 show that there is often an incomplete exchange of information in verbal discussions, which may lead to poor decisions (Dennis, 1996). However, evidence abounds in these studies that shows that the use of GSS in team discussions increases the amount of information exchanged (Benbasat & Lim, 1993; Dennis, et al., 1996; Fjermestad, 2004). Hence, this study used a computer-mediated meeting where participants exchanged information using a GSS system that allows users to build a list, (created by the experimenter for this study; one list of the information pieces and one list of candidates for the decision choice), and rank or rate items on this list, as well as to conduct a threaded discussion. All experimental sessions were held in two laboratories where computers were placed such that participants could neither have visual contact nor be able to verbally communicate with each other.

5.3 Team Information Exchange System

The group support system developed for this research is called Team Information Exchange System (TIES). Anonymity is maintained in this study by randomly giving pseudo-name (P1, P2, P3, and P4) to participants, with team members knowing that P1 is the team leader. In order to avoid trust issues during discussion, team members meet and agree on the group leader before going into discussion.

TIES was originally designed to provide electronic communication. However, there were several issues that could not be addressed in time to conduct the experiments. As such, SKYPE, an electronic communication system with parallelism and group memory was a perfect fit for the task. A recent study (Voigtlaender, Pfeiffer & Schulz-Hardt, 2009) reported that lack of structuring (i.e., running text instead of tallying pieces of information describing each alternative) could have made it more difficult for participants to relate the decision-relevant pieces of information to each other. Related to this, (Jonas, Schulz-Hardt, Frey & Thelen, 2001) have shown that preference-consistent information processing is stronger if information is presented sequentially as compared to simultaneously, and a discussion is a prototype of a sequential information presentation format. SKYPE chat permits teams to define a series of topics in an outline structure and enter comments about each topic. For this study, the discussion topics are structured and participants are not permitted to create new topics. To enter or read comments, participants will click on the topic they wish to discuss and join the conversation. This opens a screen that displays all comments made by others in a scrollable window on the right hand side of the screen, with a window for entering comments on the bottom half.

TIES also enables teams to rate or rank items on a list, as well as state reasons for their votes. In this study, participants will choose from a list of three decision alternatives and use a rank ordering to vote, before discussion and then at the conclusion of the group discussion. For the list of types of pieces of information, a 7-point Likert scale of importance will be provided.

TIES, which is simple to learn, is designed for discussing a set of alternatives. It is menu driven with all the menu items needed for this study on the navigation bar. Nonetheless, participants will receive about ten minutes of training on how to use the GSS and send at least one practice message as well as vote on choice alternatives in a practice problem before beginning to use it for the experiment (see Figure 5.1 below). Panel I shows the login page for participants on the left pane and an overview of the project objectives on the right pane. Panel II shows the practice page that comes up when participants log in. Panel III shows the interface to the rating module that allows participants to rate characteristics on a Likert-type scale. Finally, Panel IV is a screenshot of the discussion board that allows participants to discuss each candidate. The image in panel IV is a screenshot from a pretest of the system with the practice case where a candidate (Apple) is being discussed.

Panel	
I	Group Number [ ] Participant Number [ ] Enter iXΔ Welcome to Team Information Exchange System (TIES) TIES project is a partial fulfillment of a dissertation research project conducted at NJIT. It consists of integrated research and education programs designed to improve how teams share and use information available to them to make effective decisions efficiently. Babajide Osatuyi is the PI of TIES project, advised by Drs. Starr Roxanne Hiltz and Dr. Jerry Fjermestad. This work builds upon his prior research on knowledge management and modeling collaborative information foraging. A key to successful planning and effective decision making in teams is adequate information exchange. An approach to ensuring effective information sharing is by attaching salience (importance) to information items exchanged during discussions.
II	**GROUP DECISION MAKING EXERCISE PRACTICE: EXPERIMENTAL CONDITION ONE** **You are a member of a 4-person committee whose objective is to determine what dessert to order for a campus event. Each committee member has varying information that will be useful for identifying an optimal choice from a list of three candidates.** ****The committee is judged on the quality of the dessert selected.** **This exercise consists of two three-step stages. In each stage,** **Step one: Individual pre-discussion assessment of information/candidates** **Step two: Group discussion and assessment of information/candidates (on SKYPE chat)** **Step three: Individual post-discussion assessment of information/candidates** **Begin the experiment by individually rating characteristics of information available for the task here:** Begin Practice
III	**STAGE ONE: Step one** **Objective:** Order a healthy dessert **Task:** Your club is planning a dinner meeting to give awards and have a program for about 50 people. You can order only the same dessert for everybody. A dessert that promotes healthy living is genreally adviced. Rate the following characteristics of desserts (1 = least important, 4 = neutral, 7 = most important). **Multiple characteristics can have the same rating Importance Rating Characteristics — Rate Gluten content — 4 Quantity in stock — 4 Calorie content — 4 Cost per serving ($) — 4 Sugar content — 6 Submit and proceed to team discussion Submit your ratings then go and join a discussion with team members under the **Dessert Rating Discussion** topic on Skype

IV

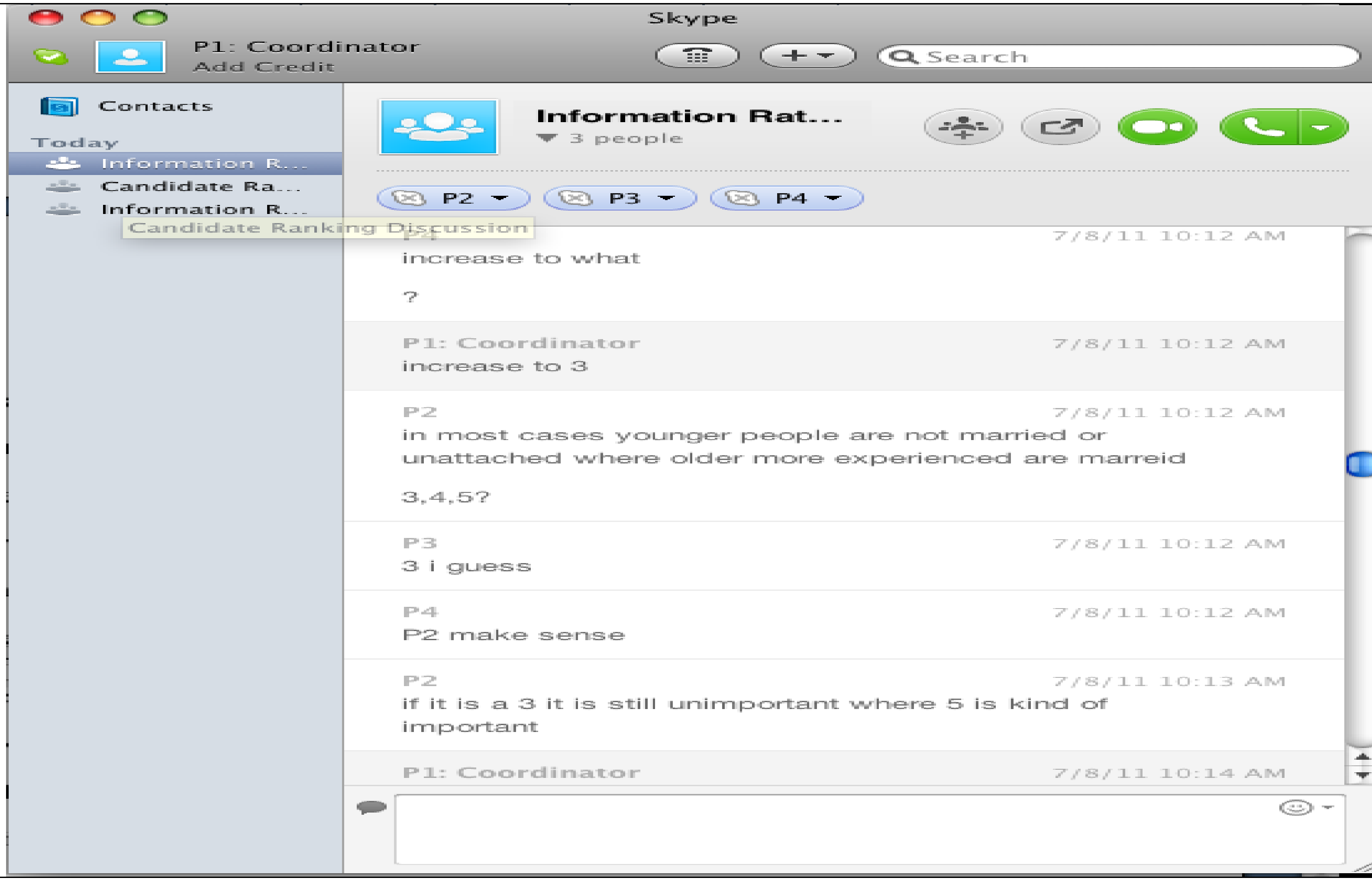


Figure 5.1 Individual rating interface of Team Information Exchange System (TIES).

5.3.1 Rating and Ranking

A rating module is built into TIES so that participants can assess information available to them individually as well as rate information shared by the team. A ranking module is also built into TIES so that participants can rank candidates based on the information provided to them individually as well as a team. Participants will be told to begin by rating pieces of information provided to them individually in terms of their importance to the task at hand, then rank candidates based on the information provided. The participants will be told to exchange information without ranking candidates as a team before discussion, because each will have only a subset of all available information and would have to share information to make a good decision.

5.4 Summary

This chapter presented the current state of the design of the tool that was used to explore the research questions in this dissertation. The next section presents results from the pretest of tasks used in this research.

CHAPTER 6

PRETEST RESULTS

6.1 Introduction

This chapter reports on results from a pretest of the experimental tasks as well as tests of the validity and reliability of procedures and measures used in this dissertation proposal. Results from protocol analysis that tests the usability of the systems developed for this study are also presented in this chapter.

6.2 Task Pretests

Eight subject matter experts (SMEs) (5 males, 3 Females) assessed reliability and validity of the initial set of tasks and ranked candidates based on all the information needed for each case. Experts were approached and briefed on the objective of the study followed by a request to participate in vetting the tasks to be used for the experiment. Participation in this task was voluntary. The experts were chosen based on their record in the Information Technology related capacity in which they served or are currently serving. The average experience of each subject matter expert in an information technology related capacity is 14.5 years. Cronbach's Alpha, α (Cronbach, 1951) statistic is used to determine agreement and consistency among the eight subject matter experts. As a rule of thumb values of Alpha from 0.40 to 0.59 are considered moderate, 0.60 to 0.79 substantial, and 0.80 outstanding (Landis & Koch, 1977). Most statisticians prefer for Alpha values to be at least 0.6 and most often higher than 0.7 before claiming a good level of agreement (Landis & Koch, 1977). The result of the inter-rater reliability of SMEs' ranking of the candidates computed using Cronbach's Alpha statistics in SPSS is presented in Table 6.1.

Table 6.1 Judges Agreement on Optimal Candidate for each Case

Case Description	Cronbach's Alpha (significance)
All tasks	0.887 ($p < 0.001$)
Hiring task (Case 1)	0.816 ($p < 0.001$)
Phone selection (Case 2)	0.889 ($p < 0.001$)
Lay off task (Case 3)	0.930 ($p < 0.001$)

From the results in Table 6.1, it is clear that there is an outstanding level of agreement and consistency ($\alpha = 0.89$) among SMEs in their ranking of candidates, suggesting that individuals are likely to agree when all the information required to make a decision is provided to them. It is anticipated that the comparison of this finding to that of teams in the experimental conditions where information provided to individuals is incomplete to make an optimal decision. Measures used in the experimental tasks were also assessed on their validity and reliability. SMEs agreed ($\alpha = 0.96$, $p < 0.001$) that age and personality should be separated as individual dimensions in the information importance task. This was subsequently done and the SMEs adjusted their ratings accordingly. Although age cannot legally be used as a criterion to hire or lay off candidates, the SMEs considered age of each candidate in the decision making process. The inter-rater reliability for the SMEs' rating of information importance was found to be $\alpha = 0.89$ ($p < 0.001$).

One of the objectives of the pretest was to identify the best two of the three tasks to be used for the experiments. At the end of the pretests, SMEs agreed ($\alpha = 0.82$, $p < 0.001$) that the hiring and lay off tasks are most suitable for the objective of the study. It was pointed out that these *"tasks are more engaging and require more communication* *among team members."* The lay off task was also noted as being more complex than the hiring task ($\alpha = 0.86$), leading to the suggestion that task complexity should be explored in the experimental design in addition to the order of task presentation.

Tables 6.2-6.4 below show the ratings of relative importance for each of the categories of information. On a scale of 1—less important to 8—more important for cases 1 and 2, and 1—less important to 16—more important, a category of information is considered more important if the average rating for that information piece is greater or equal to 4 for cases 1 and 2 or greater or equal to 8 for Case 3 (shaded rows in Tables 6.2-6.4). Otherwise, the information piece is considered to be less important. For case 1, SMEs agreed $\alpha = 0.82$ ($p < 0.001$) that programming language and last two positions held & duration were two information characteristics that is necessary to identify the optimal decision. Similarly, programming language, current position held & duration, prior position held & duration, and leadership style were agreed $\alpha = 0.79$ ($p < 0.001$) by the SMEs as necessary information characteristics for identifying the best candidate to lay off.

Table 6.2 Subject Matter Expert Ratings for Case 1

	Expert ratings of importance of information characteristics								
Characteristics	A	B	C	D	E	F	G	H	Average
Education, School, Year of Graduation	5	7	7	2	6	3	3	6	4.88
GPA	4	5	6	4	3	4	4	4	4.25
Programming language	7	6	7	1	7	1	7	5	5.13
Last 2 positions held & duration	6	3	7	3	5	2	7	7	5.00
Personality	1	2	3	5	4	7	6	3	3.875
Age	1	1	3	5	4	7	3	2	3.25
Community service	3	1	4	7	1	5	1	2	3.00
Extracurricular activities	2	1	2	6	2	6	2	2	2.88

Table 6.3 Subject Matter Expert Ratings for Case 2

	Expert ratings of importance of information characteristics								
Characteristics	A	B	C	D	E	F	G	H	Average
Screen display size	3	6	6	5	6	4	7	6	5.38
Call Waiting	1	1	7	6	1	7	2	1	3.25
Network (e.g., 3G/4G)	5	7	7	1	7	1	7	7	5.25
Weight	2	6	1	3	2	6	5	3	3.5
Keyboard	4	5	6	7	5	3	4	4	4.75
Camera	7	4	6	4	3	5	3	2	4.25
Battery life	6	5	7	2	4	2	6	5	4.63

Table 6.4 Subject Matter Expert Ratings for Case 3

	Expert ratings of importance of information characteristics								
Characteristics	A	B	C	D	E	F	G	H	Average
Personality	12	16	1	4	10	2	15	13	9.13
Current position held, duration	16	15	15	1	16	5	13	16	12.13
Prior position held, duration	15	12	2	5	14	6	12	5	8.88
Marital status	1	10	1	11	3	7	11	1	5.63
Children	1	9	5	14	5	8	10	1	6.63
Programming language	13	14	16	2	15	4	16	15	11.88
Extracurricular activities	1	3	1	10	8	10	4	1	4.75
Education, School	1	12	15	6	12	9	5	5	8.13
Community Service	1	3	1	15	7	12	2	1	5.25
Resident status	1	1	5	13	14	13	14	3	8.00
Leadership style	14	13	10	7	13	1	3	14	9.38
Promptness	1	11	16	3	11	3	8	12	8.13
Age	1	8	1	9	6	14	6	1	5.75
Gender	1	1	1	12	1	15	7	1	4.88
GPA	1	1	14	8	9	11	1	1	5.75
Place of Residence	1	7	1	16	2	16	9	1	6.63

6.3 Protocol Analysis

Four participants who volunteered to take part in the experiment tested the usability of the instruments (system and questionnaires) designed for this study. The participants performed the practice task that was used in training during the experiment. They mentioned that the interface was simple, easy to understand and use.

Two groups of four participants each also pre-tested the system and procedures following the instructions of the hiring task. They mentioned that the overall experiment was interesting and refreshing. When asked about what was confusing, difficult or what they wished was done differently, participants noted that the question about age in the pre-questionnaire would be better if phrased as a range rather than a specific age request.

6.4 Summary

Results of pretests and protocol analysis conducted to validate constructs used in the framework proposed in this study were presented in this chapter. The questionnaires have been modified based on suggestions by participants. The next section discusses results from the complete study following the approval of the system characteristics, hypotheses, tasks, and procedures by the dissertation committee.

CHAPTER 7

DESCRIPTIVE RESULTS

7.1 Introduction

This chapter reports on descriptive results from the surveys completed by participants before, during, and after the experiment for this study. The specific goals of each survey as well as the results are presented in the following sections. In addition, the planned scales are examined for validity and reliability, and a determination made of the final composition of these scales. This chapter will also present the validation of the constructs that will be used to test the theoretical model presented in Chapter 3. The theoretical model in this dissertation tests hypotheses that seek to investigate association of the importance and distribution of information with information exchange during discussions in distributed teams.

7.2 Pre-Experiment Survey

Before scheduling participants for the experiment, each of them was asked to fill out a pre-experiment survey. This survey was administered to elicit demographic information, experience on working with groups and the computer efficacy measures used by Brown et al. (2010).

One hundred and four participants completed the full experiment. All participants were graduate students from the School of Management, Information Systems Department, or Computer Science Department at New Jersey Institute of Technology. Participants were assigned to 4-person teams based on their availability for specific times as well as considerations of balancing the team composition. For example, an effort was made not to allow students from the same class to be assigned to the same group. Participants were seated for the experiment such that they could not physically see other members of the team. In addition, in order to correct for cases where students are likely to be familiar with each other, as a result of the small size of the campus, participants were given profile names and strictly warned to only engage in conversations related to the experimental tasks and not those likely to reveal their true identity.

7.2.1 Demographics

A summary of the demographics of the subjects that participated in the study is shown in Table 7.1.

Table 7.1 Sample Demographics

Age		
18 - 20	2	2.06%
21 - 24	35	36.08%
25 - 27	20	20.62%
28 - 30	9	9.28%
Above 30	31	31.96%

Gender		
Male	71	73.20%
Female	26	26.80%

Student Status		
Part-Time	31	31.96%
Full-Time	66	68.04%

Occupation Status		
Part-Time	26	33.77%
Full-Time	51	66.23%

Number of year(s) you worked in an IT related position		
0-2	71	73.20%
3-5	15	15.46%
6-10	5	5.15%
11-15	3	3.09%
15+	3	3.09%

The split between males and females as shown in Table 7.1, is reflective of the population on the university campus, where the male to female ratio is about 3 to 1. Note that only about a quarter of the subjects have more than two years of experience in an IT-related position; thus this is a limitation of the sample. On the other hand, as would be expected given their majors and university, most of the subjects are quite confident about their computer skills (see Table 7.2). Participants also stated during a short self-introduction before the experiment that although their work in the IT-related department might have been short, they had worked more on the business side of their respective companies (keeping in mind that most of the participants are from the School of Management or Management Information Systems).

Although the majority of the participants work full-time, most of them also maintain a full-time student status. Although there is a scale to assess whether or not participants are currently working, participants that are not working full-time typically work either on or off campus on a part-time basis.

7.2.2 Computer Efficacy

In order to assess participants' experience with the use of instant messaging tools as well as computers in general, four constructs from Brown et al's (2010) study were used: *My experience with messaging tools* (on a 5-point Likert scale); *I could complete a task using a computer if there was no one around to tell me what to do; I could complete a task using a computer even if there was not a lot of time to complete it; and I could complete a task using a computer if I had just the built-in help facility for assistance* (the last three scales are on a 7-point Likert scale).

Table 7.2 Sample Computer Efficacy Results

My experience with messaging tools (e.g., AIM, SKYPE, MSN or Yahoo messenger) is

None At All	2	2.08%
	5	5.21%
Neutral	22	22.92%
	23	23.96%
Very Extensive	44	45.83%

I could complete a task using a computer if there was no one around to tell me what to do

Strongly Agree	49	51.04%
	18	18.75%
	10	10.42%
Neutral	7	7.29%
	4	4.17%
	4	4.17%
Strongly Disagree	4	4.17%

I could complete a task using a computer even if there was not a lot of time to complete it

Strongly Agree	32	32.99%
	21	21.65%
	13	13.40%
Neutral	26	26.80%
	3	3.09%
	2	2.06%
Strongly Disagree	0	0.00%

I could complete a task using a computer if I had just the built-in help facility for assistance

Strongly Agree	36	37.11%
	18	18.56%
	13	13.40%
Neutral	15	15.46%
	9	9.28%
	6	6.19%
Strongly Disagree	0	0.00%

Note that most of the participants are computer savvy and are familiar with the use of one or more instant messaging tools. This is a suitable sample for the study since the entire experiment requires subjects that are at least comfortable working on a computer without extensive supervision.

7.3 Post-Case Survey

This survey sought to examine participants' perceptions about the importance of information available to them and its exchange and use for decision-making, both individually and as a team.

Since there were two cases, each subject answered this survey twice. The combined results for each set of items will be presented, followed by a breakdown by case, to see if there are any differences between the two cases.

On a 7-point Likert scale where 1 (boring) and 7 (interesting), participants indicated that tasks were interesting (*M*=5.88, *SD*=1.49). Using the Wilcoxon-Mann-Whitney test, no significant difference was found (Z = -1.06, p = 0.2884), in the average response on how interesting the task was between the hiring task (*M* = 5.99, *SD* = 1.48) and the laying off task (*M* = 5.77, *SD* = 1.51). Using a 7-point Likert scale 1 (realistic) and 7 (unrealistic), to measure the extent to which the tasks were perceived as real, participants indicated that the tasks were realistic (*M* =2.03, *SD* =1.45). Using the Wilcoxon-Mann-Whitney test, no significant difference was found (Z = 0.90, p = 0.3708), in the average response on how realistic the task was between the hiring task (*M* = 5.99, *SD* = 1.48) and the laying off task (*M* = 5.77, *SD* = 1.51). These results are satisfactory, as task differences were not expected to affect whether or not they are interesting or realistic.

Finally, on a scale from 1(too easy) and 7 (too hard), participants reported that the task is somewhat above average in terms of difficulty (M = 4.30, SD =1.22). This is further analyzed using Wilcoxon-Mann-Whitney test. The test shows that the difference in task difficulty between both tasks is significant (Z = 2.05, p = 0.0201), with the laying off task (M = 4.52, SD = 1.08) being more difficult than the hiring task (M = 4.10, SD = 1.31). This result explains why the overall response to the difficulty of the tasks is above average. It also serves as a validation of the manipulation in the experimental condition induced in the research design.

The time taken to complete each case was also recorded. On the average, the discussion time for both cases lasted for about 15 minutes. However, the total time for discussing both the importance rating and candidate selection was higher for case 2 than for case 1 as shown in Table 7.3.

Table 7.3 Time Taken During Discussion

Discussion	Case 1	Case 2
Importance Rating	1 hour, 24 minutes	1 hour, 38 minutes
Candidate Ranking	15 minutes	15 minutes
Total	1 hour, 39 minutes	1 hour, 53 minutes

7.3.1 Information Use

A summary of the participants' responses about their perceptions of how information was used during discussion is shown in Table 7.3a. On a 7-point Likert scale where 1 (Very much) and 7 (Not at all), participants indicate that on the average (M = 3.19, SD =1.44) they reconsidered their decision based on information exchanged by other team members. This is an encouraging result, since the information provided is distributed such that an optimal decision can only be made when participants exchange and use all the information available to them.

Table 7.3a Post Case Questionnaire Results: All Tasks

Individual Items are measured on a 7 point Likert scale **(N = 163)**	Mean (SD)
Information Use	**3.19 (1.44)**
To what extent did the information contributed by others cause you to re-evaluate your choice	3.12 (1.64)
To what extent did something someone else contributed make you take a second look at your choice	3.09 (1.51)
To what extent did the information contributed by others affect your decision	3.36 (1.56)

Each item measured on a 7 point Likert Scale (1-Very Much; 7- Not at all).

The author is also interested in the possible differences in how information is used when participants are working on different cases (hiring or laying off) and the experimental condition (visible or invisible assessment of team members' information). Table 7.4 provides a breakdown of how participants perceived the use of information for the two different cases (tasks).

Table 7.4 Post Case Questionnaire Results by Case

Individual Items are measured on a 7 point Likert scale)	Hiring Task	Laying off Task
	Mean (SD)	Mean (SD)
Information Use	**3.20 (1.47)**	**3.18 (1.41)**
To what extent did the information contributed by others cause you to re-evaluate your choice	3.21 (1.67)	3.01 (1.61)
To what extent did something someone else contributed make you take a second look at your choice	3.15 (1.56)	3.03 (1.45)
To what extent did the information contributed by others affect your decision	3.24 (1.53)	3.49 (1.59)

Each item measured on a 7 point Likert Scale (1-Very Much; 7- Not at all).

A Wilcoxon-Mann-Whitney test is used to compare the means of information use measures between both tasks. The result of the test shows that there is no statistically significant difference between information use measures across both tasks (Z=0.0783, p=0.94).

7.3.2 Information Exchange

A summary of the participants' responses about their perceptions of how information was exchanged during discussion is shown in Table 7.5. On the average (*M*=2.14, *SD*=1.09) participants indicated that they are satisfied with how group members exchanged information during discussion before making decisions.

Table 7.5 Post Case Questionnaire Results: All Tasks

Individual Items are measured on a 7 point Likert scale (N = 163)	Mean (SD)
Information Exchange	**2.14 (1.09)**
How do you feel about the process by which your team made its decision	2.36 (1.36)
How do you feel about the team's discussion	2.23 (1.37)
To what extent did you enjoy participating in this meeting	2.03 (1.29)
All in all, how do you feel about the team's decision	1.93 (1.18)

Each item measured on a 7 point Likert Scale (1-Very Satisfied; 7-Very Dissatisfied).

A comparison of participants' experiences with how information was exchanged during discussion between the hiring task (*M*=2.04, *SD*=1.03) and the laying off task (*M*=2.24, *SD*=1.45) shows no statistically significant differences (Z= 0.96, p=0.34). This suggests that participants were satisfied with the group decision-making process and it is expected that teams will generally perform well. Table 7.6 below provides a breakdown of the means of individual measures for information exchange across both tasks.

Table 7.6 Post Case Questionnaire Results by Case

Individual Items are measured on a 7 point Likert scale)	Hiring Task	Laying off Task
	Mean (SD)	Mean (SD)
Information Exchange	**2.04 (1.03)**	**2.24 (1.45)**
How do you feel about the process by which your team made its decision	2.24 (1.31)	2.48 (1.40)
How do you feel about the team's discussion	2.18 (1.26)	2.28 (1.48)
To what extent did you enjoy participating in this meeting	1.90 (1.09)	2.18 (1.47)
All in all, how do you feel about the team's decision	1.86 (1.14)	2.01 (1.22)

Each item measured on a 7 point Likert Scale (1-Very Satisfied; 7-Very Dissatisfied)

7.3.3 Information Importance

Overall, participants indicated that group members exchanged information that they believed was important during the group discussion (see Table 7.7).

Table 7.7 Post Case Questionnaire Results: All Tasks

Individual Items are measured on a 7 point Likert scale (N = 163)	Mean (SD)
Information Importance	**2.87 (1.39)**
I am sure that all the information that others contributed was important	3.15 (1.91)
Some people contributed important information	2.85 (1.84)
I am sure team members completely shared all their important information	2.96 (1.99)
I am convinced that all the information everyone contributed was important	2.52 (1.55)

Each item measured on a 7 point Likert Scale (1-Strongly Agree; 7-Strongly Disagree).

A breakdown of the perceptions of the importance of information exchanged during group discussion by case is presented in Table 7.8. A quick look at the table suggests that there is no difference between information importance measures across both tasks. In addition, the Wilcoxon-Mann-Whitney test is conducted to compare the average means of information importance measures across both tasks. The result shows that there is no significant difference ($Z = 0.48$, $p = 0.63$) in the perceived importance of information exchanged during the group discussion between the hiring task (*M* = 4.36, *SD* = 1.09) and the laying off task (*M* = 4.41, *SD* =1.12).

Table 7.8 Post Case Questionnaire Results by Case

Individual Items are measured on a 7 point Likert scale)	Hiring Task	Laying off Task
	Mean (SD)	Mean (SD)
Information Importance	**4.36 (1.09)**	**4.41 (1.12)**
I am not sure that all the information that others contributed was important	4.90 (1.81)	4.78 (2.02)
Some people did not contribute important information	5.04 (1.81)	5.27 (1.88)
I am not sure team members completely shared all their important information	4.98 (1.96)	5.10 (2.05)
I am convinced that all the information everyone contributed was important	2.52 (1.62)	2.51 (1.49)

Each item measured on a 7 point Likert Scale (1-Strongly Agree; 7-Strongly Disagree).

7.4 Post-Experiment Survey

At the end of both tasks, participants were asked to fill out a post-experiment survey for their feedback on the effectiveness of the experimental setup (see Table 7.9). Responses on behavioral intention to use such a system as that used in the study were also included in the survey.

Table 7.9 presents feedback on participants' experiences with the instruction and practice that was given before the experiment. Using a 7-point Likert scale, 1 (Complete) to 7 (Incomplete), participants indicated that the amount of instruction and practice given was complete (*M* = 1.45, *SD* = 0.82). For the scale ranging from 1 (Sufficient) to 7 (Insufficient), participants indicated that the amount of specialized instruction and practice that was given was sufficient (*M* = 1.51, *SD* = 1.04). This indicates that participants were clear on what needed to be done and when during the experiment.

Table 7.9 Post Experiment Survey Results: Experimental Procedure and Feedback

The amount of specialized instruction and practice that was given was:

Complete	62	70.45%
	15	17.05%
	9	10.23%
Neutral	1	1.14%
	1	1.14%
	0	0.00%
Incomplete	0	0.00%

The amount of specialized instruction and practice that was given was:

Sufficient	65	73.86%
	11	12.50%
	6	6.82%
Neutral	2	2.27%
	4	4.55%
	0	0.00%
Insufficient	0	0.00%

The TIES system that was used for the experiment consists of a threaded chat (Skype) and a group decision support system with voting that was developed solely for the study. The ease of use, design layout and the extent to which the system was helpful was assessed by participants' feedback. Participants indicated on a 7-point Likert scale ranging from 1 (easy to use) to 7 (hard to use), and on a 7-point Likert scale ranging from 1 (simple) to 7 (complex), that the system designed for the study was relatively easy to use (M = 1.32, SD = 0.70), the design layout of the system was simple (M = 1.47, SD = 0.74). On a 7-point Likert scale ranging from 1 (very helpful) to 7 (not helpful at all), the system was considered helpful in carrying out the task for the experiment (M = 1.67, SD = 1.16).

Table 7.10 Post Experiment Survey Results: Feedback on the System

The systems (TIES and Skype) used for accomplishing this task for your team was:

Easy to Use	69	78.41%
	12	13.64%
	6	6.82%
Neutral	0	0.00%
	1	1.14%
	0	0.00%
Hard to Use	0	0.00%

The design of the layout and display of the ranking system (TIES) was:

Simple	60	68.18%
	11	12.50%
	7	7.95%
Neutral	6	6.82%
	4	4.55%
	0	0.00%
Complex	0	0.00%

The systems (TIES and Skype) used for accomplishing the tasks in this experiment for your team was:

Very Helpful	58	65.91%
	21	23.86%
	7	7.95%
Neutral	2	2.27%
	0	0.00%
	0	0.00%
Not Helpful At All	0	0.00%

Similar to Stasser and Titus' (2003) experiment, a reason for concern was that students might not take the task seriously and that the results might not generalize to other populations and group tasks. Subjects got five points toward their final grade average in the class through which they participated in exchange for their participation. In addition to the extra credit, participants were automatically entered into a raffle for $50 and $25 Amazon gift cards to the first and second place teams and a 4GB flash drive to the third place teams among the best performing groups. This approach maintained the integrity of the hidden profile solution as we only the performance definition was revealed and which teams performed best after all the experimental sessions had finished. As shown in Table 7.11 after the experiment, participants indicated on a 7-point Likert scale from 1 (very likely) to 7 (very unlikely) on average 1.41 (*SD* = 0.89) that "*I am motivated to do my best to receive the extra credit offered for participating in this experiment*", and on average 2.06 (*SD* = 1.48) that "*I am motivated to win the prizes in addition to the extra credit offered for participating in this experiment*", both indicating that on average the participants had a vested interest in participating in the experiment and performing to the best of their ability.

Table 7.11 Post Experiment Survey Results: Motivation to Participate

I am motivated to do my best to receive the extra credit offered for participating in this experiment

Very Likely	65	73.86%
	15	17.05%
	6	6.82%
Neutral	1	1.14%
	0	0.00%
	0	0.00%
Very Unlikely	1	1.14%

I am motivated to do my best to win the prizes in addition to the extra credit offered for participating in this experiment

Very Likely	47	54.02%
	16	18.39%
	7	8.05%
Neutral	13	14.94%
	1	1.15%
	1	1.15%
Very Unlikely	2	2.30%

Some constructs from Brown et al. (2010) were included in the post experiment survey to assess participants' intention to use (see Table 7.12) and performance expectancy (see Table 7.13) of the tools designed for exchanging information during the group discussion in other contexts. On a 7-point Likert scale ranging from 1 (Very Likely) to 7 (Very Unlikely), participants indicated on the average that they are likely to use (M = 2.00, SD = 1.18) or recommend (M = 2.10, SD = 1.11) the use of the system to their collaborators. This indicates high satisfaction with the decision support tools.

Table 7.12 Post Experiment Survey Results: Behavioral Intention to Use

I believe I would use the system for future collaborations if accessible to me and my collaborators

Very Likely	38	43.18%
	27	30.68%
	13	14.77%
Neutral	7	7.95%
	2	2.27%
	0	0.00%
Very Unlikely	1	1.14%

I would recommend the use of this system to my collaborators for future meetings

Very Likely	31	35.23%
	31	35.23%
	16	18.18%
Neutral	7	7.95%
	2	2.27%
	1	1.14%
Very Unlikely	0	0.00%

Performance expectancy, a measure of the extent to which use is expected to improve work performance, has been one of the most consistent predictors of behavioral intention across technologies (Venkatesh, Morris, Davis & Davis, 2003). Using a 7-point Likert scale where 1 is Strongly Agree, and 7 is Strongly Disagree, participants' responses show that they think the tool designed for this study would increase their productivity (M = 2.03, SD = 1.18), and be useful for communication and collaboration with their partners (M = 1.89,SD = 1.17).

Table 7.13 Post Experiment Survey Results: Performance Expectancy

Using TIES and Skype will increase my productivity

Response	Count	Percent
Strongly Agree	38	43.18%
	24	27.27%
	15	17.05%
Neutral	9	10.23%
	0	0.00%
	2	2.27%
Strongly Disagree	0	0.00%

I believe using TIES and Skype will be useful for communication and collaboration

Response	Count	Percent
Strongly Agree	42	48.28%
	29	33.33%
	8	9.20%
Neutral	4	4.60%
	2	2.30%
	2	2.30%
Strongly Disagree	0	0.00%

7.5 Validation of Scales

Although some of the scales used in this dissertation have been used and tested in the literature, the validity of their use in this study is examined.

7.5.1 Validation of Post Case Survey Scales

Confirmatory factor analysis (CFA) was first conducted to validate constructs in the post case survey. CFA of the proposed model will result in a reasonably good approximation to reality when it provides a good fit to the data (Anderson & Gerbing, 1988). The CFA for the measurement model resulted in a comparative fit index (CFI) of 0.95 (≥0.90 recommended), a non-normed fit index (NNFI) of 0.92 (≥0.90 recommended), a normal fit index of (NFI) of 0.93 (≥0.90 recommended), and a χ^2/df ratio of 3.05 ($\leq$ 3 recommended). Thus, the measures represent a reasonable fit for the measurement model.

Convergent validity is typically demonstrated when the scores of different items used to measure the same construct are strongly correlated. Reviewing the t-test for each item loading can assess convergent validity. It is recommended that the t-test for each item loading be greater than twice their standard error. The test for each indicator loading is shown in Table 7.14. Generally, t-values greater than 1.960 are significant at $p < 0.05$; those greater than 2.576 are significant at $p < 0.01$; and those greater than 3.291 are significant at $p < 0.001$ (Hatcher, 1994). The obtained results show that the overall constructs demonstrate high convergent validity since all t-values are significant at the 0.01 level.

Table 7.14 CFA Properties of the Significant Post Case Survey Constructs

	Standardized Loadings	t-Values (Std Error)	Cronbach's Alpha
Information Use			**0.91**
†To what extent did the information contributed by others cause you to re-evaluate your choice	0.88	13.66 (0.105)	
†To what extent did something someone else contributed make you take a second look at your choice	0.89	13.88 (0.064)	
†To what extent did the information contributed by others affect your decision	0.86	13.28 (0.096)	
Satisfaction with Information Exchange			**0.89**
††How do you feel about the process by which your team made its decision	0.83	12.42 (0.091)	
††How do you feel about the team's discussion	0.90	14.01 (0.088)	
††All in all, how do you feel about the team's decision	0.84	12.60 (0.078)	
Perceived Information Importance			**0.75**
†††I am sure that all the information that others contributed was important	0.53	6.71 (0.15)	
†††Some people contributed important information	0.82	11.30 (0.13)	
†††I am sure team members completely shared all their important information	0.85	11.86 (0.14)	
†††I am convinced that all the information everyone contributed was important	0.47	5.91 (0.12)	

†Each item measured on a 7 point Likert Scale (1-Very Much; 7- Not at all).
††Each item measured on a 7 point Likert Scale (1-Very Satisfied; 7-Very Dissatisfied).
†††Each item measured on a 7 point Likert Scale (1-Strongly Agree; 7-Strongly Disagree).

Referring to the constructs in Table 7.14, a measure in the information exchange construct (To what extent did you enjoy participating in this meeting) was removed from the construct, as it was not significantly correlated with other measures of information exchange.

The task rating construct that asked if participants found the tasks to be boring, realistic or difficult was dropped from the original model because the correlations with the measures of task experience were insignificant.

Internal consistency of each construct is examined by Cronbach's alpha values. Alpha values will be high if the various items of the construct are strongly correlated with each other. The standardized Cronbach alpha values for information use, information exchange, and information importance, were 0.91, 0.89, and 0.75 respectively, all of which exceed the recommended level of 0.70 (Nunnally, 1978).

Discriminant validity refers to relatively weak correlations between the measures of different constructs. A test displays discriminant validity when it is demonstrated that the test does not measure a construct that it was not designed to measure (Hatcher, 1994). The confidence interval test was conducted to assess the discriminant validity among the three variables in this survey. This test involves calculating a confidence of plus or minus two standard errors around the correlation between the examined variables, and determining whether this interval includes 1.0. If it does not include 1.0, discriminant validity is demonstrated (Anderson & Gerbing, 1988). The intervals, as shown in Table 7.15, do not include the value 1.0.

Table 7.15 Confidence Interval Tests for Discriminant Validity

	Estimate	Standard Error	Lower Bound	Higher Bound
Information Use — Information Exchange	0.29	0.081	0.13	0.45
Information Use — Information Importance	-0.02	0.088	-0.20	0.15
Information Exchange — Information Importance	-0.44	0.077	-0.59	-0.28

External validity refers to the extent to which the findings can be generalized across times, people, and settings. A threat to the external validity of the findings occurs when the sample is systematically biased; for example, responses from users who had a second opportunity to participate in the experiment. This kind of bias was avoided by keeping a log of participants to ensure that students got only one opportunity to participate in the experiment.

The scale responses, shown in Table 7.16, had a good distribution since the skewness was less than 2 and kurtosis was less than 5 for all constructs (Ghiselli, Campbell & Zedeck, 1981).

Table 7.16 Descriptive Analysis with Correlations

	Information Use	Information Exchange	Information Importance
Mean	3.19	2.17	5.09
Standard Deviation	1.44	1.18	1.77
Median	3.00	2.00	5.50
Skewness	0.55	1.27	-0.69
Kurtosis	-0.07	1.82	-0.51
Correlations			
Information Exchange	0.29	1.00	
	(<0.001)		
Information Importance	-0.02	-0.44	1.00
	(0.0043)	(<0.001)	

7.5.2 Validation of Post Experiment Survey Scales

CFA was first conducted to validate the post experiment survey data to the measurement model. The CFA for the measurement model resulted in a CFI of 0.94 (≥0.90 recommended), a non-normed fit index (NNFI) of 0.90 (≥0.90 recommended), a normal fit index of (NFI) of 0.89 (≥0.90 recommended), and a χ^2/df ratio of 2.03 ($\leq$ 3 recommended). Thus, the measures represent a reasonable fit for the measurement model.

Internal consistency of each construct in the post experiment survey is then examined by Cronbach's alpha values. The standardized Cronbach alpha values for feedback on instruction, motivation, system feedback, behavioral intention to use, and performance expectancy, were 0.91, 0.68, 0.81, 0.87 and 0.91, respectively all of which are at least approximately at the recommended level of 0.70 (Nunnally, 1978).

Next, the convergent validity of the measures used for each construct is computed. Reviewing the t-test for each item loading is used to assess convergent validity. It is recommended that the t-test for each item loading be greater than twice their standard error. The test for each indicator loading is shown in Table 7.17. Generally, t-values greater than 1.960 are significant at $p < 0.05$; those greater than 2.576 are significant at $p < 0.01$; and those greater than 3.291 are significant at $p < 0.001$ (Hatcher, 1994). The obtained results show that the overall constructs demonstrate high convergent validity since all t-values are significant at 0.05 and 0.01 levels.

Table 7.17 CFA Properties of the Post Experiment Survey Constructs

	Standardized Loadings	t-Values (Std Error)	Cronbach's Alpha
Instruction Feedback (Instruction)			**0.91**
The amount of specialized instruction and practice that was given was:	0.67	8.76 (0.076)	
The amount of specialized instruction and practice that was given was:	1.06	12.05 (0.088)	
Motivation to Participate (Motivation)			**0.68**
I am motivated to do my best to receive the extra credit offered for participating in this experiment	0.66	6.03 (0.110)	
I am motivated to do my best to win prizes in addition to the extra credit offered for participating in this experiment	1.02	5.80 (0.177)	
System Feedback (System)			**0.81**
The systems used for accomplishing this task for your team was:	0.56	8.49 (0.066)	
The systems used for accomplishing the tasks in this experiment for your team was:	0.64	9.48 (0.068)	
The design layout and display of the ranking system (TIES) was:	0.73	6.15 (0.119)	
Behavioral Intention to Use (Intention to Use)			**0.87**
I believe I would use the system for future collaborations if accessible to me and my collaborators	1.13	11.36 (0.099)	
I would recommend the use of this system to my collaborators for future meetings	0.90	8.92 (0.102)	
Performance Expectancy (Performance)			**0.91**
Using systems developed for this experiment will increase my productivity	1.09	10.68 (0.102)	
I believe the systems developed for this experiment will be useful for communication and collaboration	1.05	10.18 (0.103)	

The confidence interval test was conducted to assess the discriminant validity among the five variables in this survey. This test involves calculating a confidence of plus or minus two standard errors around the correlation between the examined variables, and determining whether this interval includes 1.0. If it does not include 1.0, discriminant validity is demonstrated (Anderson & Gerbing, 1988). As shown in Table 7.18, the intervals do not include the value 1.0.

Table 7.18 Confidence Interval Tests for Discriminant Validity

	Estimate	Standard Error	Lower Bound	Higher Bound
Instruction — Intention to Use	0.63	0.07	0.48	0.78
Instruction — Motivation	0.25	0.12	0.01	0.49
Intention to Use — Motivation	0.47	0.11	0.24	0.70
Instruction — System	0.35	0.10	0.15	0.56
Intention to Use — System	0.68	0.07	0.53	0.83
Motivation — System	0.63	0.10	0.42	0.84
Instruction — Performance Expectancy	0.13	0.11	-0.08	0.35
Intention to Use — Performance Expectancy	0.62	0.08	0.47	0.78
Motivation — Performance Expectancy	0.41	0.12	0.17	0.65
System — Performance Expectancy	0.69	0.07	0.55	0.84

The responses, shown in Table 7.19, had a good normal distribution since the skewness was less than 2 and kurtosis was less than 5 for all but the motivation construct (Ghiselli, et al., 1981). To investigate this, either of the two measures of motivation were explored.

Table 7.19 Descriptive Statistics: Original Model

	Instruction	Motivation	System	Intention to Use	Performance Expectancy
Mean	1.48	1.73	1.48	2.05	1.96
Standard Deviation	0.89	1.03	0.74	1.08	1.12
Median	1.00	1.00	1.00	2.00	2.00
Skewness	2.05	2.07	1.63	1.21	1.42
Kurtosis	3.80	6.62	2.27	2.04	2.03

It was found that when one of the measures of participants' motivation (I am motivated to do my best to receive the extra credit offered for participating in this experiment) was removed from the measurement model, the constructs had a good normal distribution as shown in Table 7.20, since the skewness is at most 2 and kurtosis is less than 5 for all constructs (Ghiselli, et al., 1981). This means that the best fit measure of the motivation of participants is the second question: I am motivated to do my best in order to win the prizes in addition to the extra credit offered for participating in this experiment.

Table 7.20 Descriptive Statistics: Revised Model

	Instruction	Motivation	System	Intention to Use	Performance Expectancy
Mean	1.48	2.06	1.48	2.05	1.96
Standard Deviation	0.89	1.46	0.74	1.08	1.12
Median	1.00	1.00	1.00	2.00	2.00
Skewness	2.05	1.45	1.63	1.21	1.42
Kurtosis	3.80	1.74	2.27	2.04	2.03

CFA of the new scales resulted in a comparative fit index of 1.00 (≥0.90 recommended), a non-normed fit index (NNFI) of 1.04 (≥0.90 recommended), a normal fit index of (NFI) of 0.98 (≥0.90 recommended), and a c^2 / df ratio of 0.47 (± 3 recommended). Thus, the new measures of all the constructs in the post experiment survey represent a reasonably significant fit for the measurement model.

7.6 Validation of Variables for the Theoretical Model

Table 7.21 shows the univariate analysis of the sample. The sample has a good normal distribution since the skewness is less than two and kurtosis less than five for all the measures (Ghiselli, et al., 1981).

Table 7.21 Univariate Analysis of Measures

Measures	Mean	Standard Deviation	Skewness	Kurtosis
Fraction of total information shared	0.37	0.21	0.45	-0.77
Fraction of unshared information	0.22	0.15	0.43	0.41
Fraction of Partially shared information	0.40	0.31	0.84	0.56
Fraction of Shared information	0.51	0.32	0.24	-1.06
Fraction of More important information	0.48	0.28	0.57	-0.59
Fraction of Less important information	0.24	0.20	0.80	-0.13
Fraction of Shared more important information	0.54	0.35	0.01	-1.20
Fraction of Shared less important information	0.43	0.37	0.78	-0.89
Fraction of Unshared less important information	0.10	0.19	1.72	1.78
Fraction of Unshared more important information	0.40	0.37	0.82	-0.87
Fraction of Partially shared less important information	0.31	0.37	0.86	-0.75
Fraction of Partially shared more important information	0.50	0.40	0.71	0.47
Fraction of shared necessary information	0.53	0.31	0.08	-1.22
Decision quality	0.50	0.51	0.00	-2.10
Exchange Performance	0.71	0.45	-0.97	-1.09
Exchange All	0.14	0.35	2.08	2.38

The validation analysis proceeds by examining the reliability estimates of the dependent variable constructs in the theoretical model. Internal consistency of each construct is examined by Cronbach's alpha values. Alpha values will be high if the various items of the construct are strongly correlated with each other.

The validation of variables analysis begins with the information exchange performance construct that contains four measures. 1. Fraction of information shared, which is the total number of information pieces mentioned during discussion divided by the total number of information available to the team. 2. Performance of teams was measured as a fraction of the information shared. Availability of necessary information was measured, as the mention of pieces of information that the pilot studies result show are necessary to identify the optimal decision alternative, during the discussion. 4. Fraction of shared necessary information was measured as the number of pieces of necessary information mentioned during discussion divided by the total number of necessary information available. The standardized Cronbach alpha value for information exchange performance is 0.86, which exceeds the recommended level of 0.70 (Nunnally, 1978). Within the information exchange performance construct, the fraction of information shared and exchange performance of teams measured as a fraction of the information shared are two measures that are more correlated with each other, with a standardized Cronbach alpha value of 0.92. The other two measures in the information exchange performance construct, fraction of shared necessary information, and availability of necessary information, are correlated with Cronbach alpha value of 0.77. Decision quality is measured by a nominal value, which is either true or false if the optimal choice is selected.

In sum, the coefficient alpha estimates (Cronbach, 1951) of all the variables in the theoretical model exceed the recommended value of 0.70, and are reported on the diagonal of Table 7.22.

Table 7.22 Means, Standard Deviations, Intercorrelations, and Coefficient Alpha Reliability Estimates for the Variables

Variables	Mean (SD)	1	2	3	4	5
1. Exchange Performance	0.39 (0.29)	(0.86)				
2. Decision Quality	0.50 (0.51)	0.06	(1.00)			
3. Importance	0.36 (0.21)	0.92	-0.02	(0.75)		
4. Distribution	0.38 (0.21)	0.92	-0.01	0.99	(0.73)	
5. Importance/Distribution	0.38 (0.23)	0.91	-0.03	0.99	0.99	(0.87)

7.7 Validation of the Theoretical Model

In order to further validate the constructs in the theoretical model, confirmatory factor analysis (CFA) was also conducted since it will result in a reasonably good approximation to reality when it provides a good fit to the data (Anderson & Gerbing, 1988). The CFA for the theoretical model resulted in a goodness of fit index (GFI) of 0.96 (≥0.90 recommended) and GFI adjusted for degrees of freedom (AGFI) of 0.94 (≥0.90 recommended). Thus, the measures represent a reasonably good fit for the theoretical research model. The standardized loading for each indicator is shown in Table 7.23.

Table 7.23 CFA Properties of the Theoretical Model Constructs

	Standardized Loadings	Std Error	Cronbach's Alpha
Information Distribution			**0.73**
Unshared information	0.57	0.89	
Partially shared information	1.00	0.00	
Shared information	0.87	0.49	
Information Importance			**0.75**
More important information	0.84	0.54	
Less important information	0.71	0.71	
Information Importance and Distribution			**0.87**
Unshared more important information	0.61	0.79	
Unshared less important information	0.20	0.98	
Partially shared more important information	0.56	0.83	
Partially shared less important information	0.61	0.79	
Shared More important information	0.74	0.68	
Shared Less important information	0.70	0.71	
Task (Manipulated)			**--**
Visibility (Manipulated)			**--**
Information Exchange Performance			**0.86**
% Information shared	0.99	0.10	
Exchange performance	0.82	0.57	
Availability of necessary information	0.45	0.89	
% shared necessary information	0.76	0.65	
Decision Quality (Nominal)			**--**

Discriminant validity refers to relatively weak correlations between the measures of different constructs. A test displays discriminant validity when it is demonstrated that the test does not measure a construct that it was not designed to measure (Hatcher, 1994). The correlation between the construct coefficients presented in Table 7.16 was used to determine the discriminant validity of the theoretical model of the study. The correlation between information use and information exchange constructs is 0.29 ($p < 0.001$), the correlation between information use and information importance is -0.02 (*p* 0.0043), and the correlation between information exchange and information importance is -0.44 ($p < 0.001$).

All the variables in the theoretical model have a good normal distribution since the skewness is less than two and kurtosis less than five as shown in Table 7.24 (Ghiselli, et al., 1981).

Table 7.24 Means, Standard Deviations, Kurtosis and Skewness for the Variables

Variables	Mean	SD	Kurtosis	Skewness
Exchange Performance	0.39	0.29	-0.88	0.49
Decision Quality	0.50	0.51	-2.10	0.00
Importance	0.36	0.21	-0.73	0.52
Distribution	0.38	0.21	-0.79	0.45
Importance/Distribution	0.38	0.23	-0.81	0.50
Task	1.50	0.51	-2.10	0.00
Condition	1.50	0.51	-2.10	0.00

7.8 Summary

The objective of this Chapter was to validate the constructs in the questionnaires and measures in the theoretical model of this study. The planned scales were also examined for validity and reliability, and a determination made of the final composition of these scales used in the study (see Appendix J for a summary of the frequencies of the survey responses). The validated measures will be used to test the hypotheses that predict relationships among the measures in the theoretical model, in the next chapter.

CHAPTER 8

TESTS OF HYPOTHESES

8.1 Introduction

This chapter reports on tests of the hypotheses that seek to answer all the research questions (RQ1— RQ3) of this dissertation study by investigating the impact of the importance and distribution of information on its exchange during team discussions. More specifically, the results presented in this chapter seek to answer the following research questions:

RQ1: To what extent does the importance of information correlate with its exchange in a team discussion?

RQ2: To what extent is the distribution of information among team members associated with information exchange in team discussions?

RQ3: Does the complexity of the task seem to interact with the visibility of importance ratings in the GSS to mediate the exchange process in any way?

Analyses and results of each hypothesis are presented in the following sections.

8.2 Results of Research Measurements

It was planned to use non-parametric data analysis techniques, which rely on fewer assumptions, if necessary, due to the relatively small sample size of 42 teams (21 teams doing two tasks each). However, when the variables are normally distributed, Pearson's point-biserial correlation is used to measure the association of continuous variables with dependent nominal variables (manipulated experimental conditions). To test whether teams that exchanged all their information items on a continuous variable have different outcomes on a dependent variable, dividing a new dichotomous variable such that teams that do not exchange all the necessary information on the continuous variable take a value of “0” and teams that exchange all the necessary information, the value “1”. Finally, analysis of variance (ANOVA), nested by group, is performed to test the multivariate research model as represented in Figure 3.2 in Chapter 3.

Table 7.21 in section 7.6 of Chapter 7 shows the descriptive statistics for the sample for information exchange and decision making performance. As expected, on average groups exchanged a greater fraction of shared information (M = 0.51, SD = 0.32) than unshared information (M = 0.22, SD = 0.15). The sample has a good normal distribution since the skewness is less than two and kurtosis less than five for all the measures. All the hypotheses are then tested one after the other as shown in the research model (Figure 3.2) in section 8.3. Tests with significance greater than 0.05 but less than .10 will be considered weakly supported while those with less than 0.05 will be considered strongly supported.

8.3 Hypotheses Testing

8.3.1 Information Importance Visibility and Information Exchange

The result of the correlation between information importance visibility setting and information exchange variables is shown in Appendix I.1. Pearson’s point bi-serial correlation is used to compare the information exchange variable means of the teams in the visible importance information setting (where team members are able to see other team members’ rating of information categories and ranking of candidates) to the teams in the invisible information importance setting (where team members are not able to see other team members' rating of information categories and ranking of candidates).

Table 8.1 shows the Pearson's point-biserial correlation coefficient revealing that there is no significant difference in the relative amount of discussion that is dedicated to more important information items between the visible importance information setting (*M* = 0.529, *SD* = 0.298) and the invisible importance information setting (*M* = 0.439, *SD* = 0.253), with a Pearson's point-biserial correlation coefficient of -0.16 and *p* = 0.15. Hence, hypothesis (H1) is rejected, that posits that teams that can view other team members' assessment of information importance will exchange a greater proportion of the more important information than teams that are not able to view other team members' assessment of information importance.

Table 8.1 Pearson Point-Biserial Correlation Test: Importance and Visibility Conditions

Variables Fraction of:		Visible Information Importance *N* = 21	Invisible Information Importance *N* = 21
More Important Information	Mean	0.529	0.439
	SD	0.298	0.253
		Visible vs. Invisible	
	Point-biserial corr. coefficient	-0.16	
	t-test, significance	-1.19, *p = 0.15*	

In order to test the difference between teams that exchange a larger or smaller fraction of total information items, two new dichotomous variables are defined with values "0" for teams with a fraction of total information items exchanged less than the overall average (*M*=0.37) and values "1" for teams with the fraction of total information items exchanged equal to or greater than the overall average fraction of total information shared. As shown in Table 8.2, teams in the visible information setting exchanged a larger fraction of total items (*M* = 0.403, *SD* = 0.231), than teams in the information invisible setting (*M* = 0.343, *SD* = 0.183). However, the Pearson's point-biserial correlation coefficient of -0.15 and *p* = 0.20 shows that the difference is not significant. Furthermore, the Pearson's point-biserial correlation test shows that there is no significant difference in the exchange performance of teams in the visible information importance setting (*M* = 0.571, *SD* = 0.507) and the invisible information importance setting (*M* = 0.429, *SD* = 0.507), with Pearson's point-biserial correlation coefficient of -0.14 and *p* = 0.20. Hence, hypothesis (H2) is rejected. H2 states that the overall exchange performance of teams that are able to view importance ratings of their team members will be higher than teams that are unable to view importance ratings of their team members.

Table 8.2 Pearson Point-Biserial Correlation Test: Exchange Performance and Visibility Conditions

Variables Fractions of:		Visible Information Importance *N* = 21	Invisible Information Importance *N* = 21
Total Information	Mean	0.403	0.343
Shared	SD	0.231	0.183
		Visible vs. Invisible	
	Point-biserial correlation	-0.15	
	t-test, significance	-0.88, *p = 0.20*	
Exchange	Mean	0.571	0.429
Performance	SD	0.507	0.507
		Visible vs. Invisible	
	Point-biserial correlation	-0.14	
	t-test, significance	-0.83, *p = 0.20*	

8.3.2 Distribution and Importance of Information and Information Exchange

The next sets of hypotheses predict that more important information will be mentioned during team discussions than less important information and also that a higher number of shared more important information items will be exchanged compared to shared less important information items. However, the only way to disentangle direct effects and interaction effects between the importance of information and its distribution is with Analysis of Variance (ANOVA).

Table 8.3 Team-Level Analysis of Variance Result

Variable	df	ANOVA SS	F-Value	*p-value*
Importance	1	609.25	16.29	< 0.0001
Distribution	2	836.30	11.18	< 0.0001
Importance Distribution	2	190.99	2.55	0.0783

Table 8.3 presents the ANOVA results for the team-level measures. There is a strong significant main effect for information importance (16.29, $p < 0.0001$), and information distribution (11.18, $p < 0.0001$). The effect of the interaction between information importance and distribution is weak (2.55, $p = 0.0783$). The next set of analyses investigates each variable and their interaction effect on information exchange.

The result of the interaction of the distribution and importance of information and information exchange variables is shown in Table 8.4. A paired t-test is used to test the difference in means between the fractions of information distributed (unshared, partially shared, and shared) and the importance of the information. Table 8.4 shows the paired t-test revealing that there is a significant difference in the relative amount of discussion that is dedicated to a larger fraction of shared information ($M = 0.51$, $SD = 0.32$) compared to the fraction of partially shared information items ($M = 0.40$, $SD = 0.31$), with a paired t-test statistic of 2.20 and $p < 0.01$. The null hypothesis is therefore rejected and support is found for hypothesis (H3) that teams will exchange more shared information compared to partially shared information.

Table 8.4 Paired t-test of the Information Exchange Variables

Difference: Variables	Mean	df	t-value	Pr > |t|
Shared – Partially Shared	0.10	42	2.20**	0.0338
Shared – Unshared	0.29	42	6.60*	< .0001
Partially Shared – Unshared	0.19	42	4.19*	0.0001
Shared More Important – Shared Less Important	0.11	42	1.96**	0.050
Unshared More Important – Unshared Less Important	0.31	42	4.88**	< .0001
Partially Shared More Important – Partially Shared Less Important	0.19	42	2.75**	0.0088
More Important – Less Important	0.24	41	7.07*	< .0001

***Difference in mean is significant at the 0.01 level**
****Difference in mean is significant at the 0.05 level**

The paired t-test on the difference between the exchange of partially shared information (M = 0.40, SD = 0.31) and unshared information (M = 0.22, SD = 0.15) is strongly significant with a t-test statistic of 4.19 and $p < 0.01$. Hence, the null hypothesis is rejected and support is found for hypothesis (H4) that teams will exchange more partially shared information compared to unshared information.

Table 8.4 also reveals that there is a strong significant difference in the relative amount of discussion that is dedicated to the fraction of shared information (M = 0.51, SD = 0.32) compared to fraction of unshared information items (M = 0.22, SD = 0.15), with a paired t-test statistic of 6.60 and $p < 0.01$. This result confirms findings from prior hidden profile studies that team members discuss information already known to all members more than information known only to one member or a subset of the team. This result also supports H4, as a subset of the team that is familiar with similar information items tends to discuss that information rather than introduce new unshared information.

Next paired t-test is used to test the interaction effect of distribution of information and importance of information on the information exchange variables. Table 8.4 shows that there is a significant difference in the relative amount of discussion that is dedicated to the fraction of shared more important information (M = 0.54, SD = 0.35) compared to the fraction of shared less important information items (M = 0.43, SD = 0.37), with a paired t-test statistic of 1.96 and $p = 0.05$. The null hypothesis is therefore rejected and support is found for hypothesis (H5) that teams will exchange more shared more important information compared to shared less important information.

The paired t-test on the difference between the exchange of fraction of more important information items (M = 0.48, SD = 0.28) and fraction of less important information items (M = 0.24, SD = 0.20), as presented in Table 8.4, is strongly significant with paired t-test statistic of 7.07 and $p < 0.01$. Hence, the null hypothesis rejected and there is support for hypothesis (H6) that participants will be more likely to exchange more important information than less important information.

8.3.3 Task Characteristics and Information Exchange

The characteristic of the task used in this study is that of its complexity, as presented and validated in Chapter 7. The result of the correlation between task complexity and information exchange variables is shown in Appendix I.2.

A Pearson's point-biserial correlation test is used to compare the information exchange means of teams in the simple task setting to the teams in the more complex task setting. Table 8.5 shows the Pearson's point-biserial correlation between the overall fraction of information exchange performance of teams and the task conditions. The Pearson's point-correlation coefficient value of -0.41 is significant at the 0.05 level both in the 1— and 2—tailed test, revealing that the overall information exchange performance in the simple task setting is significantly higher (M = 0.458, SD = 0.232) than in the complex task setting (M = 0.288, SD = 0.142). Hence, the null hypothesis is rejected and there is support for hypothesis (H7) that the more complex the task, the lower the overall information exchange performance of teams.

Table 8.5 Pearson Point-Biserial Correlation Test: Task Complexity Conditions

Variable Fractions of:		Simple Task N = 21	Complex Task N = 21
Total Information Shared	Mean	0.458	0.288
	SD	0.232	0.142
		Simple vs. Complex	
	Point-biserial correlation	-0.41*	
	t-test, significance	-2.19, $p = 0.015$	

***Significant at the 0.05 level (1 & 2-tailed)**

In order to test the hypothesis (H8) that there will be a strong positive relationship between information exchange performance and the possession of all the necessary information, two new dichotomous variables are defined with values "0" for teams that do not have all the necessary information and "1" for teams that have all the necessary information. The information exchange performance variable used in this test is the fraction of total information exchanged by each team.

A Pearson's point-biserial correlation test is used to compare the information exchange means of teams in the study. The Pearson's point-biserial correlation coefficient of 0.49 and p = 0.0005, as presented in Table 8.6, shows strongly significant support for the hypothesis that the higher the exchange performance the more the likelihood of exchanging all the necessary information. Hence, the null hypothesis is rejected and there is support for H8. This result is similar to findings from prior studies (Fjermestad & Ocker, 2007; Ocker & Fjermestad, 2008) that show that high performing teams tend to exchange more information compared to low performing teams during discussions in virtual teams.

Table 8.6 Pearson Point-Biserial Correlation Test: Exchange Performance

Variable Fraction of:		Exchange All Necessary Information *N* = 6	Not Exchange Necessary Information *N* = 36
Exchange		*All vs. Not All*	
Performance	Point-biserial correlation	0.49*	
	t-test, significance	4.35, *p = 0.0005*	

***Difference in mean is significant at the 0.05 level for both one and two-tailed test**

In order to test the final hypothesis (H9) that there will be a strong positive relationship between the exchange of necessary information and the selection of the optimal choice during discussion, Pearson's point-biserial correlation test is conducted. The test reveals that the correlation between teams that exchange a higher fraction of the necessary information and decision quality (selection of the optimal decision) is strongly significant ($t = 2.46$, $p < 0.05$). H9 is therefore supported. A Pearson's point-biserial correlation test is then used to compare H9 across both task conditions. Teams in the simple task condition exchange a higher fraction of shared necessary information pieces ($M = 0.61$, $SD = 0.32$) than teams in the complex task condition ($M = 0.44$, $SD = 0.28$). The point-biserial coefficient value of -0.265 ($t = 1.49$, $p = 0.072$), revealed a weak significant difference in the task conditions, suggesting that the complexity of task does not have a strong influence on the relationship between the fraction of necessary information exchanged and decision quality. This result suggests that discussing necessary information during discussions is imperative for realizing favorable outcomes for all levels of complexity, but somewhat more important for simpler tasks.

Interestingly, a correlation test between teams that selected the optimal solution and the exchange of all the necessary information shows a weak association with phi coefficient value of 0.14 ($p > 0.05$). These results suggest that exchanging all the necessary information during discussion might be important but not a sufficient condition for making optimal decisions. This result confirms prior studies (Dennis, 1996; Dennis, Hilmer, et al., 1997) that although teams exchange all the necessary information during discussion, they seldom use it effectively to make better decisions. More importantly, the results indicate that there is a threshold of the fraction of important information that needs to be exchanged and effectively used to make better decisions during discussions to avoid information overload, which inhibits team performance.

8.3.4 Perceived Information Importance and Information Exchange: Survey Results

Next the perceived relationships among information importance, information exchange, and information use are tested. This test is performed using path analysis, specifically structural equation modeling (SEM) techniques using SAS. There are three important assumptions associated with path analysis: (1) the normal distribution of variables, (2) an absence of multicollinearity, and (3) a maximum number of variables in the model (Hatcher, 1994). The mean scaled univariate kurtosis and multivariate kurtosis tests of normality were conducted and no violation was found. The correlations among variables were all significantly less than 0.80, thus no likely violation of multicollinearity was indicated (Anderson & Gerbing, 1988). The total number of variables in this model was three, which fell in the suggested range of three to six (Bentler & Chou, 1987). Overall, the theorized model in Figure 7.1 fit the data, having CFI = 0.97(≥0.90 recommended), NFI = 0.93 (≥0.90 recommended), NNFI = 0.96 (≥0.90 recommended), c^2 / df ratio of 1.66 (± 3 recommended). The structural model in Figure 8.1 showed that all the expected relationships between perceptions of information importance, exchange and use were supported. The direct effect link between satisfaction with information exchange process and perceived use of information was positive and significant. According to the theorized model, the direct effect of perceived information importance was found to have a significant and positive association with satisfaction toward the information exchange process (t = 5.63, $p < 0.0001$). In accordance to the theorized model, satisfaction with the information exchange process was found to have a significant and positive association with the perceived use of information during discussion in distributed teams (t = 3.35, $p = 0.0009$). Finally, according to the theorized model, the direct effect of perceived information importance was found to have a significant and positive relationship with perceived information use during discussion in a distributed team environment (t = 5.71, $p < 0.0001$).

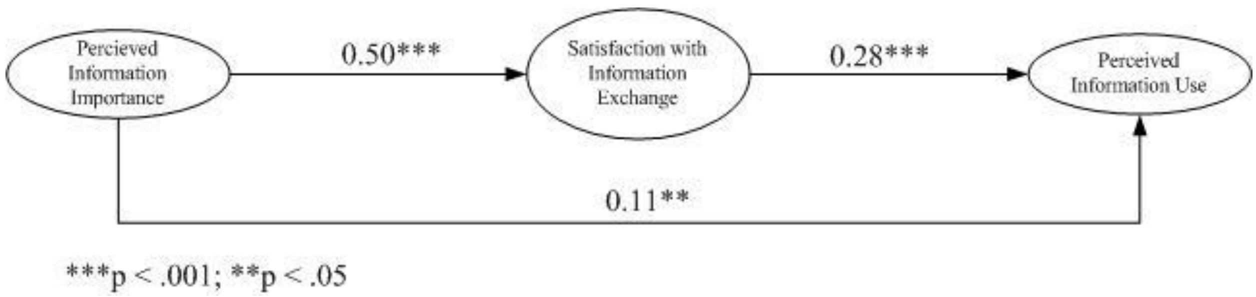


Figure 8.1 Empirical model for perceived information importance, exchange and use.

Participants were also interviewed during the debriefing session after the experiment and most of them mentioned that they paid more attention to information already known to other group members "*as it was easier from a communication perspective.*" Other participants reported that they "*generally believed that important information is known to and by all team members"* and so "*....it is expected that team members shared their important information.*" One participant answered a question about satisfaction with the exchange process thus: *"I was satisfied with the way we [team 15] exchanged critical information about candidates that was not known to some of us in the team before discussion…mostly because I could track contributions from other team members during discussion without interrupting their contribution."*

In sum, the feedback from participants during the debriefing session suggests that the importance of information in a technology-mediated discussion seem to increase when every team member is aware of it. In addition, participants expressed satisfaction with the use of group support system that allows for parallel conversation during team discussion. However, the lack of support for H1 and H2 suggests that when the importance of information is made aware to other members in a technology mediated discussion, it may create an unconfirmed notion that every team member is aware of it and hence, not often well processed.

8.3.5 Multivariate Analysis: A Model for Information Exchange in Distributed Teams

At this point, the relationship between all the pairs of variables in the research model presented in Figure 3.2 have been tested individually. However, there are disadvantages to separately testing relationships in a model such as the possible inflation of the type I error rates and non –independence of variables (Tabachnick & Fidell, 2007). Hence, it is imperative to validate all the variables in the research model at once. This validation is performed using path analysis, specifically structural equation modeling (SEM) techniques using SAS.

An analysis of variance of the variables in the research model is first conducted, as shown in Table 8.7, which suggests that all the variables have significantly strong main effects (F = 12.41, p < *0.0001*), with a significant but weak interaction effect between information importance and information distribution

Table 8.7 Team-Level Analysis of Variance Result for Research Model Variables

Variable	df	ANOVA SS	F-Value	*p-value*
Task	2	466.37	12.68	0.0004
Condition	2	369.95	10.06	0.0016
Importance	1	609.25	16.29	< 0.0001
Distribution	2	836.30	11.18	< 0.0001
Importance Distribution	2	190.99	2.55	0.0783

Table 8.8 shows the bivariate correlation of variables used in the research model. It is noticed that there is a moderate to high correlation between all individual measures of information distribution and importance, ranging from 0.328 to 0.928. It is noteworthy to point out that partially shared information is significantly associated with the exchange performance during discussions (Pearson's correlation alpha = 0.78, p < .001). It was noticed that Table 8.8 also shows weak correlations between fractions of total information exchanged and decision quality (Pearson's correlation alpha = -0.011), case (task) (Pearson's correlation alpha = -0.412), and information visibility condition (condition)(Pearson's correlation alpha = -0.146).

Table 8.8 Bivariate Pearson Correlations of all Variable Pairs ($N = 42$)

Fraction of:		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Total	corr.	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Information	sig.		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2. Shared	corr.	0.777	1	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Necessary	sig.	0.000		*	*	*	*	*	*	*	*	*	*	*	*	*	*
3. Unshared	corr.	0.684	0.673	1	*	*	*	*	*	*	*	*	*	*	*	*	*
Information	sig.	0.000	0.000		*	*	*	*	*	*	*	*	*	*	*	*	*
4. Partially	corr.	0.796	0.636	0.396	1	*	*	*	*	*	*	*	*	*	*	*	*
Shared	Sig.	0.000	0.000	0.009		*	*	*	*	*	*	*	*	*	*	*	*
5. Shared	corr.	0.903	0.623	0.461	0.549	1	*	*	*	*	*	*	*	*	*	*	*
Information	sig.	0.000	0.000	0.002	0.000		*	*	*	*	*	*	*	*	*	*	*
6. More	corr.	0.938	0.742	0.562	0.704	0.914	1	*	*	*	*	*	*	*	*	*	*
Important	sig.	0.000	0.000	0.000	0.000	0.000		*	*	*	*	*	*	*	*	*	*
7. Less	corr.	0.83	0.651	0.688	0.751	0.633	0.598	1	*	*	*	*	*	*	*	*	*
Important	sig.	0.000	0.000	0.000	0.000	0.000	0.000		*	*	*	*	*	*	*	*	*
8. Shared M	corr.	0.818	0.572	0.407	0.459	0.937	0.872	0.475	1	*	*	*	*	*	*	*	*
Important	sig.	0.000	0.000	0.007	0.002	0.000	0.000	0.002		*	*	*	*	*	*	*	*
9. Shared L	corr.	0.747	0.503	0.399	0.526	0.772	0.677	0.703	0.502	1	*	*	*	*	*	*	*
Important	sig.	0.000	0.001	0.008	0.000	0.000	0.000	0.000	0.000		*	*	*	*	*	*	*
10.Unshared L	corr.	0.328	0.321	0.596	0.274	0.109	0.104	0.577	0.157	-0.015	1	*	*	*	*	*	*
Important	sig.	0.034	0.038	0.000	0.079	0.492	0.511	0.000	0.322	0.927		*	*	*	*	*	*
11. Unshared	corr.	0.687	0.673	0.789	0.384	0.574	0.715	0.501	0.463	0.58	0.046	1	*	*	*	*	*
M Important	sig.	0.000	0.000	0.000	0.012	0.000	0.000	0.001	0.002	0.000	0.775		*	*	*	*	*
12. Partially	corr.	0.685	0.562	0.518	0.803	0.426	0.485	0.849	0.341	0.435	0.388	0.44	1	*	*	*	*
Less Important	sig.	0.000	0.000	0.000	0.000	0.005	0.001	0.000	0.027	0.004	0.011	0.004		*	*	*	*
13. Partially	corr.	0.619	0.481	0.142	0.831	0.471	0.66	0.394	0.407	0.427	0.071	0.195	0.335	1	*	*	*
M Important	sig.	0.000	0.001	0.371	0.000	0.002	0.000	0.009	0.007	0.005	0.655	0.216	0.029		*	*	*
14. Decision	corr.	-0.011	0.32	0.255	-0.017	-0.13	-0.006	-0.042	-0.057	-0.218	0.022	0.192	0.095	-0.116	1	*	*
Quality	sig.	0.944	0.039	0.103	0.916	0.411	0.972	0.792	0.719	0.165	0.892	0.223	0.548	0.465		*	*
15. Task	corr.	-0.412	-0.265	-0.026	-0.358	-0.475	-0.478	-0.316	-0.332	-0.572	0.237	-0.422	-0.364	-0.226	0.238	1	*
	sig.	0.007	0.090	0.868	0.019	0.002	0.001	0.042	0.032	0.000	0.131	0.005	0.018	0.15	0.129		*
16. Condition	corr.	-0.146	-0.029	0.003	-0.077	-0.206	-0.164	-0.079	-0.194	-0.156	0.05	-0.06	-0.043	-0.081	0.238	0.143	1
	sig.	0.358	0.851	0.985	0.628	0.191	0.299	0.619	0.217	0.323	0.752	0.704	0.785	0.61	0.129	0.367	

The individual information exchange variables are then differentially grouped into variables in the research model to avoid the multicollinearity problem, which could lead to statistical problems in the path analysis (Hatcher, 1994). Table 8.9 shows that the measures in the research model are not correlated thereby avoiding the multicollinearity problem.

Table 8.9 Pearson's Correlation between Research Model Variables

Research Variables	Pearson's Correlation Estimate
Distribution – Importance	0.078
Distribution – Task Complexity	-0.048
Distribution – Visibility Condition	-0.014
Importance – Task Complexity	-0.043
Importance – Visibility Condition	-0.008
Task Complexity – Visibility Condition	0.028

Overall, the theorized model in Figure 3.2 fit the data, having a goodness of fit index of (GFI) of 0.93 (≥ 0.90 recommended) and GFI adjusted for degrees of freedom (AGFI) of 0.91 (≥0.90 recommended). Thus, the measures represent a reasonably good fit for the theoretical research model. Figure 8.2 depicts the structural equation model of the research model with path coefficients.

The direct effect links of information distribution (b = 0.99) and information importance (b = 0.97) on their interaction are highly significant at the 0.001 level. The direct effect link between the interaction of information distribution and information importance and information exchange performance was high and significant at the 0.01 level with path coefficient (b = 0.58).

The direct effect link between information importance visibility and information exchange performance was high and significant at the 0.01 level with path coefficient (b

= 0.30). The direct effect of task complexity was found to have a highly significant but negative association with information exchange performance (b = -0.30, $p < 0.001$). The negative association between task complexity and information exchange performance confirms the support for the hypothesis (H7) that information exchange performance will reduce as the complexity of the group task increases.

There is a negative direct effect link between information exchange performance and the quality of decision made with path coefficient b = -0.16 significant at the 0.05 level. The negative relationship between information exchange performance and decision quality is quite notable as it suggests that a high information exchange performance might be a necessary condition for team discussion as stated in prior studies (Dennis, 1996; Dennis, Hilmer, et al., 1997) but findings from this study show that it is not a sufficient condition for improving team performance. The negative correlation between exchange performance and decision quality might be because only six teams exchanged all the necessary information, compared to the 36 teams that did poorly on the exchange of all the necessary information.

The overall percentage of variance explained (R-squared) by the model is 0.1386, which shows that information exchange performance can be explained by more interactions that are not captured in the current model. The percent of variance explained in the exchange performance is 0.2580, while the percent of variance explained in the decision quality measure is 0.0012.

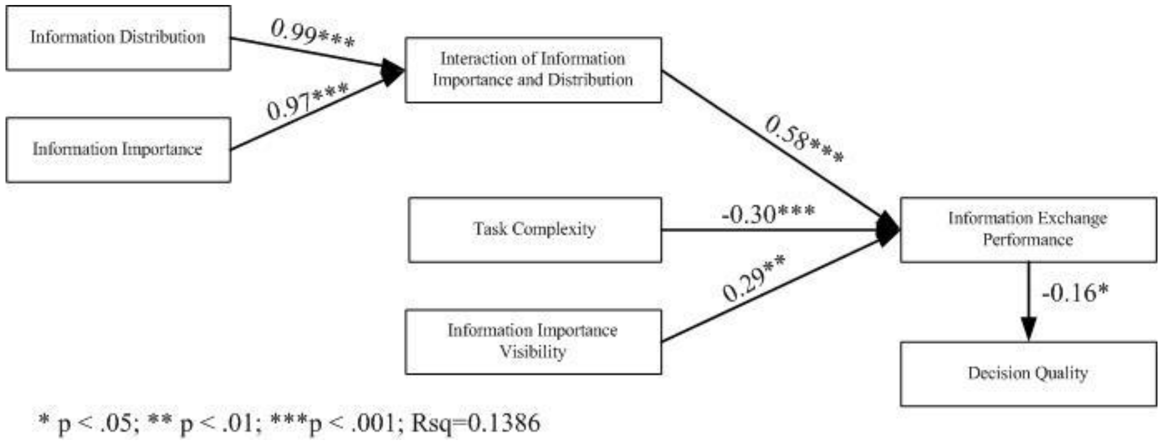


Figure 8.2 Empirical model for information exchange in distributed team discussions.

To further explore the path coefficients between information exchange performance and decision quality, Table 8.10 is computed to explore the number of teams that correctly identified the optimal decision. Only 6 out of the 42 teams correctly identified the optimal decision. Of the 36 teams that incorrectly identified the optimal decision, 21 of them were in the visible condition and the remaining 15 teams were in the invisible condition. This result suggests that the ability of team members to view importance ratings of other team members might have contributed to the selection of the wrong decision choice. This conclusion can be supported by the participants' comments stated earlier to assume that seeing importance ratings of other team members created an assumption that all the information is available to every team member.

Table 8.10 Right vs. Wrong Answer Selection by Teams

	Right Answer		Wrong Answer	
	Visible	Invisible	Visible	Invisible
Simple	2	2	10	7
Complex	1	1	11	8
Total	6		36	

An exploratory analysis to investigate teams that selected the wrong answers to see if there is a significant difference in importance ratings between subject matter experts and participants across the four conditions is shown in Table 8.11. The result shows that, across all the conditions, there is a significant difference in the importance ratings between subject matter experts and the team members that selected the wrong answers.

Table 8.11 Subject Matter Experts and Pre-discussion Importance Ratings

Simple	Complex	Visible	Invisible
M=3.37, SD=1.61	M=6.24, SD=2.81	M=4.94, SD=2.80	M=5.22, SD=2.78
t = 88.83, p < 0.001	t = 119.80, p < 0.001	t = 86.72, p < 0.001	t = 92.02, p < 0.001

8.4 Summary

Table 8.12 Summary of Hypotheses Test Results

	Hypotheses	Supported
H1	Teams that can view other team members' assessment of information importance will exchange a greater proportion of the more important information than teams that are not able to view other team members' assessment of information importance	No
H2	The overall exchange performance of teams that are able to view importance ratings of their team members will be higher than teams that are unable to view importance ratings of their team members	No
H3	Teams will exchange more shared information compared to partially shared information	Yes
H4	Teams will exchange more partially shared information compared to unshared information	Yes
H5	Teams will exchange more shared more important information compared to shared less important information	Yes
H6	Participants will exchange more important information (as determined by the judges) than less important information	Yes
H7	There will be a strong negative relationship between task complexity and information exchange performance	Yes
H8	There will be a strong positive relationship between information exchange performance and the possession of all the necessary information	Yes
H9	There will be a strong positive relationship between the exchange of necessary information and the selection of the optimal choice during discussion	Yes

This chapter presented results on the tests of hypotheses of factors that are associated with information exchange in technology mediated team discussions. All the nine hypotheses in this study were tested, using the information exchange research model presented in Section 3.4 of Chapter 3. A summary of the hypotheses and whether or not they are supported is presented in Table 8.12. In sum, this research found that teams exchanged a greater fraction of more important than less important pieces of information during discussion.

The self reported data from questionnaires administered after each task and at the end of the experiment suggest that perceived importance of information has a strong negative impact on its exchange in a technology mediated group discussion. Consistent with this finding, is the lack of support for the hypotheses that investigated the relationship between the use of a GSS that displays importance of information and the exchange of information. A possible interpretation of this finding is that the importance of information may trigger a subconscious assumption that, because the information is so important, it must be widely known, and that it is therefore not necessary to exchange during team discussion. This research found evidence to support a positive relationship between perceived information exchange and information use.

Table 8.13 below shows the result of a paired t-test conducted to test the difference between the importance ratings of the subject matter experts and the participants. The results show that there is a significant difference in how participants rated importance of information items they exchanged compared to the subject matter expert ratings.

Table 8.13 Paired t-test of the Difference in Importance Ratings

Difference:	Mean	df	t-value	Pr > |t|
Subject Matter Experts – Individual Participants	1.95	511	15.64	< 0.0001
Subject Matter Experts – Team Ratings	2.43	41	17.83	< 0.0001

Table 8.13 shows that the difference between subject matter expert ratings and both individual participants ratings before discussion, as well as the team ratings after discussion are significant. This result suggests that it is likely to discover a difference in the dynamics of information exchange performance if the importance ratings of participants are used in the analysis instead of the subject matter experts. This result may

also be considered as a possible explanation to the low R-squared value of the path analysis model.

The next chapter presents a discussion of results, limitations, conclusions and future work of this study.

CHAPTER 9

DISCUSSION, CONCLUSIONS AND FUTURE RESEARCH

9.1 Introduction

This chapter discusses the contributions and implications of the findings of the dissertation study on theory and practice. Future directions of research and additional work that needs to be done in the area of information exchange in groups, especially distributed groups will be discussed. This chapter will begin by discussing the implication of each hypothesis test, followed by a discussion of theoretical and practical implications. The chapter will conclude with discussions on future directions of the study.

9.2 Discussion

The objective of this study was to investigate the correlation between the importance and distribution of information and its exchange during team discussions. In order to conduct this investigation, this study pursued three research questions:

RQ1: To what extent does the importance of information correlate with its exchange in a team discussion?

RQ2: To what extent is the distribution of information among team members associated with information exchange in team discussions?

RQ3: Does the complexity of tasks seem to interact with the visibility of importance ratings in the GSS to mediate the exchange process in any way?

To answer these questions, a theoretical research model was proposed from a synthesis of prior hidden profile studies (Dennis, 1996; Stasser & Stewart, 1992; Stasser, et al., 1995). Previous research found teams that use group support systems during discussions focus more on shared than unshared information (Dennis, 1996). This dissertation study reports similar findings. Prior research explained group discussion using a dichotomous distribution of information model where a piece of information is either shared or unshared. This dissertation study includes an additional dimension to the distribution model—partially shared information—and shows that it is significantly associated with the exchange performance during discussions.

It was found in this study that teams exchanged more important information compared to less important information as measured by mentions during discussion, which supports the claim in this study that importance of information strongly affects the exchange process. It was also found that information exchanged among team members strongly correlates with its importance as well as its distribution. Specifically, results from this study show that teams exchanged the more important fraction of the three information dimensions than the less important fractions (see Table 8.4 in Chapter 8). This result therefore provides answers to the first two research questions (RQ1 and RQ2). More importantly, this finding is a major contribution to the information-sampling paradigm as it provides additional explanation to the dynamics of information exchange during team discussions. Prior studies have continually reported that unshared pieces of information are not exchanged during team discussions. However, this study shows that only the less important fraction of the unshared pieces of information tend not to be exchanged during discussion.

This research investigated the relationship between information exchange performance and the quality of team performance, measured by a team's selection of an optimal decision from a set of decision alternatives. Findings from this research confirm previous research that indicate that more information exchange does not necessarily increase performance in a group decision making process (Mennecke, 1997). It appears that the exchange of all the necessary and important information on its own does not automatically lead to better performance. However, it was found that the exchange of all necessary and important information strongly correlates with successful team performance. The path analysis showed a strong negative path coefficient between information exchange performance and decision quality in the structural equation model in Figure 8.2. One explanation might be the fact that teams had to come up with a decision during the discussion, as opposed to an asynchronous situation where teams would have more time to reflect and possibly come up with better decisions. Another possible explanation of this result might be due to the fact that only 6 out of 36 teams exchanged all the necessary information needed to identify the optimal decision alternative. An interpretation of this result might be that when a team spends a great deal of time exchanging information, they neglect to spend time making sense of it in order to arrive at an optimal decision. This highlights the importance of conducting multivariate analysis to test a research model, as only then can it be assessed for unique contributions of each variable in the model.

Studies show that technology mediated discussions can easily become overwhelming with a large amount of information (both important and less important) that is not effectively assessed, leading to sub-optimal decisions. A possible intervention from the findings in this research to reduce ineffective information use is to ensure that group members are able to collectively and dynamically assess information available to them during discussions. With this intervention in place, it becomes easier to compute and visualize the fraction of attention paid to information that is more or less important, which could improve decision making in teams. An application area of this intervention is on technology mediated communication platforms such as social networks, wikis, and micro-blogging services where groups of users interact with an immense amount of information to make decisions. The author expects that group support system designers will leverage this finding by developing visualizations for information exchange dynamics to serve as performance indicators to aid decision-making processes.

The results from the analyses reported in this research show a strong negative correlation between task complexity and information exchange performance, which confirms the initial predicted relationship. On the other hand, this reasearch found no evidence for a significant relationship between information exchange performance and the use of the tool devised to enable team members to view the information item assessment of fellow team members. It may be that the team members get caught up in discussion and neglect to check their ratings carefully.

Furthermore, this research found no evidence of a relationship between task complexity and the use of a GSS that enables team members to view information assessment of fellow team members, which provides the answer to the third research question. One possible interpretation of these findings is that information importance may trigger a subconscious assumption that, because the information is so important, it must be widely known, and that it is therefore not necessary to exchange, so information importance combined with the complexity of the task may affect information exchange negatively. These findings suggest teams tend to exchange a relatively smaller proportion of pieces of information when working on a complex task. Given that most practical problems are complex in nature, it might be instructive to structure computer-mediated discussions to emphasize the need for more information exchange.

9.3 Implications for Practice

This study has several implications for project managers that hope to encourage their teams to exchange and use information in organizational problem solving. Organization project team members are often selected based on the unique expertise and information they are believed to contribute to the team. It is believed that by exchanging this unshared information, the team will make optimal decisions (Dennis, 1996). This study however suggests differently: participants exchanged only a small portion of their unique information. More interestingly, participants exchanged more of the unshared information that was considered to be important. Thus, one implication for managers is that improving information exchange is an important initial step in improving organizational decision-making.

Another implication is, thus, to structure group meetings as a two-stage process where in the first stage, group members meet to identify all the ideas and related information about such ideas with a consensus on their relevance to the task at hand. The second stage of the meetings will then provide sufficient opportunity for group members to assess, discuss and agree on the importance of every piece of available information before they begin the decision making process. Structuring group meetings this way will give individuals in the group the opportunity to reassess the justification of their ideas in light of the group discussion.

Based on the findings that team members tend to change their opinion to reach consensus, recommender systems can be designed to capture opinion shifts of users before and after joining a conversation. The capture of such shifts in opinion can be leveraged by organizations to assess users' true perception of their experience with the product of interest.

Application designers can also leverage findings from this study to support group decision making by providing a mechanism for decision makers to dynamically assess the importance or relevance of discussion points in the decision making process. This approach may create transparency and encourage team members to exchange information that they consider to be relevant to the discussion, especially given that the tasks are more likely to be complex in nature.

It should be noted that H1 to H5 and H7 are negative factors influencing the accomplishment of better group decisions. It is also quite clear that the classical assumptions of information pooling problems are somewhat limited for applicability to the emergency management area, which is an application area of great interest for studies of information exchange as it relates to information importance and the quality of decision choices made. The author suggests the need for a new formulation of this type of problem to be used for a basis for future experimentation. Among the conditions that might be introduced are:

1. The introduction of surprise information, unknown ahead of time by any of the participants, which occurs at programmed points in the exercise. This is very characteristic of what happens in emergency situations. This would include the changing status of the specific event being dealt with in a time urgent manner.

2. A minimum of five person groups to allow the establishment of stable minority views (3 to 2) which is also common in emergency situations.

3. Ratings of the importance of information and the alternative solutions being proposed through the exercise with the ability for participants to change their vote at any time.

4. Specific time limited problems spanning the time of the exercise. The participants might take on roles in the exercise.

A good example may be found in (White, Turoff & Walle, 2007), for which the task is deciding which of many requesting organizations in an emergency should get a much smaller number of available emergency generators delivered.

9.4 Limitations

This dissertation study suffers from the usual limitations of laboratory experiments (McGrath, 1984). For instance, this study was unable to examine the influence of uncertainty associated with the information possessed by participants on how they exchange it. The literature suggests that such variables might be important. Secondly, as a laboratory experiment using student subjects who had not previously worked together as a team, the generalizability to organizational teams is unknown. There may be contextual factors (e.g., social and political factors) that could affect how information exchange occurs in teams, which may result in different findings from those presented in this study.

Analyses were conducted based on the importance ratings of subject matter experts. It was found that there is significant difference between the importance ratings of subject matter experts and participants during the experiment. Additional analyses will be conducted with the use of subjective importance ratings of each participant and how that may relate to what information is exchanged.

Finally, importance of pieces of information was explicitly manipulated in this experiment and attention was called to it by having participants repeatedly rate importance. If importance were not rated, it might not come into play in all groups.

9.5 Implications for Research

There are several implications for future research. Initially, predictions from prior information sampling theories found support only for the distribution of shared and unshared information. This study includes a third distribution condition—partially shared information—and shows that it is significantly relevant to the exchange dynamics during discussions. New theories of information sampling need to consider how partially shared information may impact team performance. The results from this study suggest that if at least two people have the information, it is much more likely to be discussed than if only one person does. The category of partially shared information, rather than only not shared at all or shared by all members before discussion, is likely to be a frequently occurring circumstance in actual project groups.

Prior research focused mainly on the dynamics of the distribution of information that impacts its exchange. Findings from this study suggest that additional research is needed to investigate and understand various ways in which importance of the information being exchanged among team members can be dynamically elicited and integrated into team discussions. It has been speculated that the importance of information may influence how it is exchanged during team discussions (Stasser & Stewart, 1992; Stasser, et al., 1995). This study provides empirical evidence for the correlation of importance to its exchange during team discussions. The author calls on researchers to test this theory in other application domains.

This research found no support for the effect of the visibility of importance ratings during discussion, as manipulated by the tool devised for this study. Moreover, the results from this study indicate that this display may actually cut down on discussion.

More research is needed on how to structure a group support tool to make the relative importance of various pieces of information more salient as a topic of discussion.

Although this research found that participants exchanged more of the unshared information that was considered more important, additional work is needed to examine strategies to stimulate the exchange of this information during team discussions.

Information systems are generally conceived as a collection of best practices model (Boland & Yoo, 2003), which puts an emphasis on data storage. This study has however confirmed Weick’s (1995) suggestion that more information does not necessarily lead to better decision-making. Information systems should therefore be designed to connect people, to stimulate reflection and the quality of interaction, and to support building the team’s own identity rather than the current focus on the search for and storage of information. A practical implication of this finding is that it could be more important to focus on the processing of existing information than the collection of new assessment information, also because the exchange of the appropriate amount of necessary information was found to support better performance than when all the necessary information is exchanged. To enable better performance, it is thus imperative to change the usual quantitative information gathering notion that “more is better” and embrace a qualitative and interpretive information processing focused model of information and knowledge exchange.

Results from this dissertation show that group members tend to exchange a higher proportion of important information when working on simpler tasks compared to complex tasks. Given that most tasks that require group effort are complex in nature, additional research is also needed to explore ways to instigate group members to exchange more important information when working on complex tasks.

9.6 Summary

This Chapter concludes this dissertation by discussing contributions and implications of findings in the study conducted for theory and practice. Future work in the area of research studied in this dissertation was also discussed. In conclusion, the answers to the research questions that guided the research study are presented.

9.6.1 Research Question 1

RQ1: To what extent does the importance of information correlate with its exchange in a team discussion?

The answer to this problem is based on the findings in Chapter 8, that the importance of information has a significant main effect in the analysis of variance of the research variables. Furthermore, the structural model analysis shows that importance of information is strongly related to information exchange performance.

9.6.2 Research Question 2

RQ2: To what extent is the distribution of information among team members associated with information exchange in team discussions?

The answer to this problem is based on the finding in Chapter 8, that the distribution of information has a significant main effect in the analysis of variance of the research variables. In addition, the structural model analysis shows that distribution of information is strongly related to information exchange performance. Shared information is exchanged the most, followed by partially shared information and unshared information is exchanged the least.

9.6.3 Research Question 3

RQ3: Does the complexity of tasks seem to interact with the visibility of importance ratings in the GSS to mediate the exchange process in any way?

The answer to the last research question is based on the result of the first two hypotheses where this study found no support for the interaction effect of task complexity and the visibility of importance ratings during team discussions. Future studies will investigate this interaction further to gain additional insights into an explanation for the result.

9.7 Summary of Contributions

First, this dissertation developed a theoretical framework contributing to the body of theories that explain a phenomenon of an information system (Weber, 2003), as well as its design. The framework explicates the relationship between four factors (technology, information, human, and task characteristics) and information exchange processes as well as the resulting team performance. This framework is a contribution to the understanding of the possible factors that may relate to information exchange processes as well as the team performance.

The framework operationalized theoretical constructs of technology, information, and task characteristics in team information exchange, and predicted relationships between information exchange processes and team performance. A good fit between the research model and data from the experiment was established, and provides validated insights on how importance of information and its distribution affected the predicted information exchange performance and team performance during discussions among distributed team members.

The research method used in this dissertation highlighted the practical issues and challenges in running hidden profile experiments within the existing information-sampling paradigm. This dissertation presented a new approach for investigating hidden profile experiments with more practical implications than the classical information sampling paradigm (Stasser & Stewart, 1992; Stasser, et al., 1995). More specifically, this study included a third dimension of information related factor—partially shared information—and empirically validated its association with information exchange performance as well as team performance during discussions. A second practical issue investigated in this dissertation was that of the importance of information that is discussed. This study also validated a strong main effect of the interaction between importance and distribution of information during discussions in distributed teams. The lessons learnt regarding study design, including instrument development, participant recruitment, participant commitment, data collection and analysis used to address research questions in this dissertation, provide valuable practical information for running large scale studies in general.

Finally, this research program has developed a hidden profile study design and a pair of tasks, which can be used by other researchers to simulate organizational information sharing in a laboratory setting. The task is more realistic and interesting for information systems professionals and students than most of the tasks used in prior hidden profile studies, in the author's opinion. These materials can be used in order to gain more insights into information and knowledge flow structure and how to better structure these processes, in the MIS domain.

In sum, this dissertation contributes to the field of Information Systems by providing a framework to understand the association of information importance and its distribution with the exchange of information in a distributed team decision-making environment. Most importantly, this dissertation study extends the information-sampling theory as it provides a validated extension of its affordances to explain practical characteristics that are associated with information exchange processes. This study also contributes to the group decision support literature by providing empirical evidence for the influence of task complexity on information exchange in computer-mediated communications.

9.8 Future Work

The findings of the empirical studies in this dissertation not only provided important insights to the research questions raised, but also made interesting discoveries that pave the way for future research directions.

Future research could use this framework to further explore how information systems, organizational structures, task characteristics, individual and social factors relate to the exchange of information. Research should determine how best to instigate the exchange and use of unshared important information during discussions in distributed teams. This research is relevant across several domains, especially in this global era where organizations are increasingly using communication technologies both for business and regular activities.

In this dissertation study, only aspects of three out of four factors that may associate with information exchange and team performances were investigated. As shown in Figure 9.1, additional study should be done to fully explore the association of human factors in different contexts with information exchange processes and team performance.

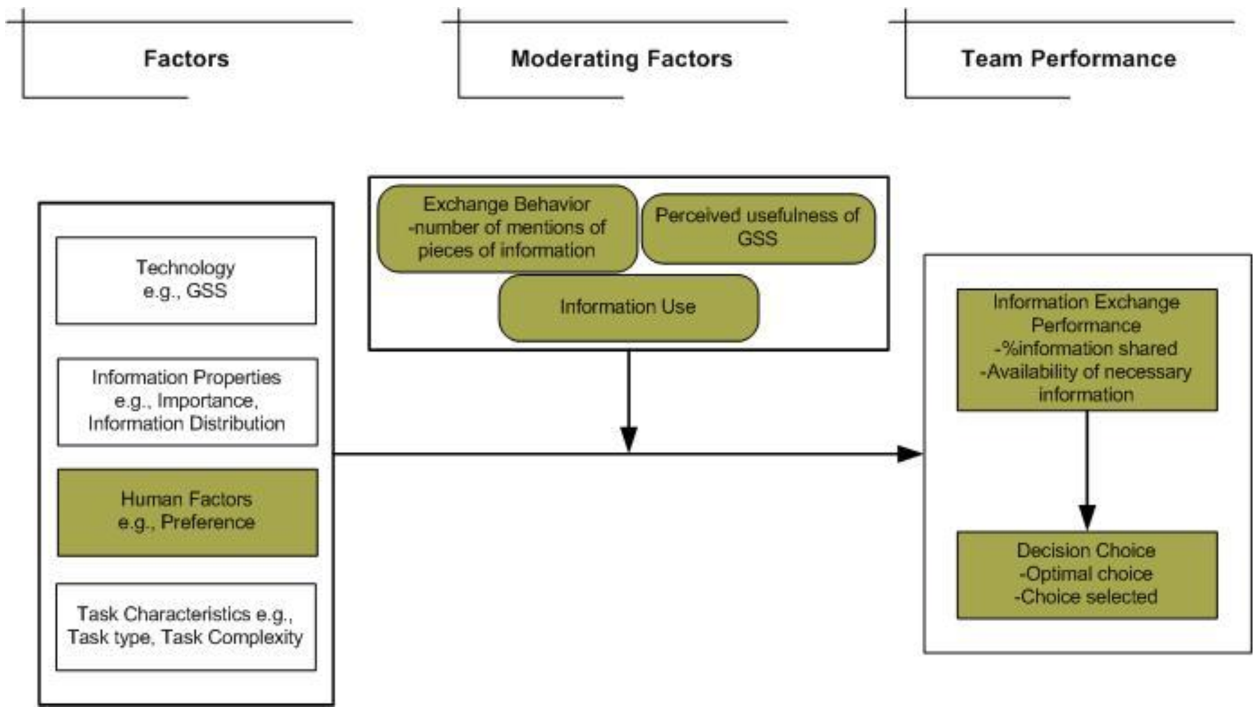


Figure 9.1 Framework for future research directions.

Taking a broader approach, future studies could explore all four factors in different contexts to measure and identify their relationship with information exchange and team performance. For instance, a study could seek to examine the association of human factors and task characteristics on information exchange and use during discussions in distributed teams. Another study could investigate how perceived usefulness of a group decision support system may correlate with the exchange and use of information during discussions in distributed teams. One could also look at how individual ratings of importance relate to information exchange. Future explorations could also examine the extent to which decision quality varies with the fraction of necessary information exchanged during discussion.

Future work should also conduct the same or a similar experiment using a “four group design”(Solomon, 1949) in which half of the participants in all conditions work on their tasks without requiring them to begin with rating importance of the different pieces of information. The results from such a study can then be compared with results from this study to see whether or not importance plays a role during group decision-making in virtual teams, even without calling attention to this dimension of information by asking for explicit ratings.

In the light of the significance of identifying and collectively assessing importance of information in group decision making, the new approach to conducting hidden profile experiments described in this dissertation could be adapted to investigate discussion dynamics in social systems such as micro-blogging sites, social network sites, discussion forums, and online blogs. This research found from this dissertation that increasing information exchange performance correlates with better team performance. Hence, upon developing an understanding of discussion dynamics on different discussion platforms, tools can then be built to give feedback on information exchange performance in order to maintain the focus of the discussions as well as steer the team towards better outcomes.

APPENDIX A

INFORMATION IMPORTANCE RANKING

This appendix presents the information categories that were provided to the participants for rating for each case (including the practice case). Also included in this appendix is the information distribution for each of the candidates in all the experimental cases.

Rank each case category in Table A.1 in order of importance, where 1 is the least important and 7 = most important for cases 1 and 2, 16 = most important for case 3.

Table A.1 Expert Ratings of Information Importance

Case 1	Rank	Case 2	Rank	Case 3	Rank
Education, School, Year of Graduation		Screen display size		Personality	
GPA		Call Waiting		Current position held, duration	
Programming language		Network (e.g., 3G/4G)		Prior position held, duration	
Last 2 positions held & duration		Weight		Marital status	
Personality		Keyboard		Children	
Age		Camera		Programming language	
Community service		Battery life		Extracurricular activities	
Extracurricular activities				Education, School	
				Community Service	
				Resident status	
				Leadership style	
				Promptness	
				Age	
				Gender	
				GPA	
				Place of Residence	

Practice Case: Dessert order

Table A.2 Dessert Nutrient Matrix

	Desserts		
Characteristic	Apple pie	Chocolate cake	Fresh fruit salad
Gluten content	Gluten free	High	Gluten free
Quantity in stock	55	60	50
Calories	500	600	120
Cost per serving ($)	2	3	4.0
Sugar content	8	10	7

Case 1: Job description

Table A.3 Expert Ratings of Job Candidate Characteristics

	Candidates		
Characteristic	Amy	Bob	Chris
Education, School, Major, Year of Graduation	BSc, University of Michigan, Information Systems, May 2010	BSc, Carnegie Mellon Uni., Information Tech., June 2007	BSc, Monroe County College, Computer Science, March 2009
Programming language	Java, C++, DB Admin	Pascal, C, Fortran	C/C++, DB Admin, Java
Personality	Quiet	Friendly	Great communicator
Age	21	26	25
GPA	3.9	3.0	2.2
Last 2 positions held, Duration	Customer Service, Jan08-Dec08; IT Helpdesk, Jun10--Present	System Admin, Feb07-Mar09; IT Manager, April 09--Present	Web Designer, Jan09-Mar09; Tech. Support, July10--Present
Hobbies	Biking	Poker	Bird-watching
Community Service	Emergency Rescue Squad	City council	Habitat for humanity

Case 2: Phone for Social Networking

Table A.4 Expert Ratings of Candidate Phone Functionalities (*GPRS: General packet radio service, is a very slow network)

	Candidates		
Characteristic	Alpha	Beta	Kappa
Network (e.g., 3g/4g)	3g	4g	GPRS*
Keyboard	Qwerty	Calculator	Qwerty
Screen Size	128x128	240x320	260x340
Camera	5megapixel	1.3megapixel	0.5megapixel
Battery life	4hrs	7hrs	1.5hrs
Call Waiting	Yes	No	Yes
Weight (ounces)	1.5	3	1.5

Case 3: Lay off task

Table A.5 Expert Ratings of Candidates: Lay off Task

	Candidates		
Characteristic	Pat	Sara	Jim
Personality	Friendly	Reclusive	Quiet
Current position held, duration	Java programmer, 2 years	Web developer, 1.5 years	Help desk, 1 year
Prior position held, duration	Java/C++ programmer, 5 years	Helpdesk, 6 months	Tech. support, 3 months
Marital status	Single	Single	Divorced
Children	None	One	One
Programming language	Java/C++, DB Admin	Web publishing	Fortran
Extracurricular activities	Biking	Bird-watching	Poker
Education, School	BSc, MIT	BSc, Harvard	BSc, Uni of Texas
Community Service	Emergency Rescue Squad	City Council	Habitat for humanity
Resident Status	Work permit (H-1B)	US Citizen	US Resident
Leadership style	Autocratic	Autocratic	Democratic
Promptness	Late	Prompt	Sometimes Late
Age	48	31	23
Gender	Female	Female	Male
GPA	2.5	3.8	3.0
Place of residence	Country	Suburb	City

Rank candidates for each case based on the characteristic information provided in Table A.3, A.4, and A.5.

Table A.6 Expert Ratings of Candidates

	Rank (1st choice, 2nd choice, 3rd choice)		
Candidate	Case 1	Case 2	Case 3
First candidate			
Second candidate			
Third candidate			

APPENDIX B

PRE-EXPERIMENT SURVEY

This appendix describes the survey instrument used to gather demographic information about participants before scheduling them for the experiment.

Time/Date: ____________________

1. Name: ___________________
2. UCID:___________________
3. E-mail: __________________
4. Age: _____________________
5. Gender: Female /Male
6. Student Status: Full-Time/Part-Time
7. Year of School: Freshman/Sophomore/Junior/Senior/Graduate
8. Major: ________________
9. Occupation: Full-Time/Part-Time
10. Job type (IT-related) and duration
11. Experience with personnel selection
12. Of what country are you a citizen?
13. Through what course will you be participating in this study?
14. The final question will be a list of days and time for participation, and they will be asked to check all times at which they could come to the laboratory

APPENDIX C

POST - CASE SURVEY

This appendix describes the post case survey instrument used to capture participants' experience after each case, with the information exchange processes during the experiment.

Task

The selection task was:

Boring			Neutral			Interesting
1	2	3	4	5	6	7

Realistic			Neutral			Unrealistic
1	2	3	4	5	6	7

Too Easy			Neutral			Too Hard
1	2	3	4	5	6	7

Information usage

To what extent did the information contributed by others cause you to re-evaluate your choice?

Very Much			Neutral			Not At All
1	2	3	4	5	6	7

To what extent did something someone else contributed make you take a second look at your choice?

Very Much			Neutral			Not At All
1	2	3	4	5	6	7

To what extent did the information contributed by others affect your decision?

Very Much			Neutral			Not At All
1	2	3	4	5	6	7

Information importance

I am not sure that all the information that others contributed was important

Strongly Agree Neutral Strongly Disagree

1 2 3 4 5 6 7

Some people did not contribute important information

Strongly Agree Neutral Strongly Disagree

1 2 3 4 5 6 7

I am not sure team members completely shared all their important information

Strongly Agree Neutral Strongly Disagree

1 2 3 4 5 6 7

I am convinced that all the information everyone contributed was important

Strongly Agree Neutral Strongly Disagree

1 2 3 4 5 6 7

Usefulness of GSS

The systems used for accomplishing this task for your team, was:

Easy to use Neutral Hard to Use

1 2 3 4 5 6 7

Very Helpful Neutral Not Helpful At All

1 2 3 4 5 6 7

The design of the layout and display of the system (TIES) was:

Simple Neutral Complex

1 2 3 4 5 6 7

Useful			Neutral			Useless
1	2	3	4	5	6	7

APPENDIX D

POST - EXPERIMENT SURVEY

This appendix presents the survey instrument used to gather feedback on the procedures and completeness of the instructions available to participants during the experiment.

For me the experimental procedures were

Completely clear Neutral Completely confusing

1 2 3 4 5 6 7

Please describe any instructions that were not clear to you: ____

The amount of specialized instruction and practice that was given was:

Complete Neutral Incomplete

1 2 3 4 5 6 7

Sufficient Neutral Insufficient

1 2 3 4 5 6 7

APPENDIX E

PRE-DISCUSSION ALGORITHM FOR DISTRIBUTION OF INFORMATION

This appendix describes the pre-discussion algorithm for distributing information among teams for all the experimental cases in the study.

Table E.1 Distribution of Pre-Discussion Information for Cases 1 and 2

	Candidates			Information received by participant			
Characteristic	A	B	C	1	2	3	4
Important	Positive	Positive	Negative	Y	Y	Y	Y
Important	Positive	Negative	Positive	Y	Y	Y	Y
Less important	Neutral	Positive	Positive	Y	Y	Y	Y
Less important	Neutral	Positive	Positive	Y	N	Y	N
Important	Positive	Neutral	Negative	Y	N	N	N
Important	Neutral	Positive	Negative	N	Y	N	Y
Less important	Neutral	Negative	Neutral	N	N	Y	N
Less important	Positive	Neutral	Positive	N	N	N	Y

Table E.2 Distribution of Pre-Discussion Information for Case 3

	Candidates			Information received by participant			
Characteristic	Pat	Sara	Jim	1	2	3	4
Less important	Positive	Negative	Neutral	Y	Y	Y	Y
Important	Positive	Positive	Negative	Y	N	Y	Y
Important	Positive	Negative	Negative	N	Y	N	Y
Less important	Positive	Positive	Neutral	Y	Y	Y	Y
Less important	Positive	Neutral	Neutral	Y	N	N	N
Important	Positive	Negative	Negative	Y	N	N	Y
Less important	Positive	Neutral	Negative	Y	N	Y	N
Important	Positive	Positive	Neutral	N	Y	N	N
Less important	Positive	Negative	Positive	N	N	Y	Y
Important	Neutral	Positive	Positive	Y	Y	Y	Y
Important	Negative	Negative	Neutral	N	N	Y	N
Important	Negative	Positive	Neutral	N	N	N	Y
Less important	Negative	Neutral	Positive	Y	N	N	N
Less important	Negative	Neutral	Positive	Y	Y	Y	Y
Important	Negative	Positive	Neutral	N	N	N	Y
Less important	Negative	Neutral	Positive	Y	Y	Y	Y

APPENDIX F

TASK DESCRIPTION

This appendix presents the description of each of the objective of the tasks used in the experiment.

Practice Task

Your club at NJIT is planning a dinner meeting to give awards and have a program for about 50 people. You can order only the same dessert for everybody. Which dessert should you order?

Case 1: Job Description

LADE is an IT firm that specializes in installing and managing IT systems such as library computers, ATMs, and vending machines. The firm is in need of a systems analyst to help with the development of a new technology that will allow the firm to better manage its processes. An ideal candidate for this job will have the following qualifications: Knowledge of Java programming language, experienced programmer, database designer and administrator, system architecture, and usability designer. Management skill and experience with gathering user requirements are necessary.

Case 2: Phone for Social Networking

The marketing team of a phone manufacturing company is about to roll out a new generation phone (based on popular demand) that will enable users to carry out social networking activities. An ideal phone will have fast Internet connectivity, easy to chat and post comments, good picture quality, and long battery life among other functionalities.

Case 3: Laying off a member of a web development team in a software company

As a result of budget cuts in a software development company, one of three programmers in the web development team needs to be fired in order to continue business and prevent bankruptcy. An ideal candidate to fire will be one with the least impact on the performance of the business.

APPENDIX G

EXPERIMENT PROTOCOL & CHECKLIST

1. [Investigator] Send out the invitation letter to potential subjects
2. Setup Session Checklist, network connection for each compute, server connection for the online group support system

3. For extra credit in your current course, you are invited to participate in an experiment using a group support system. There are two tasks to be completed in total. Before we proceed to the first case, we would like you to first do a simple practice task to get familiar with the system and the procedure.

4. When you begin your task, we will keep record of your forum discussion for further analysis. All your information will be kept confidential, and only the investigator has accessibility to these records. The transcripts of your conversation will be erased after the analysis.

5. Please treat the case as real as possible. Please also be aware that we are here to evaluate the online group support system and the realism of the tasks, not your computer skills. If there is any difficulty carrying out the tasks, it is the system's fault, not yours. If you encounter any system problem during the process, please do not hesitate to ask the investigator.

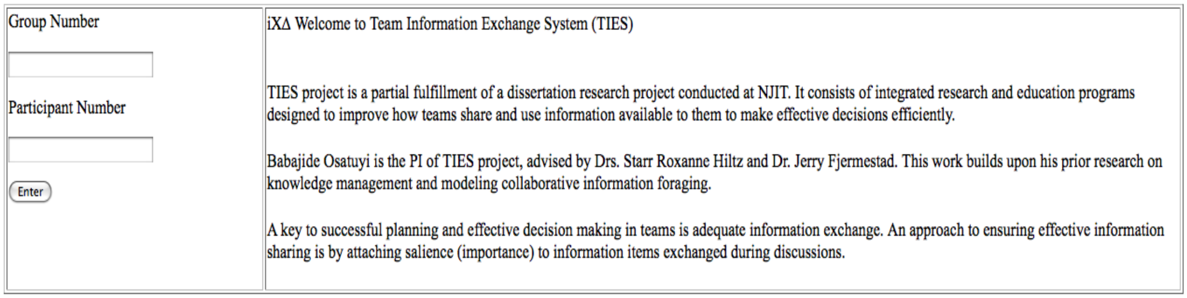
6. The estimated time for completing one case is 20 to 40 minutes, depending on the team's performance. You will be given 10 minutes to do the practice case.

7. There are two post case questionnaires and after you complete both cases, you are invited to fill out a short post-experiment questionnaire concerning the experiment. Then you will be gathered and debriefed.

8. You will be sent links to the consent form, pre-experiment questionnaire, post-case questionnaire for both cases and post-experiment questionnaire via email. Please click the link for "Consent form," read it and carefully sign it online. If you have any questions about the questionnaire, please do not hesitate to ask the investigator.

9. (After the consent form is filled out). OK, now let us go back to the TIES workspace. As part of the introduction, we are going to do a simple practice case to get familiar with this online group support system. The task has to be done by a four-member team. The investigator will tell you your team number and each member's participant number.

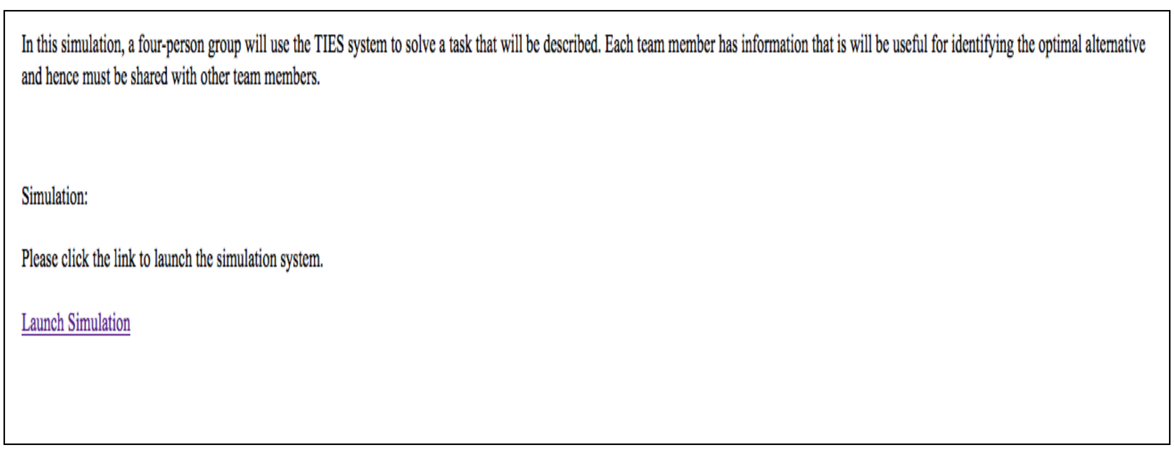
10. (After all participants know their participation numbers). Now please people in the same team, go to your assigned computer terminal and log in.



11. Now it is time to do the practice case. If you have any questions, please ask the investigator.

12. [Investigator] Team ID, case number, and treatment will be assigned to each subject.

13. (After the teams complete the practice test). We now have an idea of how TIES works. If you have any questions, please ask the investigator……..OK, it looks like we are good to go. Now we can start working on Case 1. Here are the cards with your name and team ID (Investigator distributes the cards to the participants). Now please people in the same team go to your assigned cubical. (After everyone is seated). Please go back to TIES workspace. [Navigate to Launch simulation].



14. (After teams complete Case 1). Thank you very much! Now please click on the post-case questionnaire and fill it out.

15. (After teams complete the post-case questionnaire). Now proceed to Case 2

16. (After teams complete Case 2). Thank you very much! Now please click on the post-case questionnaire and fill it out.

17. Thank you very much! Now please click on the post-experiment questionnaire and fill it out.

18. [Investigator] Team members are gathered and debriefed. Thanks again, and I'll see you some other time.

19. [Investigator] Backup experiment date on the server

20. [Investigator] Update the assignment in the user configure file.

APPENDIX H

DEBRIEFING

Upon completion of the experiments, participants will be assembled in the same room for debriefing.

1. Participants will be asked to give feedback on their experience during the experiment
2. The goals of the research will be presented as follows:
    a. The first goal of the research program is to produce a process-level theory about information exchange in decision making teams. The theory will be expressed in computer-executable form and evaluated via experimentation with undergraduate and graduate students at NJIT. Future experiments will be conducted with professionals with experience in team decision making.

    b. The second goal, which is beyond the scope of this dissertation, is to integrate the computable theory into a prototype group decision support system, whose impact on decision making will be evaluated via experimentation in a computer-based environment.
3. Participants will be given the opportunity to ask questions about the research.
4. Design of the experiment used in the current study will be discussed.
5. Theoretical model for the study will be explained with emphasis on the expectation that information distribution and importance to affect group process and outcome.
6. Finally, participants will be told not to discuss the research with anybody else since the experiment is still in progress.

APPENDIX I

RESULTS

This appendix presents the results of the analyses conducted to test the hypotheses as well as the exploratory analyses not discussed in the dissertation.

Table I.1 Pearson Point Bi-serial correlation test of the visibility conditions

Variables Fractions of:		Visible Information Importance $N = 21$	Invisible Information Importance $N = 21$
Exchange	Mean	0.571	0.429
Performance	SD	0.507	0.507
		Visible vs. Invisible	
	Point bi-serial correlation	-0.14	
	t-test, significance	-0.83, $p > .05$	
Total Information	Mean	0.403	0.343
Shared	SD	0.231	0.183
		Visible vs. Invisible	
	Point bi-serial correlation	-0.15	
	t-test, significance	-0.88, $p > .05$	
Shared	Mean	0.536	0.517
Necessary	SD	0.309	0.322
Information		*Visible vs. Invisible*	
	Point bi-serial correlation	-0.03	
	t-test, significance	-0.18, $p > .05$	
Unshared	Mean	0.218	0.219
Information	SD	0.152	0.156
		Visible vs. Invisible	
	Point bi-serial correlation	0.003	
	t-test, significance	0.02, $p > .05$	
Partially	Mean	0.429	0.381
Shared	SD	0.321	0.312
Information		*Visible vs. Invisible*	
	Point bi-serial correlation	-0.08	
	t-test, significance	-0.47, $p > .05$	
Shared	Mean	0.571	0.442
Information	SD	0.336	0.295
		Visible vs. Invisible	

Variables Fractions of:		Visible Information Importance $N = 21$	Invisible Information Importance $N = 21$
	Point bi-serial correlation	-0.21	
	t-test, significance	-1.19, $p > .05$	
More Important Information	Mean	0.529	0.439
	SD	0.298	0.253
		Visible vs. Invisible	
	Point bi-serial correlation	-0.16	
	t-test, significance	-1.19, $p > .05$	
Less Important Information	Mean	0.255	0.225
	SD	0.217	0.179
		Visible vs. Invisible	
	Point bi-serial correlation	-0.08	
	t-test, significance	-0.48, $p > .05$	
Shared More Important Information	Mean	0.611	0.476
	SD	0.359	0.339
		Visible vs. Invisible	
	Point bi-serial correlation	-0.19	
	t-test, significance	-1.13, $p > .05$	
Shared Less Important Information	Mean	0.492	0.373
	SD	0.442	0.321
		Visible vs. Invisible	
	Point bi-serial correlation	-0.16	
	t-test, significance	-0.92, $p > .05$	
Unshared Less Important Information	Mean	0.089	0.108
	SD	0.194	0.183
		Visible vs. Invisible	
	Point bi-serial correlation	-0.05	
	t-test, significance	-0.33, $p > .05$	
Unshared More Important Information	Mean	0.425	0.381
	SD	0.373	0.368
		Visible vs. Invisible	
	Point bi-serial correlation	-0.06	
	t-test, significance	-0.37, $p > .05$	
	Mean	0.327	0.295

Variables Fractions of:		Visible Information Importance *N* = 21	Invisible Information Importance *N* = 21
Partially Shared			
Less	SD	0.395	0.352
Important		*Visible vs. Invisible*	
Information	Point bi-serial correlation	-0.04	
	t-test, significance	-0.33, $p > .05$	
Partially Shared	Mean	0.531	0.467
More	SD	0.371	0.427
Important		*Visible vs. Invisible*	
Information	Point bi-serial correlation	-0.08	
	t-test, significance	-0.49, $p > .05$	
Decision	Mean	0.381	0.619
Quality	SD	0.492	0.498
		Visible vs. Invisible	
	Point bi-serial correlation	0.24	
	t-test, significance	1.73, $p > .05$	

Table I.2 Pearson Point-biserial correlation test: Task Complexity Conditions

Variable Fractions of:		Simple Task *N* = 21	Complex Task *N* = 21
Exchange	Mean	0.667	0.333
Performance	SD	0.483	0.483
		Simple vs. Complex	
	Point-biserial correlation	-0.14	
	t-test, significance	-0.83, $p > .05$	
Total Information	Mean	0.458	0.288
Shared	SD	0.232	0.142
		Simple vs. Complex	
	Point-biserial correlation	-0.41*	
	t-test, significance	-2.19, $p < .05$	
Shared	Mean	0.608	0.444

Variable Fractions of:		Simple Task $N = 21$	Complex Task $N = 21$
Necessary Information	SD	0.323	0.284
		Simple vs. Complex	
	Point-biserial correlation	-0.26	
	t-test, significance	-1.46, $p > .05$	
Unshared Information	Mean	0.222	0.214
	SD	0.205	0.074
		Simple vs. Complex	
	Point-biserial correlation	-0.026	
	t-test, significance	-0.16, $p > .05$	
Partially Shared Information	Mean	0.516	0.294
	SD	0.369	0.199
		Simple vs. Complex	
	Point-biserial correlation	-0.39**	
	t-test, significance	-2.08, $p < .05$	
Shared Information	Mean	0.656	0.357
	SD	0.296	0.272
		Simple vs. Complex	
	Point-biserial correlation	-0.47*	
	t-test, significance	-2.47, $p < .05$	
More Important Information	Mean	0.615	0.354
	SD	0.301	0.175
		Simple vs. Complex	
	Point-biserial correlation	-0.48*	
	t-test, significance	-2.49, $p < .05$	
Less Important Information	Mean	0.302	0.178
	SD	0.216	0.159
		Simple vs. Complex	
	Point-biserial correlation	-0.32	
	t-test, significance	-1.86, $p > .05$	
Shared More Important Information	Mean	0.659	0.429
	SD	0.301	0.367
		Simple vs. Complex	
	Point-biserial correlation	-0.33	
	t-test, significance	-1.82, $p > .05$	

Variable Fractions of:		Simple Task $N = 21$	Complex Task $N = 21$
Shared Less	Mean	0.651	0.214
Important	SD	0.415	0.184
Information	Mean Rank	27.38	15.64
		Simple vs. Complex	
	Point-biserial correlation	-0.57*	
	t-test, significance	-2.89, $p < .05$	
Unshared Less	Mean	0.056	0.143
Important	SD	0.133	0.223
Information		*Simple vs. Complex*	
	Point-biserial correlation	0.24	
	t-test, significance	1.72, $p > .05$	
Unshared More	Mean	0.556	0.25
Important	SD	0.475	0.007
Information		*Simple vs. Complex*	
	Point-biserial correlation	-0.42*	
	t-test, significance	-2.24, $p < .05$	
Partially Shared	Mean	0.444	0.178
Less	SD	0.439	0.226
Important		*Simple vs. Complex*	
Information	Point-biserial correlation	-0.36**	
	t-test, significance	-1.97, $p < .05$	
Partially Shared	Mean	0.587	0.410
More	SD	0.493	0.249
Important		*Simple vs. Complex*	
Information	Point-biserial correlation	-0.22	
	t-test, significance	-1.29, $p > .05$	
Decision	Mean	0.381	0.619
Quality	SD	0.492	0.492
		Simple vs. Complex	
	Point-biserial correlation	0.24	
	t-test, significance	1.73, $p > .05$	

***Significant at the 0.05 level (1 & 2-tailed)**
****Significant at the 0.05 level (2-tailed)**

APPENDIX J

RESPONSE FREQUENCIES OF SURVEY QUESTIONS

This appendix presents the response frequencies for the pre-experiment, post-case and post-experiment survey variables measured using an interval scale.

Table J.1 Frequency Distributions for Pre-Experiment Survey Variables

Variables		Response Frequencies 1	2	3	4	5	6	7	Total
Computer Efficacy									
I could complete a task using a computer if there was no one around to tell me what to do	Count	49	18	10	7	4	4	4	96
	Row N %	51.04	18.75	10.42	7.29	4.17	4.17	4.17	100
I could complete a task using a computer even if there was not a lot of time to complete it	Count	32	21	13	26	3	2	0	97
	Row N %	32.99	21.65	13.40	26.80	3.09	2.06	0.00	100
I could complete a task using a computer if I had the built-in help facility for assistance	Count	36	18	13	15	9	6	0	97
	Row N %	37.11	18.56	13.40	15.46	9.28	6.19	0.00	100

Table J.2 Frequency Distribution for Post-Case Survey Variables

		Response Frequencies							
Variables		1	2	3	4	5	6	7	Total
Information Use									
To what extent did the information contributed by others cause you to re-evaluate your choice	Count	31	30	47	22	17	9	7	163
	Row N %	19.02	18.40	28.83	13.50	10.43	5.52	4.29	100
To what extent did something someone else contributed make you take a second look at your choice	Count	25	33	53	25	12	11	4	163
	Row N %	15.34	20.25	32.52	15.34	7.36	6.75	2.45	100
To what extent did the information contributed by others affect your decision	Count	21	25	50	32	18	10	7	163
	Row N %	12.88	15.34	30.67	19.63	11.04	6.13	4.29	100
Information Exchange									
How do you feel about the process by which your team made its decision	Count	57	40	33	24	4	3	2	163
	Row N %	34.97	24.54	20.25	14.72	2.45	1.84	1.23	100
How do you feel about the team's discussion	Count	61	49	29	11	7	4	2	163
	Row N %	37.42	30.06	17.79	6.75	4.29	2.45	1.23	100
To what extent did you enjoy participating in this meeting	Count	72	47	26	11	3	0	4	163
	Row N %	44.17	28.83	15.95	6.75	1.84	0.00	2.45	100
All in all, how do you feel about the team's decision	Count	75	51	20	12	2	1	2	163
	Row N %	46.01	31.29	12.27	7.36	1.23	0.61	1.23	100
Information Importance									
How do you feel about the process by which your team made its decision	Count	45	30	17	32	15	13	11	163
	Row N %	27.61	18.40	10.43	19.63	9.20	7.98	6.75	100
How do you feel about the team's discussion	Count	52	37	17	25	12	12	8	163
	Row N %	31.90	22.70	10.43	15.34	7.36	7.36	4.91	100
To what extent did you enjoy participating in this meeting	Count	53	37	15	17	16	12	13	163
	Row N %	32.52	22.70	9.20	10.43	9.82	7.36	7.98	100
All in all, how do you feel about the team's decision	Count	57	37	29	20	10	8	2	163
	Row N %	34.97	22.70	17.79	12.27	6.13	4.91	1.23	100

Table J.3 Frequency Distribution for Post-Experiment Survey Variables

Variables		Response Frequencies							Total
		1	2	3	4	5	6	7	
Experimental Procedure and Feedback									
The amount of specialized instruction and practice that was given was complete	Count	62	15	9	1	1	0	0	88
	Row N %	70.45	17.05	10.23	1.14	1.14	0.00	0.00	100
The amount of specialized instruction and practice that was given was sufficient	Count	65	11	6	2	4	0	0	88
	Row N %	73.86	12.50	6.82	2.27	4.55	0.00	0.00	100
Feedback on the System									
The systems (TIES and Skype) used for accomplishing this task for your team was easy or hard to use	Count	69	12	6	0	1	0	0	88
	Row N %	78.41	13.64	6.82	0.00	1.14	0.00	0.00	100
The design of the layout and display of the ranking system (TIES) was simple or complex	Count	60	11	7	6	4	0	0	88
	Row N %	68.18	12.50	7.95	6.82	4.55	0.00	0.00	100
The systems (TIES and Skype) used for accomplishing the tasks in this experiment for your team was helpful or not	Count	58	21	7	2	0	0	0	88
	Row N %	65.91	23.86	7.95	2.27	0.00	0.00	0.00	100
Motivation to Participate									
I am motivated to do my best to receive the extra credit offered for participating in this experiment	Count	65	15	6	1	0	0	1	88
	Row N %	73.86	17.05	6.82	1.14	0.00	0.00	1.14	100
I am motivated to do my best to win the prizes in addition to the extra credit offered for participating in this experiment	Count	47	16	7	13	1	1	2	88
	Row N %	54.02	18.39	8.05	14.94	1.15	1.15	2.30	100
Behavioral Intention to Use									
I believe I would use the system for future collaborations if accessible to me and my collaborators	Count	38	27	13	7	2	0	1	88
	Row N %	43.18	30.68	14.77	7.95	2.27	0.00	1.14	100
I would recommend the use of this system to my collaborators for future meetings	Count	31	31	16	7	2	1	0	88
	Row N %	35.23	35.23	18.18	7.95	2.27	1.14	0.00	100
Performance Expectancy									
Using TIES and Skype will increase my productivity	Count	38	24	15	9	0	2	0	88
	Row N %	43.18	27.27	17.05	10.23	0.00	2.27	0.00	100
I believe using TIES and Skype will be useful for communication and collaboration	Count	42	29	8	4	2	2	0	88
	Row N %	48.28	33.33	9.20	4.60	2.30	2.30	0.00	100

APPENDIX K

STUDIES IN THE INFORMATION SAMPLING PARADIGM

This appendix presents a summary of the studies that used the hidden profile task to examine information exchange in teams. The summary includes the authors, research objectives and the major findings from the studies.

Table K.1 Studies that use Information Sampling Paradigm

Authors	**Research Objective(s)**	**Findings**
Cruz, M. G., Boster, F. J., & Rodriguez, J. I. (1997)	The impact of group size and proportion of shared information on the exchange and integration of information in groups	Group information sharing and decision-making effectiveness were found to be higher in small groups with a low percentage of shared information, and lower when groups either were large or shared a high percentage of information. Greater information sharing, however, did not correlate with longer discussions. The proportion of shared information affected bolstering and discounting of information.
Dennis, A. R. (1996a)	Examine information exchange and use during group decision-making	Verbally interacting groups exchanged only a small fraction of the available information and made poor decisions as a result. Groups interacting using a GSS exchanged about 50% more information providing sufficient information to all groups to identify the optima decision. However GSS groups did not accurately process this information, only one GSS group chose the optimal decision.
Dennis, A. R. (1996b)	The study examines information exchange and decision making processes in small groups that interact verbally or with a GSS	Both GSS and non-GSS groups exchanged only a small portion of the available information. Both made poor decisions because they lacked sufficient information. GSS groups were less likely to use shared information, possibly because anonymity reduced the information's credibility or the GSS impaired members' abilities to integrate the newly received information into their existing base of information
Devine, D. J. (1999)	Examine the effect of group composition (member task-related knowledge and cognitive ability) on information sharing, conflict, and group decision effectiveness in a complex low-fidelity management simulation	Controversy within the group over the strategy to employ was strongly related to interpersonal conflict between members, whereas group-level indices of cognitive ability and task knowledge were the best predictors of decision-making effectiveness. As in past studies using relatively simple choice tasks, groups exhibited biased information sampling and generally failed to identify the best course of action suggested by their collective information.

Authors	Research Objective(s)	Findings
Faulmuller, N., Kerschreiter, R., Mojzisch, A., & Schulz-Hardt, S. (2010)	Exp 1: Does individual preference effect impede the solution of hidden profiles in the absence of social validation of information supporting a group member's suboptimal preferences? Exp 2: compare the performance of individuals working on a hidden profile task to the performance of real interacting groups	Individual preference effect is indeed an individual-level phenomenon. In comparison to real interacting groups, almost half of all groups fail to solve hidden profiles due to the individual preference effect.
Franz, T. M., & Larson, J. R. J. (2002)	Impact of experts on information sharing during group discussion	Experts contribute more information to group discussion; no support was found for their impact on increasing other members' contributions. Identification of expertise and task type both accentuated information sharing by experts
Greitemeyer, T., & Schulz-Hardt, S. (2003)	Exp 1 & 2: Are hidden profiles still more difficult to solve than manifest profiles if (a) all information is exchanged an (b) participants are not aware of other group members' preference?	Hidden profiles are hardly ever solved due to persistent individual pre-discussion preference
Gruenfeld, D. H., Mannix, E. A., Williams, K. Y., & Neale, M. A. (1996)	The role of group composition and information distribution on group process and decision making	All stranger groups were most likely to identify the correct suspect when information is fully shared. All familiar and 2 familiar/1 stranger groups were most likely to identify the correct suspect when critical clues remained unshared. Group process analysis reveals that this pattern of results was due to an "aggregation strategy" on the part of strangers and an "information pooling strategy" on the part of groups composed of familiar individuals
Jefferson, T. J., Ferzandi, L., & McNeese, M. (2004)	The effects of hidden knowledge profiles on perceptually anchored team cognition and knowledge transfer in distributed teams	Teams that received full non-perceptually anchored knowledge acquisition task identified more complete details than teams in the hidden knowledge profile. There is no significant differences between the impact of hidden knowledge acquisition on individual knowledge transfer
Kelly, J. R., & Karau, S. J. (1999)	The effects of initial preferences and time pressure on group decision making	Initial preferences were major determinants of group decisions. Time pressure either enhanced or reduced decision quality depending on the strength of initial preference and the content of the group interaction
Klein, O., Jacobs, A., Gemoets, S., Licata, L., & Lambert, S. M. (2003)	The impact of the distribution of information regarding social groups on the formation of shared stereotypes within triads	Study 1: Sampling of information independently of the discussion directly influenced emerging stereotypes. Discussion consensualized initial stereotypes. Study 2: in the inconsistent condition, participants were more likely to discuss information that violated stereotypical

Authors	Research Objective(s)	Findings
		expectations, and to be less influenced by sampling as a result of discussion. All together, information sampling directly affects the consensualization of social stereotypes.
Lam, S. S. K., & Schaubroeck, J. (2000)	This study compared a group decision support system with face-to-face group discussion on characteristics of information exchange and decision quality	GSS groups shared more unshared information than FTF groups. No difference when there was no hidden profile. GSS groups significantly outperformed the FTF groups in agreeing on the superior hidden profile candidate, especially when there was a lack of pre-discussion consensus. Individual-level analyses revealed that members of GDSS groups that did not have a prediscussion consensus tended to experience stronger preference shifts toward the group's consensus decision
Larson, J. R. Jr., Christensen, C., & Abbott, A., Franz, T. M. (1996)	Hypotheses derived from information sampling model of group discussion are tested	Shared information was, overall, more likely to be discussed than unshared information, and it was brought into discussion earlier. Team leaders repeated substantially more case information than did other members and that, over time, they repeated unshared information at a steadily increasing rate. The latter findings are interpreted as evidence of leaders' information management role in problem-solving discussions.
Larson, J. R. J., Christensen, C., Franz, T., & Abbott, A. (1998)	The impact of group discussion on the decision-making effectiveness of medical teams was examined	Compared with unshared information, shared information was more likely to be pooled during discussion and was pooled earlier. In addition, team leaders were consistently more likely than other members to ask questions and to repeat shared information and, over time, also become more likely than others to repeat unshared information. Finally, pooling unshared (but not shared) information improved the overall accuracy of the team diagnoses, whereas repeating both and unshared information affect bias (but not accuracy) in the diagnoses.
Larson, J. R. J., Foster-Fishman, P. G., & Franz, T. (1998)	Impact of leadership style and the discussion of shared and unshared information in decision-making groups	During group decision-making, shared information was brought into discussion earlier, and was more likely to be mentioned overall than was unshared information. Groups with a participative leader discussed more information than groups with a directive leader, but that directive leaders

Authors	Research Objective(s)	Findings
		were more likely to repeat information (especially unshared) than participative leaders. Leadership style and the information held by the leader prior to discussion interacted to influence group decision quality.
Larson, J. R. J., Foster-Fishman, P. G., & Keys, C. B. (1994)	Effects of task importance and group decision training on the discussion behavior of decision-making groups	Groups discussed much more of their shared information than their unshared information. Increasing the importance of the task slowed the rate at which information was brought forth during discussion. By contrast, group decision training increased the amount of both shared and unshared information discussed and altered the sequential flow of shared and unshared information into the discussion: discussion in untrained groups focused first on shared information and then on unshared information; discussion in trained groups did not shift focus over time.
Lavery, T. A., Franz, T. M., Winquist, J. R., & Larson, J. R. J. (1999)	Is the amount of unshared information exchanged within groups related to group-judgment accuracy?	There was no relationship between the amount of unshared information discussed and group accuracy on hidden-profile cases. Instead, group accuracy was determined by how accurate members were prior to discussion. The vital role of group discussion was not to exchange information but to aggregate member judgment into a consensual group judgment
Lightle, J. P., Kagel, J. H., & Arkes, H. R. (2009)	Identify a previously undiscovered factor responsible for discovering hidden profiles	Structure of the problem in conjunction with erroneous recall is responsible for not discovering hidden profiles. Individual heterogeneity in information recall plays at most a modest role in the failure to identify hidden profile. Biased information recall in favor of pre-discussion preference
Mennecke, B. E. (1997)	Impact of group size and meeting structures on information sharing and decision quality	Group size had no effect on information sharing. Groups using structured agenda shared more initially shared and initially unshared information. Although no relationship was found between information-sharing performance and decision quality, a curvilinear (U-shaped) relationship between information sharing and satisfaction was observed. These results show that, for hidden-profile tasks, a critical performance level must be reached before

Authors	Research Objective(s)	Findings
		performance is positively related to satisfaction.
Mentis, H. M., Bach, P. M., Hoffman, B., Rosson, M. B., & Carroll, J. M. (2009)	RQ1: How does group rationale develop over a complex group decision making task? RQ2: How does group rationale development differ between new groups and established groups in a complex group decision-making task?	Groups begin their reasoning processing by stating and relating information and finish their reasoning though a point-counterpoint discussion. Established groups reduced their need to analyze information during the last moments of a decision.
Mesmer-Magnus, J. R., & DeChurch, L. A. (2009)	Meta analysis of 72 studies that explore information sharing in teams	Information sharing positively predicted team performance. 3 factors shown to affect team information processing were found to enhance team information sharing: task demonstrability, task type, and discussion structure by uniqueness. 3 factors representing decreasing degrees of member redundancy were found to detract from team information sharing: information distribution, informational interdependence, and member heterogeneity
Parks, C. D., & Cowlin, R. (1995)	Examine whether task-related discussion in problem-solving groups is affected by the number of decision alternatives being considered and/or by the imposition of a decision deadline	Results supported the first hypothesis; however, deadlines were found to have a more complex relationship with discussion than was hypothesized. Evidence was also obtained for a "surface evaluation" explanation of how groups narrow the choice set, as was support for the notion that severe deadlines increase the rate of work-related activity within the group.
Postmes, T., Spears, R., & Cihangir, S. (2001)	Impact of group norms for maintaining consensus versus norms for critical thought on group decisions	Critical norms improved the quality of shared and unshared information; consensus norm groups valued shared information more highly than critical groups did, and valence was a good predictor of decision outcome.
Reimer, T., Reimer, A., & Hinsz, V. B. (2010)	Will naïve groups—who enter group discussions without any preconceived preferences—detect hidden profiles than pre-decided groups? RQ1: Do time constraints moderate the discussion advantage favoring shared information? RQ2: Do time constraints have an effect on the number of hidden-profile detections?	When information was provided in the form of common rather than unique cues, naive groups detected the hidden profile throughout. All hypotheses were supported
Savadori, L., Van Swol, L. M., & Sniezek, J. A. (2001)	Judge advisor system and unstructured groups discuss shared and unshared information	Advisors mentioned but did not repeat a higher proportion of unshared information than group members. Judges felt more responsible for, reported putting more effort toward,

Authors	Research Objective(s)	Findings
		and had higher confidence in the decision than group members. There was more inequality of participation and consensus seeking in judge assisted systems compared to groups
Schittekatte, M. (1996)	Examined the effects of several conditions on the information flow during unstructured discussion in small groups	Exp1: In line with Stasser et al's (1987) findings, the tendency to speak primarily about shared information was reduced when there was little information to talk about when most information was unshared; Exp2: Making members aware of the unique information they can contribute facilitates the exchange of unshared information. Yet unshared information remained underrepresented. Items supporting the final decision alternative proportionally outnumber opposing items, despite the equilibrium in the profiles of the candidates. Exp3: the suggestion that there was a correct answer has no effect on the use of unshared information. There was no shift in the focus of the discussion away from shared information either. Fewer consensuses were reached when subjects thought they were solving a problem. Informational influence possibly dominated more during the discussion when the task was of an intellective nature.
Stasser, G., Taylor, L. A., & Hanna, C. (1989)	Examine the relative amount of shared and unshared information that were discussed by groups en route to their decisions	Discussions contained, on the average, 46% of the shared but only 18% of the unshared information; this difference was greater for 6-person than for 3-person groups. Moreover, structuring discussions increased the amount of information discussed, but this increase was predominately due to discussion of already shared information.
Stasser, G., & Titus, W. (1987)	Effects of information load and percentage of shared information on the dissemination of unshared information during group discussion	Members' pre- and post-discussion recall suggested that discussion disseminated sizable amounts of unshared information only under low percentage shared, most notably in the low-load/33%-shared condition. Moreover, discussion biased recall in favor of the group's choice
Stasser, G., Stewart, D. D., & Wittenbaum, G. M. (1995)	The impact of assigning expert roles to group members on solving hidden profiles	Groups were more likely to select the correct suspect and mentioned more of the unshared clues when members were told who in the group had additional information about

Authors	Research Objective(s)	Findings
		each suspect. Simply forewarning individual members that they would receive more information about a specific suspect did not have these beneficial effects
Stasser, G., Vaughan, S. I., & Stewart, D. D. (2000)	Examine the effects of forewarning and role assignment in a collective-recall task similar to Stewart and Stasser (1995)	Groups mentioned more shared than unshared information. Forewarning increased the likelihood that unshared information would be retained on a written protocol once it was mentioned during discussion
Steinel, W., Utz, S., & Koning, L. (2010)	Information sharing is a strategic behavior that depends on people's pro-social or pro-self motivation	Pro-social individuals were consistently found to honestly reveal their private and important information, while selfish individuals strategically concealed or even lied about their private and important information
Stewart, D. D., & Stasser, G. (1995)	Examined how personal expertise facilitates the mentioning and validation of unshared information in collective recall and decision-making groups by increasing members' awareness of who holds what types of information	Assigned expertise increased substantially the proportion of unshared information mentioned during both collective recall and decision-making tasks. Two results supported the hypothesis that assigned expertise provides validation for the recall of unshared information. When expertise was assigned, (1) more of the unshared information mentioned during the recall task was retained on the collectively endorsed written protocol, and (2) unshared information that was mentioned in discussion was more likely to be correctly recognized by members after group interaction.
Toma, C., & Butera, F. (2009)	Differential impact of cooperation and competition on strategic information sharing	Exp 1 revealed that competition compared to cooperation: (1) led group members to withhold unshared information; (2) group members were more reluctant to disconfirm their initial preferences. Decision quality was lower in competition than in cooperation, mediated by disconfirmation use. Exp 2 replicated the same findings in Exp 1 and revealed the role of mistrust in predicting strategic information sharing and use in competition. This findings support a motivated information processing approach of group decision making
Van Hiel, A., & Schittekatte, M. (1998)	The effects of accountability, intergroup perception, and gender composition of group on information exchange are investigated	Heterogeneous groups exchanged more information when a second group was present. Information exchange was not promoted by the presence of an outgroup fo homogeneous groups. Groups in the accountability condition displayed

Authors	Research Objective(s)	Findings
		more difficulties to reach agreement, but this did not lead to the mentioning of more information
Van Swol, L. M., Savadori, L., & Sniezek, J. A. (2003)	3 experiments examined 3 factors that may impede the discovery of hidden profiles: commitment to initial decision, reiteration effect, and ownership bias. Exp 1: No initial decision; Exp 2: commitment to initial decision and repetition of information; Exp 3: reiteration effect	Exp 1 and 2 found no support for the commitment to an initial decision hypothesis for uncovering hidden profiles. Exp 2 found that repetition of common information significantly reduced individual's ability to uncover hidden profiles. Exp 3 found that information owned (unique and common) before discussion was rated as more valid than the other information. Also no evidence for common information, which is generally repeated more, was found to be rated as more valid than unique information.
Wheeler, B. C., & Valacich, J. S. (1996)	Test the ability of appropriation mediators (facilitation, GSS configuration, and training) to directively affect group decision making through guidance and restrictiveness	Appropriation mediators can increase the faithful use of structured decision techniques and that faithful use can improve decision quality
Winquist, J. R., & Larson Jr., J. R. (1998)	Is group decision making affected by the amount of unshared information pooled during discussion but not the amount of shared information pooled and then only when a hidden profile exists.	Discussion focused more on members' shared than unshared information. However, decision quality was affected only by the amount of unshared information discussed and by member's prediscussion choice preferences. The amount of shared information discussed did not affect decision quality. These results suggest a dual-process model of how the prediscussion distribution of decision-relevant information impacts group decision-making effectiveness
Wittenbaum, G. M. (1998)	Impact of task-relevant status on biased information discussion	Members who had prior experience working on personnel selection task were less likely to mention shared information than members without prior experience. Although experienced members were less successful than inexperienced members at persuading the group to adopt their preference, they won with less effort
Wittenbaum, G. M. (2000)	High-status group members' attenuation of discussion bias	Members who had prior experience working on personnel selection task were less likely to mention shared information than members without prior experience

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