WENDY VAN GINKEL

The Use of Distributed Information in Decision Making Groups

The Role of Shared Task Representations

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Het gebruik van ongedeelde informatie in besluitvormingsgroepen:
De rol van gedeelde taakrepresentaties

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Wendy

Contents

Chapter 1
Introduction

Information Elaboration and Group Decision Making

Small groups play a vital role in organizations. Their function can range from advisory, service, production, development, and action and negotiation purposes to management purposes and they seem to be prevalent in most of the larger organizations (Lawler, Mohrman, & Ledford, 1995). One especially important role of small groups seems to be making decisions. The widespread incidence of top management teams illustrates that when it comes to high impact decisions, organizations tend to rely on small groups rather than on any one individual. While there can be several reasons for relying on groups rather than on individuals, like increasing perceived fairness of, support for, satisfaction with, and commitment to a decision, it may be argued that one of the most important reasons to rely on groups is the idea that "two heads know more than one" (Tindale, Kameda, & Hinsz, 2003). Compared to individuals groups can usually bring a broader range of information, knowledge, and insights into the decision arena, which should allow them to make more informed decisions. This is even more true when individual group members' knowledge is somehow more diverse, for instance because they come form different departments within the organization and it seems to be reflected by the increasing use of cross-functional teams for decision making purposes in organizations (Denison, Hart, & Kahn, 1996).

In sharp contrast to these positive reflections on groups with distributed information, research has quite consistently shown how decision making groups fail to adequately make use of the information that is uniquely possessed by group members. Several experiments have shown that information that is distributed over group members in such a way that only one member has a certain piece of information, is not exchanged as much as information that all group members have in common (Stasser, 1999; Stasser & Titus, 1985; Wittenbaum & Stasser, 1996). Moreover, even when groups do pool members unique information, this information still is not adequately integrated in the decision making process (e.g., Gigone & Hastie, 1993; Winquist & Larson, 1998). Furthermore, more general evidence from field studies also indicates that (informationally) diverse groups often fail to capitalize upon the diversity of informational resources they possess (cf. Simons, Pelled, & Smith, 1999).

For groups in which information is distributed over group members to be able to capitalize upon their informational resources, the unique information possessed by individual group members need to be integrated. This integration requires exchange of information, individual-level processing of the information, feeding back the results of this individual-level processing into the group, and discussion and integration of its implications, which has also referred been to as *information elaboration* (van Knippenberg, de Dreu, & Homan, 2004). Based on group decision making research

one can conclude that groups not only insufficiently exchange unique information, but also insufficiently elaborate on unique information (e.g., Gigone & Hastie, 1993; Winquist & Larson, 1998). When unique information is of importance for the quality of a group decision, it is easy to see how insufficient integration of distributed information leads to lower quality decisions. Because it could be argued that the most vital decision making groups in organizations, like top management teams and new product develop teams exist of members with distributed information, it is of great importance to understand how these groups make effective use of their informational resources.

Task Representations

While several factors that seem to influence the extent to which groups elaborate upon information have been identified, in this dissertation I argue that a fundamental factor underlying group elaboration of decision-relevant information, group members understanding of their task, or their *task representations* has been overlooked. Although direct evidence mostly seems to be lacking, there are indications that decision making groups' are insufficiently attuned to the task's information exchange and integration requirements. Group members are inclined to focus on finding common ground than on integrating and discussing distributed information. That is, decision making groups may (wrongly) assume that an important part of their task involves discussing members' preferences and somehow trying to get them aligned rather than pooling members' unique information and basing a group decision on all information (cf. Hastie & Pennington, 1991; Pennington & Hastie, 1993; Wittenbaum, Stasser, & Merry, 1996).

In the current dissertation I argue that when group members hold an adequate understanding of the informational requirements of a group decision making task in terms of task representations that emphasize the importance elaboration, they should engage in more information elaboration and make higher quality decisions. Throughout the dissertation I examined the effects of task representations that emphasize information elaboration on group decision making in groups in which task-relevant information is distributed over group members by means of a series of experiments. Furthermore, I investigated the role of awareness of sharedness of task representations emphasizing information elaboration. Finally, I also examined several antecedents of groups' shared task representations, specifically knowledge about distributed information, group reflexivity, and group leadership. Below I will give short outline of the main points discussed in each of the chapters.

Overview of the Dissertation

In the second chapter we tested the proposition that if group members share task representations that emphasize the importance discussing and integrating information and refraining from making a decision before distributed information is considered is (i.e., when they have task representations emphasizing elaboration), they should elaborate more on information and reach higher-quality decisions. We argued that task representations emphasizing elaboration are mental structures that

focus group members' attention on information elaboration rather than on finding common ground. Although, group members are inclined not to think or talk about such underlying task representations (cf. Hollingshead, 1998; Mohammed & Ringseis, 2001), task representations should impact the way groups go about elaborating on distributed information and subsequent decision making quality. A second major point of this chapter is the effect that *awareness of* sharedness of task representations emphasizing elaboration has. It is argued that the effects of task representations emphasizing elaboration of decision-relevant information are stronger when group members are more aware of sharing these representations. The underlying reasoning is that awareness of sharedness should be able to remove psychological barriers that may withhold people from introducing and discussing distributed information. Removing psychological barriers is important, because there is evidence that, besides group members' understanding of their decision task, a second reason for the suboptimal use of distributed information lies in group members' fear of evaluation (e.g., Wittenbaum, Hubbell, & Zuckerman 1999; Wittenbaum & Park, 2001, Edmondson, Bohmer, & Pisano, 2001). It is hypothesized that awareness of sharedness leads to higher group information elaboration and decision making quality, because it fosters psychological safety (Edmondson, 1999; 2001).

In chapter three we focus on how the concept of shared task representations can contribute to other studies as well by explaining other research findings. We showed how shared task representations can be applied to explain a research finding for which thus far no adequate explanation has been presented. Several studies have shown that when members of decision making groups with distributed information are presented with knowledge about which group member has what kind of information, groups do a better job exchanging unique information and making high-quality decisions. While this effect has been shown in several studies and seems fairly robust (Littlepage, Robison, & Reddington, 1997; Stasser, Stewart, & Wittenbaum, 1995; Stewart & Stasser, 1995) it remains unclear why this effect occurs (Stasser, Vaughn, & Stewart, 2000). In chapter three we argued that shared task representations emphasizing elaboration are able to provide an explanation for this effect. In addition, we discussed how better understanding these effects of knowledge about distributed information, allows us to identify when these effect will or will not take place. Moreover, better understanding the effects of distributed information on group performance also makes it possible to influence them, which makes understanding these effects also relevant for practice.

In the fourth chapter we turned to the development of (shared) task representations in groups and examined a factor that seems essential to the development of adaptive representations, *group reflexivity*. Groups usually are not inclined to discuss their members' underlying ideas about the task and how to approach the task (Hollingshead 1998; Mohammed & Ringseis, 2001). As a result groups can have limited opportunity to adapt less adaptive ideas that members' may have about how to deal with the group task, which can result in lower group performance. We argued that the extent to which group members discuss their perceptions of the task and how to approach it, or put differently, the degree to which they reflect on the task (West, 1996) should affect the likelihood they find out about

differences in their task representations and the subsequent opportunity to develop task-adaptive representations. To examine the effect of group reflexivity, we examined both situations in which all members hold similar task-adaptive representations, but also, unlike the previous chapters, situations in which members hold not all equally adaptive representations. It is expected that the effects of reflexivity are stronger when only one member has a task-adaptive representation than when all members hold adaptive representations, because reflexivity increases the extent to which all group members develop adaptive representations. Moreover, although when groups do not collectively reflect before starting, groups in which all members hold task-adaptive representations emphasizing elaboration are expected to make higher-quality decisions than groups in which not all members hold such representations, when groups collectively reflect on their task such differences should not exist.

In chapter five we subsequently examined another factor that is likely to be critical for the development of adaptive task representations in groups, group leadership. We argued that an essential role for group leaders exist of giving directions on how to work on a task (House, 1971; Yukl, 1998) and clarifying and making sense of the task environment (Hill & Levenhagen, 1995; van Knippenberg & Hogg, 2003; Weick, 2001). Therefore, group leaders are likely to have a great influence on group members' representations of the task. We examined the effects of group leadership on group members' task representations, group information elaboration, and group decision making quality. To investigate the influence of leadership, we varied whether a group leader was present if so whether the leader held task-adaptive representations emphasizing elaboration or less adaptive representation emphasizing agreement-seeking. We hypothesized that, when a group leader is present, group members come to develop task representations similar to their leader's representations. Therefore, group members in groups with a leader with task representations that emphasize elaboration are expected to engage in more information elaboration and to make higher quality decisions than both leaderless groups and groups in which the leader has task representations emphasizing agreement-seeking. Group members' task representations (not including the leader's representations) are expected to mediate this effect.

Finally, in the chapter six I briefly summarize the main findings of the previous chapters and discuss the meaning of these findings for various research areas and the implications for future studies.

Chapter 2
The Effect of Shared Task Representations on Group Information Elaboration and Group Decision Making Quality.

Organizations tend to rely on small groups for numerous purposes. One function for which small groups seem especially suitable is making decisions that require a wide array of knowledge (Cohen & Levinthal, 1990; Kozlowski & Bell, 2003; Tindale, Kameda, & Hinsz, 2003). However, while a major reason for relying on groups for decision making purposes concerns the broader range of resources groups possess compared to individuals (Hinsz, Tindale, & Vollrath, 1997), research has shown that groups are not always good users of their informational resources. Not only do decision making groups with distributed information often fail to pool group members' unique knowledge (Stasser, 1999; Wittenbaum & Stasser, 1996), even when unique information gets pooled groups often fail to recognize its relevance and focus more on information known to all members before group discussion (Gigone & Hastie, 1993; Winquist & Larson, 1998), resulting in lower-quality group decisions.

While earlier research addressing this issue has made great progress in identifying the factors that affect groups' use of distributed information (Stasser, 1999), it has not focused on what we propose is one of the issues laying at the roots of groups' suboptimal use of distributed information: group members' task representations. Building on a growing body of knowledge about socially shared cognition in groups (cf. Cannon-bowers, & Salas, 2001; Klimoski & Mohammed, 1994; Mathieu, Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005; Tindale et al., 2003), we propose that group members' shared task representations (Tindale, Smith, Steiner, Filkins, & Sheffey, 1996) play an important role in groups' use of their informational resources. Group members often seem to be insufficiently attuned to the task's information exchange and integration requirements and seem to focus more on the pooling of preferences in reaching a decision. Groups should therefore make better use of their distributed information when group members' task representations emphasize the exchange, discussion, and integration of decision-relevant information. We propose that the effects of such task representations are not just a matter of individual group members' understanding of the task, however, but should obtain especially when group members are aware of sharing these task representations, because this awareness removes psychological barriers to introducing new insights into group discussion. We tested these ideas in two experiments that illustrate how an analysis of the use of distributed information in terms of shared task representations may enhance our understanding of group decision making, and potentially group performance more generally.

Information Elaboration and Task Representations

In recognition of the fact that groups may reach high-quality decisions when they are able to

integrate the diversity of information and perspectives held by their members, research in group decision making has invested substantial effort in understanding groups' use of distributed information. This research has uncovered such diverse factors as team leadership (Larson, Foster-Fisherman, & Franz, 1998), knowledge about group member expertise (Stewart & Stasser, 1995), and member familiarity with each other (Gruenfeld, Mannix, Williams, & Neale, 1996) as determinants of groups' use of distributed information (for a review, see Stasser, 1999). Somewhat surprisingly, a factor that may lie at the basis of groups' use of their informational resources has received little attention in this respect: group members' shared task representations.

Shared task representations have been defined as "any task/situation relevant concept, norm, perspective, or process that is shared by most of the group members" (p. 84, Tindale et al., 1996). Recently there has been an upsurge of attention for shared cognition in small groups. The term shared cognition usually refers to cognition that is (highly) similar across group members (although it could also mean complementary, see Cannon-Bowers, Salas, 2001). Among the several types of shared cognition that can be discerned, one important type that seems to impact group behavior is shared cognition about the group task. Several studies have shown that when group members share certain (appropriate) representations of their task, this can have beneficial effects for group functioning (cf. Marks, Zaccaro, & Mathieu, 2000; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005; Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2001).

We propose that the notion of shared task representations has important implications for our understanding of groups' use of distributed information. The effective use of distributed information requires the exchange of distributed information, careful consideration of this information and its implications, and discussion and integration of these implications. This process of exchange, consideration, and integration has been referred to as group *elaboration* of information (van Knippenberg, De Dreu, & Homan, 2004). Groups seem to differ in the extent to which they recognize the importance of the elaboration of decision-relevant information for successful task performance, however. Accordingly, we propose that the extent to which group members have shared task representations for elaboration affects groups' use of distributed information.

Research on jury decision making hints at the possibility that group members often insufficiently recognize the need for information elaboration. Studies have shown that juries can approach a decision task in at least two ways. Juries using an evidence-driven style first gather relevant evidence and then use the evidence in coming to a group judgment. Juries using a verdict-driven style start with pooling their individual judgments and only after pooling group members' judgments cite evidence in a piecemeal fashion organized by the verdicts (Hastie & Pennington, 1991; Kameda, 1991). Hastie and Pennington (1991) showed that in contrast to groups, individuals always proceeded in the evidence-driven manner when performing the same task, suggesting that the need to reach agreement with others in addition to reaching an individual judgment may motivate groups to use the verdict-driven strategy. Research by Wittenbaum, Stasser, and Merry (1996) also shows that group members may not

recognize the need for elaboration. They found that when group members believed they were about to participate in a group decision making session as compared to a group recall session, they tended to focus more on information which they believed the other members would also have than on distributed information. Our interpretation of these findings is that group members' understanding of the decision making task centered on the need to find common ground more than the elaboration of information. Also hinting at the role of task representations, Stasser and Stewart (1992) showed that groups that believed there was an objectively correct solution to the decision making problem made better use of their distributed information than groups that believed that there was no objectively correct solution. Although different mechanisms may have been in operation (e.g., differential weighting of new information) and a second study (Stasser & Stewart, 1998) was unable to completely replicate the results, we would propose that the perception that there was an objectively correct solution gave rise to task representations suggesting a search for information to identify this solution.

Although these studies at best only yield circumstantial evidence for the role of task representations, they are consistent with the notion that misconceptions about task requirements may play a role in groups' suboptimal use of distributed information, and that group members' task representations may affect the extent to which groups focus on the pooling of preferences and finding common ground or on the exchange, consideration, and integration of information. Besides the way group members perceive or understand their task or the content of their task representations, there is likely to be a second aspect of group members' task representations that could be of importance for groups' information elaboration. Below we further discuss this second factor.

The Role of Awareness of Sharedness

Group members may be unaware of other group members' task representations, even when these are identical. That is, group members may share similar representations of their task without knowing they do. Arguably, shared cognition entails more than group members thinking along highly similar lines. Implicit in the study of shared cognition is the notion that shared cognition not only involves group members thinking the same about something, but also includes a shared awareness of these converging cognitions (cf. Tindale & Kameda, 2000). Indeed, it may be argued that it is this awareness of sharedness (cf. Kerr & Tindale, 2004; Klimoski et al., 1994; Rentsch & Hall, 1994; Tindale & Kameda, 2000) that moves shared cognition beyond a mere aggregation of individual cognition and renders shared cognition a true group-level construct (Klein & Kozlowski, 2000). Yet, while awareness of sharedness is often assumed when discussing the effects of shared cognition, the effects of awareness of sharedness are usually not put to the test. In the present study we define shared task representations as not only entailing actual sharedness of mental representations of the task, but also a sense of awareness of this sharedness. To be able to substantiate our claim that awareness of sharedness can be important for group functioning, we address the role of awareness of sharedness empirically, and test the prediction that the effects of task representations emphasizing elaboration of

decision-relevant information are stronger when group members are more aware of sharing these task representations.

Awareness of sharedness is expected to make a difference because it should remove psychological barriers to introducing and discussing distributed information. One reason for groups' biased information use lies in group members' tendency to focus on information shared by all members, or consistent with other members' preferences, out of fear of being rejected (Gruenfeld et al., 1996; Nemeth, 1986; Wittenbaum, Hubbell, & Zuckerman 1999; Wittenbaum & Park, 2001). Furthermore, there are indications that group members who mention arguments that conflict with the common group preference may get negative reactions from other group members and are liked less by other members than members who mention arguments that are consistent with an option preferred by most members (Edmondson, Bohmer, & Pisano, 2001; Nemeth, 1986; Wittenbaum et al., 1999; Wittenbaum & Park, 2001). Thus, fear of rejection seems to inhibit information exchange. Psychological safety (i.e., the perception that it is safe to speak one's mind in group interaction; Edmondson, 2003) may attenuate fear of rejection. Psychological safety may foster the expectation that people will not sanction the discussion of new information that may lead the group away from an agreement (e.g., discussion of information pro A, while most members already believe B to be the best option) and subsequently stimulate discussion of more "risky" information that could interfere with an emerging group agreement (cf. Edmondson, 1999; Kramer, Brewer, & Hanna, 1996). Thus, higher psychological safety in teams can foster information elaboration.

Awareness of sharedness of task representations may foster psychological safety, because it provides group members with relevant knowledge to base expectations of other members' behavior on. When group members are aware of the fact that they share task representations emphasizing the importance of information exchange and discussion, this provides them with knowledge that other members recognize the importance of sharing unique information and viewpoints for the task at hand. When group members know that other members also value information exchange and discussion, they will expect that other members will not react negatively to group members coming forward with unique information. This knowledge may create a feeling of psychological safety that stimulates group members to voice information.

Hypothesis 1a. Groups engage in more information elaboration and reach higher-quality decisions when group members have shared task representations emphasizing information elaboration than when they hold such shared representations to a lesser extent.

Hypothesis 1b. The effects of task representations emphasizing elaboration on information elaboration and decision-making performance are stronger when group members are aware of sharing these representations.

An Experimental Test

To establish the causality implied in our analysis, we put our hypotheses to an experimental test. Because to our knowledge this is the first study in which shared task representations and the awareness

of sharedness of these task representation is manipulated (and measured), replication of our key findings would substantially bolster the confidence in our findings. Therefore, we tested our hypotheses in a small preliminary study as well as in a more full-blown experiment. In both experiments we compared control groups to experimental groups that received task instructions designed to engender task representations emphasizing elaboration of decision-relevant information. In addition, half of the experimental groups where made aware of sharing these task instructions (and associated representations). We relied on audio-video data to code group information elaboration, because audio-video data tend to be more reliable and provide a richer source of information than self-report data (Weingart, 1997).

To substantiate our analysis in terms of the processes implied, we also formulated an explicit hypothesis about the processes translating the experimental manipulations in decision-making performance.

Hypothesis 3. Group information elaboration mediates the relation between shared task representations and group decision-making performance.

In both experiments we tested Hypotheses 1 to 3. In addition, in the main study we also assessed the role of psychological safety proposed to underlie the effect of awareness of sharedness on information processing and performance.

Preliminary Study

Method

Design and Participants

Just as the main study, the preliminary study had a one-factor design with three levels (elaboration instruction without sharing/elaboration instruction with sharing/control). A total of 112 Dutch undergraduate students (74 men, 38 women) were assigned to 28 four-person groups. Groups were randomly assigned to conditions. The majority of participants were business administration students (86.6 %). Participants received 10 euro (± 12 USD) for participation.

Experimental Task

The task was a cooperative decision making task inspired by the Towers Market task (Weingart, Bennet, & Brett, 1993). While the original task was designed as a negotiation task, the adaptation was such that the current task was a purely cooperative decision making task. So, contrary to the original task, each group member represented all interests. The task concerns the organization of a small market center that contains a bakery, a florist, and a greengrocery. Participants are told that they function as an independent advisory committee that is to aid the three stores in making three interrelated decisions about the temperature for the market center, the division of maintenance costs between three stores, and the organization of marketing campaigns. To do this all participants were given information on the preferences of the three stores and on the relative importance of the three

issues to the stores. In addition they were told to take the interests of all three stores into account. For each issue, groups could choose from a limited number of options. Based on all available information a hierarchy in the quality of the decision options existed (i.e., some combinations of decision options served the interests of all stores better than others). All members received some information on all three stores. The information items were partially based on another adaptation of the task (Beersma & De Dreu, 2002) and partially designed specifically for this study.

Following prior research in group decision making, part of the decision-relevant information was given to all group members and part of the information was given to only one of the group members (cf. Stasser & Stewart, 1992). Items of information necessary for making good decisions were divided between the group members, so that for all members to be able to learn about these items groups had to share the information. For every decision issue there were always three items of information that were crucial for reaching an optimal decision. Each of these was uniquely assigned to one of the group members. For each decision issue group members received this crucial, unshared information on a different store (e.g., group member 1 received unshared information about the bakery on item 1, about the florist on item 2, etc., while group member 2 received crucial information about the florist on item 1 and about the greengrocery on item 2, etc.). To make the task more complex, some irrelevant information about the three stores was also included (this information was always given to all members). Groups were told that the information the members received might differ.

Experimental Manipulations

Individual task representations were manipulated through written instructions. Group members in both the elaboration-instruction-with-sharing-condition (i.e., the condition where members shared task representations for information elaboration *and* were made aware of this) and the elaboration-instruction-without-sharing-condition (i.e., the condition in which members did share task representations for information elaboration, but were *not* made aware of sharing them) received information that explained what kind of task they were going to work on and what would be important for this task. As a rational for receiving this information they were told that we aimed to simulate reality in organizations, where people in decision making groups usually have some prior experience and perception of a task before they come to a group. Because the participants in this study had no prior experience with the task this information allegedly was given to assist them in developing an impression of the task.

The critical difference between the two experimental conditions is that in the one condition group members were made aware that all members had the same task representations, while in the other condition instructions and procedures did not reveal that all group members had received identical task instructions, and presumably held very similar task representations. Group members in the elaboration-instruction-with-sharing-condition received the information for the manipulation of task representations while they were already seated at one table as a group, so that they could see they

all received the same information. Moreover, they were told that it would be good if they were aware of each others' perceptions of the upcoming task, and that they therefore received approximately two minutes to briefly repeat (part of) the instruction out loud to each other. This was done so they could hear that they all were given the same instruction.

In the elaboration-instruction-without-sharing-condition, in contrast, participants received the information before they gathered as a group, so they could not see each other's instructions. Also, they received additional information that stated that other group members might have gotten slightly different instructions, allegedly because we aimed to simulate reality in organizations in which team members can have different experiences, background information, and perceptions concerning group tasks. Groups in the control condition only received the basic task instructions that were given to groups in all conditions.

Measures

Performance scores for decision quality were based on the extent to which the decision for each issue matched the relatively objective standard for decision quality based on all available information. Based on all available information a hierarchy in correctness of the different decision alternatives existed (e.g.,, one option was consistent with all information, one with most information, one with only information given to all members). A pre-test was used to insure that this hierarchy was indeed clear if decision makers were given the full set of information. On two of the decision issues groups could attain a score ranging from 1 to 3 and on one issue groups could attain a score ranging from 1 to 4 (whether a three or a four-point scale was used had to do with the total amount of available decision options). Because all three decision issues were designed to let decision quality be contingent on information exchange and processing, and optimal decisions were contingent on an integration of stores' interests over issues, a performance score (ranging from 3 to 10) aggregated over the three issues was calculated.

Individual task representations were measured using a questionnaire. Participants were asked to indicate on a 7-point scale ranging from "completely disagree" to "completely agree" to what extent they agreed with five statements. An example of a statement is "It was important to base the group decision on as much information as possible" ($\alpha = .80$).

Awareness of sharedness was measured using the same questions used to measure task representations, only this time participants were asked to answer the questions from the perspective of each of the three other members. They thus had to answer the five questions three times (four, including answering the questions for themselves). For each participant, we calculated the standard deviation over their ratings of the task representations of all members as a measure of the extent to which they were aware of differences between members. As awareness of sharedness increases people should perceive the others in the group as more concerned with the extensive consideration of information as an essential part of the group task (i.e., the representation induced by the experimental

manipulation). Accordingly, people should perceive smaller differences between members and the standard deviation should become smaller.

Shared task representations were operationalized by taking the mean of the ratings of group members' own task representations and their perceptions of the task representations of the other three members. This measures reflects both the content of the task representations (i.e., the extent to which they emphasize elaboration) and the awareness of sharedness of these representations, and thus captures both aspects of shared task representations for information elaboration.

We used audio-video recordings to measure group information elaboration[1]. Two coders blind to the experimental conditions rated group information elaboration on a seven point scale anchored with specific behavioral standards ($\kappa = .78$). Information elaboration was coded for each decisions issue and a mean score over the three decision issues was calculated (See Appendix B for the coding scale).

An alternative explanation for differences in group decision performance between groups in the elaboration-instruction-with-sharing-condition and groups in the two other conditions might be that the extra time that groups in the elaboration-instruction-with-sharing-condition got before they started with the group discussion (although this time was very short – approximately two minutes or less) affected other variables like group cohesion, group member identification, or group climate. To be able to rule out an increase in cohesion or identification with the group, or a change in group climate as alternative explanations these variables were also measured (see Appendix B). Reliability levels of the measures were respectively $\alpha = .92$, $\alpha = .87$, and $\alpha = .89$.

Procedure

On arrival participants in all conditions were told that they were to participate in an experiment that examined group decision making and were seated apart from each other and given the task and the basic task instructions. The basic task instructions existed of a brief introduction to the task and a description of what participants were supposed to do. Subsequently, participants in all conditions studied the task materials individually. In the control condition, after finishing the task individually, participants gathered together as a group and proceeded with the group task. In the elaboration-instruction-without-sharing-condition, group members received the basic task instructions and all other instructions for this condition before they gathered as a group. In the elaboration-instruction-with-sharing-condition, group members received the basic task instructions and then gathered as a group. As a group, they then received the instructions for this condition. Following, they were invited to discuss their task representations for a couple of minutes before proceeding with the decision task.

All groups were told that they were allowed to review the task booklets with the informational items during the group task. However, they were also told not to let the other members read their booklets. Furthermore, to motivate groups to do well on the task all groups were told that a bonus of 50 euro per group member could be won by performing well. All groups received as much time as they needed for the group discussion. Yet, for practical reasons, when groups were not finished after

30 minutes (which rarely happened) they were asked to finish and were given a maximum of two minutes to do this. After finishing the task, participants were seated alone again and received a questionnaire. After answering the questions they were debriefed, paid, and dismissed.

Results

Preliminary Analysis

To determine the level of analysis mean $a_{wg(1)}$ values were calculated for each variable (Brown & Hauenstein, 2005). Cut-off scores of .60 or .70 have been reported (Brown & Hauenstein, 2005). The mean $a_{wg(1)}$ value for individual task representations (.87), cohesion (.75), identification (.68), and climate (.61) were all above the .60 cut-off point. These variables were therefore analyzed at a group-level. To test for differences between the conditions planned contrasts were computed. In addition, because of the relatively small sample size a significance level of $p < .10$ was adopted. Descriptive statistics are reported in Table 1.

Manipulations Checks

Task representations emphasized elaboration more in the experimental conditions than in the control condition, $t(25) = 3.69$, $p < .01$, $\eta^2 = .35$, for the contrast of the elaboration instruction with sharing and control condition, and $t(25) = 2.20$, $p < .05$, $\eta^2 = .16$, for the contrast of the elaboration-instruction-without-sharing and control condition. In addition, there were no significant differences between the experimental conditions, $t(25) = 1.44$, $p = .16$, $\eta^2 = .08$. These findings point to the success of our manipulation of task representations. Importantly, they also show that potential differences between the experimental conditions are not due to differences in group members' individual task representations.

Table 1

Descriptive Statistics and Correlations[a] *among the Variables, Preliminary study.*

		M	*SD*	1	2	3	4	5	6	7
1	Individual task representations	6.34	.40	-						
2	Awareness of sharedness	.36	.17	.09	-					
3	Shared task representations	5.92	.40	.76**	- .49*	-				
4	Information elaboration	4.91	1.55	.61**	- .12	.50*	-			
5	Performance	7.59	1.37	.41**	- .26	.47*	.79**	-		
6	Cohesion	5.50	.60	.27	- .42*	.52**	.29	.17	-	
7	Identification	5.20	.55	.24	- .34+	.49**	.11	.09	.81**	-
8	Climate	6.08	.44	.29	-.27	.44*	.27	.04	.64**	.80**

+$p < .10$; *$p < .05$; **$p < .01$,

[a]Correlations reported are partial correlations controlled for the effects of experimental conditions.

Second, we expected groups in the elaboration-instruction-with-sharing-condition to score higher on awareness of sharedness than groups in the elaboration-instruction-without-sharing-condition (but not necessarily than groups in the control condition). Results showed that the standard deviation for group members' ratings of each of the other members' task representations was smaller in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition, $t(25) = -1.94$, $p < .10$, $\eta^2 = .13$, but not than groups in the control condition $t(25) = .32$, $p = .75$, $\eta^2 = .00$. All means per condition are reported in Table 2.

Testing Hypothesis 1 to 3

Hypothesis 1 predicted that groups with shared task representations emphasizing elaboration score higher on elaboration and performance. To test this hypothesis planned contrasts were used in which the elaboration-instruction-with-sharing-condition was compared to the control condition. Results showed that groups in the elaboration-instruction-with-sharing-condition scored higher on information elaboration, $t(25) = 4.66$, $p < .01$, $\eta^2 = .47$, and performance, $t(25) = 4.95$, $p < .01$, $\eta^2 = .49$, than control groups, thus confirming Hypothesis 1. Hypothesis 2 predicted that groups score higher on elaboration and performance when they are aware of sharing task representations than when they share representations but are not aware of sharing them. To test this hypothesis we compared the elaboration-instruction-with-sharing-condition with the elaboration-instruction-without-sharing-condition using planned contrasts.

As expected, groups scored higher on both information elaboration, $t(25) = 1.84$, $p < .10$, $\eta^2 = .12$, and performance, $t(25) = 2.76$, $p < .05$, $\eta^2 = 23$, in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition.

To substantiate that shared task representations indeed lead to differences in group information elaboration and decision making performance, we tested whether shared task representations mediated the effects of the experimental instructions on performance. Furthermore, Hypothesis 3 predicted that group information elaboration mediates in the relation between shared task representations and performance. First, we tested differences in shared task representations between conditions. Groups in the elaboration-instruction-with-sharing-condition scored higher than groups in both the elaboration-instruction-without-sharing-condition, $t(25) = 2.26$, $p < .05$, $\eta^2 = .17$, and the control condition, $t(25) = 2.76$, $p < .01$, $\eta^2 = .23$. Next, we conducted a series of regression analyses and Sobel tests. As can be seen in Table 3, because the βs for the relation between the dummy variables that represented the experimental conditions and performance remained significant after shared task representations was entered into the model, shared task representations can only be said to partly mediate the relation between the dummies and performance. However, information elaboration was shown to fully mediate the effects of shared task representations on decision performance, thereby confirming Hypothesis 3.

To test differences between the conditions in group cohesion, group identification, and climate planned contrasts were used. Analyses yielded no differences between conditions, all *p*s > .25.

Table 2

Means, Standard Deviations, and 95 % Confidence Intervals (CI) per Condition, Preliminary Study.

	Elaboration instruction with sharing				Elaboration instruction without sharing				Control			
	M	*SD*	CI		*M*	*SD*	CI		*M*	*SD*	CI	
			Lower	Upper			Lower	Upper			Lower	Upper
Individual task representations	6.60_a	.17	6.48	6.72	6.37_a	.50	5.99	6.76	6.02_b	.28	5.81	6.23
Awareness of sharedness	$.32_a$	.12	.24	.41	$.47_b$	.22	.30	.64	$.30_a$	.13	.20	.40
Shared task representations	6.19_a	.18	6.06	6.32	5.82_b	.51	5.43	6.20	5.73_b	.34	5.47	5.99
Information elaboration	6.11_a	.76	5.52	6.70	5.05_b	1.25	3.88	6.21	3.59_c	1.36	2.55	4.64
Performance score	8.70_a	.95	8.02	9.38	7.44_b	1.13	6.58	8.31	6.44_c	.88	5.77	7.12

Note. Different subscripts within rows mean values differ from each other at the $p < .10$ level.

Discussion

The preliminary study supported our core predictions. It showed that shared task representations lead to more elaboration and higher decision-making performance (Hypothesis 1). Moreover, group information elaboration and performance were higher when group members were more aware of sharing task representations (Hypothesis 2). Evidence for our additional hypotheses concerning the processes underlying these effects was also largely supportive. While Hypothesis 3 was only partly supported in that shared task representations only partly mediated the effects of the experimental conditions on performance, information elaboration was shown to fully mediate the relationship between shared task representations and decision quality. Our preliminary study thus offered valuable first evidence for our proposition regarding the role of shared task representations in groups' use of distributed information.

At the same time, however, it should be noticed that this is only evidence from one single study, and moreover a study with quite low sample size. Replication of our first study's findings would therefore substantially bolster the confidence in our conclusions. In addition, it would seem valuable to substantiate our reasoning about the role of psychological safety in the relationship between shared task representations and information elaboration. Accordingly, we conducted a second, more full-blown study.

The Main Study

As outlined in the introduction, shared task representations are expected to affect information elaboration and performance in two ways. First, shared task representations should lead group members to be more attuned to the need for information elaboration. Second, the awareness that these representations are shared should increase psychological safety (i.e., the expectation that group members will not respond negatively to divergent viewpoint) and thus increase the likelihood that group members enter new information into the discussion. In addition to the test of Hypotheses 1-3, the main study therefore also included a test of the following hypotheses.

Hypothesis 4a. Psychological safety is higher when group members are more aware of sharing task representations emphasizing elaboration.

The increase in psychological safety is expected to lead to more information elaboration and higher group decision performance. Because part of the effect of shared task representations on information elaboration and performance is expected to be a direct result of individual group members' increased understanding of the importance of information elaboration, psychological safety is expected to only partly mediate the effect of shared task representations on performance.

Hypothesis 4b. Psychological safety partially mediates the relationship between shared task representations and information elaboration and performance.

Table 3

Results of Mediational Analyses, Preliminary Study.

	Performance							
			+ Shared task representations			+Information elaboration		
	β	ΔR^2	β	ΔR^2	*z*	β	ΔR^2	*z*
Dummy1	- .44**	.15*	- .27^{+}		1.70^{+}	- .17		
Dummy2	- .80**	.50**	- .59**		1.89^{+}	- .21		
Shared task representations			.39*	.11*		.14		2.87**
Information elaboration						.66**	.19**	

	Information elaboration				
			+ Shared task representations		
	β	ΔR^2	β	ΔR^2	*z*
Dummy1	- .32^{+}	.08^{+}	- .15		1.64^{+}
Dummy2	- .78**	.48**	- .58**		1.81^{+}
Shared task representations			.37*	.10*	

Note. Dummy 1 represents the difference between the elaboration-instruction-with-sharing and the elaboration-instruction-without-sharing-condition and dummy 2 represents the difference between the elaboration-instruction-with-sharing and the control condition. *z*-values for the decrease in β tested with Sobel tests.

$^{+}p < .10$; $^{*}p < .05$; $^{**}p < .01$.

Method

Design and Participants

The experiment had a one-factor design with three levels (elaboration-instruction-with-sharing/ elaboration-instruction-without-sharing/ control). A total of 364 Dutch undergraduate students (228 men and 136 women) were assigned to 79 four-person groups and 12 three-person groups[2]. Groups were randomly assigned to one of the three conditions (29 groups in the group-level manipulation condition, 31 groups in the individual-level manipulation condition, and 31 groups in the control condition). For seven groups because of technical problems no audio-video data were available (three in the elaboration-instruction-with-sharing, two in the elaboration-instruction-without-sharing, and two in the control condition). There is no reason to suspect these groups to differ from the other groups. The groups were kept in the analyses (listwise deletion was used in the regression analyses). The majority of the participants were business administration students (94.4 %). Their mean age was 20.9 (*SD* = 1.3). For their participation they received a compensation of 10 euro (± 12 US dollars).

Manipulations

For the most part the manipulations were identical to the manipulations in the preliminary study. A small difference lies in the manipulation of the elaboration-instruction-without-sharing-condition. A small change in wording and the use of different-colored files accompanied the additional instructions about the

fact that task representations may not be shared. Furthermore, as an analogue to the time allotted to groups in the elaboration-instruction-with-sharing-condition to read the instructions out loud to each other, individual group members in the elaboration-instruction-without-sharing-condition were asked to very briefly summarize the instructions after they had read them (See Appendix A).

Measures

Measurement of group information elaboration, decision making performance, group cohesion, identification with the group, and group climate were identical to those used in the preliminary study. To measure individual task representations, awareness of sharedness, and shared task representations six questions were used, four similar to the ones used in the preliminary study and two new questions. Furthermore, psychological safety was measured on a 7-point scale, ranging from “completely agree” to “completely disagree” using six questions, mainly based on Edmondson (1999, 2003). All scales used in the main study along with reliability coefficients can be found in Appendix B.

Results

Preliminary Analysis

Mean $a_{wg(1)}$ values (Brown & Hauenstein, 2005) for all variables were above .70, warranting group-level analysis (.91 for shared task representations, .88 for psychological safety, .77 for cohesion, .74 for identification, and .88 for climate). See Table 4 for descriptive statistics.

To check whether groups in the elaboration-instruction-with-sharing-condition indeed had higher awareness of sharedness than groups in the other experimental condition without sharing, we tested difference between conditions for our standard deviation measure. The standard deviation over individuals' perceptions of each of the other group members' task representations (i.e., a within-person rather than between-person standard deviation reflecting individuals' awareness of sharedness) should be lower in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition. Results showed that awareness of sharedness was indeed higher in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition, $t(88) = -2.05$, $p < .05$, $\eta^2 = .05$. Neither the elaboration-instruction-with-sharing-condition, $t(88) = -1.29$, $p = .27$, $\eta^2 = .02$, nor the elaboration-instruction-without-sharing-condition, $t(88) = .93$, $p = .35$ $\eta^2 = .01$, differed from the control condition.

Table 4

Descriptive Statistics and Correlations[a] *among the Variables, Main Study.*

		M	*SD*	1	2	3	4	5	6	7	8
1	Individual task representations	5.96	.52	-							
2	Awareness of sharedness	.38	.20	-.01	-						
3	Shared task representations	5.60	.45	.71**	-.35**	-					
4	Psychological safety	5.51	.54	.19	-.19	.44**	-				
5	Information elaboration	5.04	1.61	.46**	-.07	.52**	.44**	-			
6	Performance	7.98	1.45	.40*	.07	.33**	.35**	.79**	-		
7	Cohesion	5.56	.58	.26*	-.29**	.44**	.27*	.05	-05	-	
8	Identification	4.87	.64	.25*	-.12	.38**	.25*	.16	.08	.65**	-
9	Climate	5.07	.30	.17	-.08	.38**	.10	.04	-.06	.71**	.51**

*$p < .05$; **$p < .01$

[a] Correlations reported are partial correlations controlled for the effects of experimental conditions.

Testing Hypotheses 1 to 4

Hypothesis 1 predicted that groups would process more information and perform better when they shared task representations than when they did not. To test this hypothesis planned contrasts were used in which the elaboration-instruction-with-sharing-condition was compared to the control condition. Results showed that groups indeed engaged in more information elaboration in the

elaboration-instruction-with-sharing-condition than in the control condition, $t(81) = 4.12$, $p < .01$, $\eta^2 = .17$. For performance, a similar pattern was found, $t(88) = 2.50$, $p < .05$, $\eta^2 = .07$. Thus, Hypothesis 1 was confirmed.

Hypothesis 2 predicted that groups that were more aware of sharing task representations would process more information and perform better. We used contrast analysis comparing both experimental conditions to test this hypothesis. Results confirmed that groups elaborated more on information, $t(81) = 2.28$, $p < .05$, $\eta^2 = .06$, and performed better, $t(88) = 2.41$, $p < .05$, $\eta^2 = .06$, in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition.

Hypothesis 4a predicted psychological safety to be higher in the elaboration-instruction-with-sharing-condition than in the elaboration-instruction-without-sharing-condition or control condition. Contrast analysis confirmed this hypothesis, $t(88) = 2.48$, $p < .05$, $\eta^2 = .07$, for the differences between the elaboration-instruction-with-sharing-condition condition and elaboration-instruction-without-sharing-conditions, $t(88) = 2.63$, $p < .01$, $\eta^2 = .07$, for the difference between the elaboration-instruction-with-sharing and control condition.

As in the preliminary study, we tested whether shared task representations mediated the effect of the experimental instructions on performance. Furthermore, Hypothesis 3 predicted that information elaboration mediates between shared task representations and performance. In addition, shared task representations were expected to mediate in the relation between the experimental conditions and information elaboration and performance. Finally, Hypothesis 4b predicted that psychological safety partly mediates in the relation between shared task representations and information elaboration and performance. First, we tested differences on shared task representations between conditions. Groups in the elaboration-instruction-with-sharing-condition scored higher than groups in both the elaboration-instruction-without-sharing-condition, $t(88) = 2.76$, $p < .01$, $\eta^2 = .08$, and the control condition, $t(88) = 4.29$, $p < .01$, $\eta^2 = .17$. To further test these hypotheses, a series of regression analyses and Sobel tests were used. As can be seen in Table 6, shared task representations fully mediated the effects of both dummies on performance. Furthermore, both Hypotheses 3 and 4b were confirmed.

Group Cohesion, Identification, and Climate

Again no differences on cohesion, identification, and group climate were found between conditions (all ps < .20). Thus, cohesion, identification, and group climate are again unable to explain the current findings.

Table 5

Means, Standard Deviations, and 95 % Confidence Intervals (CI) per Condition, Main Study.

	Elaboration instruction with sharing				Elaboration instruction without sharing				Control			
	M	*SD*	CI		*M*	*SD*	CI		*M*	*SD*	CI	
			Lower	Upper			Lower	Upper			Lower	Upper
Individual task representations	6.18_{a}	.33	6.06	6.31	6.02_{a}	.51	5.83	6.21	5.70_{b}	.58	5.48	5.91
Awareness of sharedness	$.33_{a}$	.19	.26	.40	$.43_{b}$	.24	.35	.52	$.38_{ab}$	.17	.32	.45
Shared task representations	5.86_{a}	.37	5.72	6.00	5.57_{b}	.46	5.40	5.74	5.40_{b}	.40	5.26	5.55
Psychological Safety	5.75_{a}	.50	5.56	5.95	5.37_{b}	.77	5.09	5.66	5.35_{b}	.45	5.18	5.52
Information elaboration	5.92_{a}	1.01	5.52	6.33	5.01_{b}	1.54	4.43	5.60	4.28_{c}	1.75	3.61	4.94
Performance score	8.59_{a}	1.05	8.19	8.99	7.70_{b}	1.44	7.18	8.24	7.68_{b}	1.64	7.08	8.28

Note. Different subscripts within rows mean values differ from each other at the $p < .05$ level.

Table 6

Results of Mediational Analyses, Main Study.

	Performance										
			+ Shared task representations			+ Psychological safety			+Information elaboration		
	β	ΔR^2	β	ΔR^2	*z*	β	ΔR^2	*z*	β	ΔR^2	*z*
Dummy1	- .30*	.06*	- .20		2.09*	- .17			- .08		
Dummy2	- .35**	.07*	- .18		2.56**	- .16			.02		
Shared task representations			.35**	.12**		.24*		1.99*	- .12		
Psychological safety						.24*	.04*		- .03		4.49**
Information elaboration									.87**	.37**	
	Information elaboration										
			+ Shared task representations			+ Psychological safety					
	β	ΔR^2	β	ΔR^2	*z*	β	ΔR^2	*z*			
Dummy1	.27*	.05*	- .30		2.46*	- .10					
Dummy2	.49**	.17**	- .23*		3.38**	- .21					
Shared task representations			.53**	.23**		.41**		2.25*			
Psychological safety						.24**	.04*				

Note. Dummy 1 represents the difference between the elaboration-instruction-with-sharing and without sharing conditions; dummy 2 the difference between the elaboration-instruction-with-sharing and control conditions. *z*-values for the decrease in β refer to Sobel tests. $^{*}p < .05$; $^{**}p < .0$.

Discussion

The main study replicated findings of the preliminary study. Task representations were again shown to engender group information elaboration and higher-quality performance (cf. Hypothesis 1), groups with shared task representations engaged in more information elaboration and performed better than groups in which the individual members had similar task representations without being aware of sharing them (Hypothesis 2). Furthermore, shared task representations were found to mediate between the experimental conditions and group information elaboration. Also, information elaboration mediated between shared task representations and performance (Hypothesis 3). Extending the findings of the preliminary study, the main study also showed that shared task representations, and more specifically awareness of sharedness of these representations was associated with greater psychological safety (Hypothesis 4a) and that as predicted psychological safety partly mediated the relationship between shared task representations and information elaboration (Hypothesis 4b). Together with the preliminary study, the main study yields highly consistent evidence for the role of shared task representations in groups' use of distributed information.

General Discussion

Decision making groups do not always make optimal use of their informational resources. While several factors may affect groups' use of distributed information, we propose that one of the more fundamental causes of groups' suboptimal use of distributed information is rooted in group members' understanding of their task, which often seems to emphasize the pooling of preferences and the search for common ground more than the elaboration of decision-relevant information. When group member task representations are insufficiently attuned to the information elaboration requirements of the task at hand, groups will exchange, discuss, and integrate less of their distributed information than when groups hold shared task representations emphasizing elaboration of decision-relevant information as an essential aspect of task performance. The present findings yield important first evidence for this proposed role of shared task representations in groups' use of distributed information, and suggest that an analysis in terms of shared task representations may more generally advance our understanding of group decision making performance.

Shared task representations, and shared cognition more generally, have gained increasing attention during the last decade or so, and there is mounting evidence that shared (task) cognition can have positive effects on group performance (cf. Marks et al., 2000; Mathieu et al., 2005; Mathieu et al., 2001). Even so, in general studies of information use in group decision making have thus far not paid much attention to the effects of shared task representations. One of the few areas in which research has been done on the effect of shared cognition for information use in decision making groups are studies of transactive memory systems (Hollingshead 1998a, 1998b). However, transactive memory systems first and foremost concern shared cognition about the team (i.e., "who knows what"),

rather than a shared understanding of the team task. In addition, in certain situations the effects of shared representations of the team may actually be mediated by shared representations of the task (see also Brandon & Hollingshead, 2004). Several studies have shown that groups tend to exchange more information and perform better on distributed information tasks when they know which group member has knowledge and information on what kind of specific topic (Stasser, Vaughn, & Stewart, 2000; Stewart & Stasser, 1995; Stasser, Stewart, & Wittenbaum, 1995). Several possible explanations for the effect of knowing what kind of specific knowledge other members have, such as an increase in coordination, or perceived social validity of group members' unique information, have been tested and discarded as explanatory mechanisms, and thus far no mediating processes seems to have been identified for the effect of having knowledge about who knows what (Stasser et al., 2000). Shared task representations may however be able to explain these findings. When group members know they all possess different knowledge and combine this with the fact that they are to work on a particular task together as a team, they may see the fact that they have to cooperate together on the task as an indication that the different members' specific knowledge is valuable for the task and needs to be combined. They may therefore come to see that their informational resources are important for the task at hand and therefore should be capitalized upon. In other words, knowing about the existence of different informational roles may affect what is perceived as the best way to attain their goal (make a decision). Thus, their knowledge about the distribution of information might lead to the adoption of a task representation similar to one's studied here. This proposition illustrates how an analysis in terms of group members' task representations may also help to make sense of other issues in research in group's use of distributed information.

Implicit in work on shared cognition is the notion that awareness of sharedness is an important aspect underlying the effects of similarity of cognition in groups (Tindale & Kameda, 2000). Studies of shared (task) cognition have, however not empirically distinguished between similarity of cognition per se and awareness of this similarity. The present study is the first to demonstrate that awareness of sharedness indeed is an important part of socially shared cognition. In this study we have conceptualized sharedness as entailing not only similarity in group members' representations, but also a sense of awareness of the similarity. Although arguably sharedness can also exist without a sense of awareness, awareness of sharedness could be said to make the concept of sharedness more of a "true" group-level construct, rather than a mere aggregation of individual-level variables. Although awareness of sharedness usually is not explicitly mentioned in research on shared (task) cognition, it seems that in some studies awareness of sharedness may still play a role. Certain effects that are attributed to sharedness seem at least for some extent also to depend on awareness of sharedness. For instance, when shared mental models are expected to affect the level of implicit coordination present in a group (cf. Blicksenderfer, Cannon-Bowers, & Salas, 2000), it seems necessary that group members do not only have a shared notion of how a task has to be dealt with, but also that they realize

that the other members share the notion. Accordingly, at least certain types of shared mental models may have a smaller effect when group members are not aware of sharing them. Therefore, more attention for awareness of sharedness may lead to more insights in group functioning in general and the effects of shared cognition in particular.

This study also showed psychological safety to partly explain the effects of shared task representations on group information elaboration and performance. Studies in team learning have shown how psychological safety can be a crucial determinant for group performance in situations that require exchange of information (e.g., Edmondson, 1991, 2003). Although shared cognition (i.e., shared beliefs) has been linked to psychological safety (Cannon & Edmondson, 2001), the actual effect of the level of sharedness on psychological safety to our knowledge had not yet been assessed. This study provides further empirical evidence for the link between sharedness of cognition and psychological safety. Moreover, whereas research in shared cognition identified several potential mediators in the relation between shared cognition and team performance (e.g., coordination and communication Marks et al., 2002; Mathieu et al., 2000; 2005; strategy formation, Mathieu et al., 2000; and interpersonal liking, Peterson et al., 2000), thus far psychological safety has not yet been identified as a potential mediator. This study shows that psychological safety can be of importance for the effects of shared cognition on group performance.

Although the decision making situation as examined in the present study to a certain degree seems representative for many important decision situations in organizations (e.g., cross-functional teams, top management teams), it should be noted that our findings mainly seem to be applicable for (a) groups dealing with distribution of important decision-relevant information and (b) decision situations in which distributed information is likely to make a substantial and positive contribution to group performance. As less information is distributed or as distributed information becomes less important for the ultimate quality of the group decision the effects of shared task representations as examined in this study are likely to become smaller.

Moreover, the level of cooperativeness of the group members is likely to be important for the effects of shared task representations. In organizational groups, members may not always only be concerned with the group goal, but may also have their individual interests or "goals" (Wittenbaum, Hollingshead, & Botero, 2004). As a decision situation becomes less cooperative, group members are likely to be less concerned with their group goal of making high quality decisions. Also, in a less cooperative situation group members could hold, besides representations on how to reach group goals, representations on how best to achieve their personal goals, which may guide their behavior. Therefore, task representations like the ones examined in this study may have a smaller effect as group members have stronger personal goals and as the distance between personal and group goals becomes larger. On the other hand, if a decision situation is competitive mainly because group members are afraid that other members might take advantage of them when they mention certain information, it

could also be the case that a higher level of psychological safety following awareness of sharedness fosters a higher level of goal alignment and therefore elaboration within such groups. To summarize, it seems likely that group and task features serve as important moderators for the effects of task representations. Because in this study only one type of group and task were examined, future research that investigates different types of tasks, ways of information distribution and different groups is needed to be able to say more about different group decision situations.

If shared task representations are important for group functioning, it also seems relevant to understand how shared task representations develop within groups in terms of content as well as in terms of sharedness. There is some research on shared cognition that has shown that a group training or pre-briefing may foster shared cognition in groups (Marks et al., 2000; Moreland, 2000). However, there are likely to be other ways through which shared task representations could develop. For instance, the amount of group discussion about how to approach the group task or, put differently the level of reflexivity (West, 1996) taking place within a group might affect group members' understanding of the group task, as well as the extent to which their understanding is shared by members, and the extent to which group members are aware of sharing their understanding. In addition, in case a group leader is present group members may look at the group leader for cues on how to best approach the task. Marks et al. (2000) already showed that leader pre-briefings can influence group members' shared cognition; however, group leaders may be able to affect group members' task representations in more ways. For instance, leaders could affect followers' representations through behavior they model or comments they make to group members during group interaction. Future research could pay more attention to the different ways in which shared task representations may develop. More attention to groups' shared task representations and awareness of sharedness may help to further develop our knowledge of group functioning.

Footnotes

[1] Note that elaboration includes exchange of information. Preliminary analyses and coding also included a separate measure of information exchange. This measure correlated highly with information elaboration (r = .84). In line with our theoretical argument it was less predictive of group performance than information elaboration.

[2] A common problem for group experiments concerns what to do when scheduled participants do not show up for the experiment and replacements are not readily available. We dealt with this problem by giving the fourth group member only shared and no unshared information so we could also run three-person groups in case the fourth participant did not show up and replacements were not available. The fact that one person did not have additional unique information is unlikely to affect our findings. Previous studies have also relied on groups in which not all members were given unique information and this did not seem to affect the results (Stasser & Stewart, 1992). Furthermore, because the three members that received unique information always received only one item of unique information per decision issue (and about four to seven items of shared information depending on the decision issue) the difference in the total amount of information given to the group members was relatively small. Preliminary analyses showed that there were no significant differences between three and four-person groups and therefore three-person groups were kept in the analysis. Because in the four-person groups one person always received only information that all the other three members had as well, changing group size to three members did not affect total amount of information possessed by the groups. Therefore, in the analyses no distinction is made between three and four-person groups

Appendix A: Instruction used for the manipulation of task representations.

The task you are about to work on requires you to make decisions together with three other participants. You will make these decisions based on the information you received. To make high quality decisions with which all parties are likely to be satisfied, it is important that group members take into account all available information possessed by the different group members. Consideration of all available information about the parties' preferences and the relative importance of these preferences for the parties is absolutely necessary to make an optimal decision. That means that to make an optimal decision, before groups try to make a decision they first need to gather all available information. A mistake often made by decision making groups is that they come to an agreement too soon without first considering all available information. Yet, even when all members initially, based on their individual preferences, agree on what is supposed to be the best solution, this does not have to mean that they really have found the best solution. Even though group members should ultimately come to an agreement, trying to reach an agreement too soon without having thoroughly discussed available information is likely to result in lower-quality decisions. So, to perform well on group tasks like these people should first exchange and thoroughly discuss the available information possessed by all group members and only after this try and come to an acceptable agreement.

Additional instructions given in the elaboration-instruction-without-sharing-condition:

"Real" decision-making teams in organizations often exist of people that have their own specific and background and experiences. Because of this it is likely that there are small differences in the way group members perceive the most important goals and strategies to achieve the goals of their task. Because we aim to create a decision making situation that may also occur in "real life", below we did not provide everybody in this experiment with exactly the same information about the task. Therefore, it is possible that, just like with "real" decision making groups some of your fellow group members have a slightly different idea about the group decision making task than you have. For this study it is important that you do not talk about this with your fellow group members.

After you have read the instructions you can proceed with writing down a short summary of the instructions.

Additional instruction given in the elaboration-instruction-with-sharing-condition:

Knowing that your fellow group members share your views of the task allows you to better understand one another and to communicate more openly and efficiently. Therefore, before you start with the group task you will first get a maximum of two minutes to very briefly summarize what you just read to your fellow group members. Mentioning the above information to the group should allow you to form a better collective idea about the task. So think about: What should we do for high performance on the group task, what should we not do for high performance on the group task.

Appendix B: Measures Main Study

Task Representations (α = .72)

1. For high quality performance it was important to base the decision on as much information as possible
2. Discussions can be useful for performance on this task
3. Discussing all members' information was of crucial importance for attaining high decision quality on this task
4. I believe that for high performance on task like these it is important to hear information of other members
5. The exchange of information was important for the quality of the final decision.
6. The best decisions on tasks like these are made by not having too elaborate discussions, but by just making a decision that is acceptable to all (R)

Psychological Safety (α = .78)

1. I felt like the other group members would judge me on the things that I said (R)
2. I had the impression the other group members wanted to hear what I had to say
3. I had the impression the other group members would appreciate discussion
4. I expected the other members to react positively when I disagreed with them
5. I felt like group members would think more positively of me when I agreed with them (R)
6. I expected this group to appreciate it when I mentioned new information

Cohesion (α = .93)

1. I would like to work together with this group in the future
2. I liked working together with this group
3. I thought this was a nice group

Identification (α = .90)

1. I feel connected to the other group members
2. I identify myself with the group I just worked with
3. I am happy to have been a member of this group
4. I see myself as a member of the group I just worked with

Climate (α = .89)

1. I felt comfortable
2. The atmosphere was good
3. Our cooperation was good

Information Elaboration (κ = .78)

A score of "1" was given when information was completely ignored by all four group members and the group immediately started with exchanging preferences. A score of "2" was given when one of the members did mention a crucial item of information, but none of the other members reacted to it (either by saying something or by nodding or looking at the person that mentioned it) or used the item in making a decision. A score of "3" was given when one of the members mentioned an item of information and at least one of the other members reacted to it, but after this the group still failed to integrate it with the other information. A score of "4" was given when one crucial piece of information was mentioned by at least one of the group members, with at least two of the other three members clearly reacting to the mentioning of the information (for instance by asking a question about it, by combining it with another piece of information, or by drawing a conclusion from it with regard to what the best decision option would be in light of this information). A score of "5" was given when one crucial piece of information got fully discussed by at least three of the group members and integrated with other information and at least one other piece of information was clearly discussed by at least two of the four group members, however without their discussion influencing the use of that item of information by the group as a whole. A score of "6" was given when at least two pieces of crucial information were fully discussed by at least three of the group members and integrated with other information. A score of "7" was given when all three crucial items of information were clearly and fully discussed by at least three of the four members, with them clearly having drawn conclusions with regard to what the best decision option would be in light of this information.

Chapter 3

Knowledge about the Distribution of Information and Group Decision Making: When and Why Does it Work?

Over the years numerous studies have documented how groups in which information is distributed over group members fail to adequately use their informational resources. Not only do group members often fail to exchange their informational resources (Wittenbaum & Stasser, 1996), when they do exchange information they often fail to adequately integrate information in coming to a decision (Gigone & Hastie, 1993). As a result of these findings, researchers have started to look for factors that can positively influence elaboration of decision-relevant information in groups (cf. Hinsz, Tindale, & Volrath, 1997; van Knippenberg, De Dreu, & Homan, 2004). One factor that aids groups in processing their informational resources is knowledge about the distribution of information within the group (i.e., knowledge about who is especially knowledgeable about what). Several studies have shown that knowledge about who knows what can positively affect information exchange and group decision making performance (Littlepage, Robison, & Reddington, 1997; Stasser, Stewart, & Wittenbaum, 1995; Stasser, Vaughn, & Stewart, 2000; Stewart & Stasser, 1995). Although it would seem to make intuitive sense that knowing who knows what is helpful, obvious explanations for this effect are not supported by the data, and it remains unclear which processes account for the effect of knowledge about information distribution on group information elaboration (Stasser et al., 2000). As a result of lack of clarity about the mediating processes, it is also unclear under what circumstances the positive effect of knowledge about information distribution is more likely to obtain. In the present study, we address both these issues.

We propose that when group members know which group member knows what, this affects the way they perceive the group task and how best to approach the task or in other words, their task representations (Tindale, Smith, Thomas, Filkins, & Sheffey, 1996). More specifically, we propose that knowledge about the distribution of information leads to shared task representations for elaboration – task representations that emphasize the importance of group elaboration of decision-relevant information for finding an optimal solution. We argue that these task representations mediate the effect of knowledge about the distribution of information on group elaboration and decision making performance. This proposition allows us to identify factors that moderate the effects of knowledge of information distribution. Factors that render it more likely that knowledge about information distribution engenders task representations emphasizing elaboration should moderate the effect of knowledge about the distribution of information. From this perspective we argue that both reflection on the implications of the knowledge about distributed information and awareness of the sharedness of this knowledge within the group moderates the effect of knowledge about information

distribution. The contribution of the current study lies therefore not only in clarifying why knowledge about the distribution of information leads to more elaboration and better decisions, but also in specifying some of the conditions under which knowledge about the distribution of information is more likely to enhance the quality of group decision making.

Knowledge about the Distribution of Information

One of the first to recognize the effect that knowledge of who knows what can have on group performance was Wegner (1987). In his transactive memory theory he proposed that when a group of people work together for a period of time, they develop a so-called transactive memory system. A transactive memory system refers to a set of individual memory systems in combination with knowledge of who knows what and the communication that takes place between individuals (Wegner, Guilano, & Hertel, 1985). Transactive memory increases the amount of informational resources group members have access to, because members need not only to depend on their own memories for information. For transactive memory to work, that is for group members to be able to retrieve information from the system, it is crucial to have a shared understanding of which group member is knowledgeable about what kind of information. Several studies have shown that transactive memory can substantially improve group performance on a variety of tasks (Austin, 2003; Hollingshead, 1998a, 1998b; Liang, Moreland, & Argote, 1995; Moreland, Argote, & Krishnan, 1998; Moreland & Myaskovsky, 2000). Further evidence that knowledge about group members' roles can determine group behavior and performance can be found in research on shared cognition about the team. Knowledge about which group member knows or does what within the team has also been referred to as mental models of the team (Cannon-Bowers, Salas, & Converse, 1993). Research has shown that when teams possessed shared mental models of their teams they coordinated their actions to a higher degree during a game of tennis (Blicksenderfer, Cannon-Bowers, & Salas, 2000) and performed better on a class project (Peterson, Mitschell, Thompson, & Burr, 2000).

Moreover, knowledge about which group member knows what has also been shown to be beneficial for performance on group decision making tasks involving distributed information (Littlepage et al., 1997; Stasser et al., 2000; Stasser et al., 1995; Stewart & Stasser, 1995). In three studies Stasser and colleagues demonstrated that performance on decision making tasks with distributed information improved when group members were aware of the distribution of information. They compared information sharing and group decision making performance in groups that had either been told which member was more knowledgeable about a topic or that had not been given such information. Results showed that groups in which group members were informed about the different areas of expertise of the members exchanged more of group members' unique information (i.e., information possessed by only one of the group members) and performed better than groups in which members were not informed about the distribution of information. However, while the effect of

knowledge about the distribution of information has been replicated and seems fairly robust, it is unclear through which processes and under what conditions it leads to higher elaboration (Stasser et al., 2000).

Several possible explanations have been posited for the effects of knowledge about the distribution of information on decision making performance, some of which have been shown to account for the effects of knowledge about the distribution of information on other types of group tasks. The first explanation centers on the idea that knowledge of who knows what facilitates coordination between team members. Research in transactive memory has shown that members of groups that had developed transactive memory were better able to anticipate each other's behavior and were able to work together more smoothly (Liang et al., 1995; Moreland & Myaskovsky, 2000). With respect to group elaboration of decision-relevant information an increase in coordination could mean more coordinated recall of information. When group members know each other's areas of expertise they can focus on only recalling and mentioning information that falls within their own area of expertise. This could then lead to a decrease of tendency to primarily discuss information that is already shared before discussion (Stasser, 1999) and thus to an increase in the probability of group members' unique information being mentioned (Stasser et al., 1995). However, Stasser et al. (2000), found that giving group members knowledge about each other's area's of expertise did not lead to group members adhering more to their own area of expertise in terms of the information they mentioned during group discussion. In other words, even though members knew about the distribution of information, during group discussion they mentioned as much information that fell within their area of expertise as they mentioned information that fell within other members' areas of expertise. Thus, although giving group members knowledge on areas of expertise led to more information exchange it did not do this by affecting coordination of information sharing (Stasser et al., 2000).

A second explanation posits that elaboration is affected by an increase in perceived validity and acceptance of information. When information can be socially verified, it is more likely to be accepted by other group members (Parks & Cowlin, 1996). Yet, when group members know that an individual who possesses information that cannot be socially verified (i.e., unshared information) is knowledgeable about the topic, the information is more likely to be perceived as valid and therefore may be more likely to be used in making a group decision (Hollingshead, 1998a; Liang et al., 1995; Moreland et al., 2000). Although perceived validity has been shown to account for effects of knowledge about the distribution of information on an assembly task (Liang et al., 1995) and on a recall task (Hollingshead, 1998a), perceived validity was not able to explain the effects that knowledge about informational roles had on information exchange and decision making performance in informationally diverse decision making groups (Stasser et al., 2000).

Thus, while there is robust evidence for the effect of knowledge about distributed information on decision making performance, it remains unclear what process drives this effect. Addressing this

issue, we propose that knowledge about information distribution elicits shared task representations that emphasize sharing and discussion of informational resources. Based on this proposition, we also identify two factors that moderate the effect of knowledge of information distribution because they should affect the extent to which knowledge about distributed information elicits such task representations: reflection on the team and the task, and awareness of sharedness of the knowledge about the information distribution.

Task Representations for Elaboration

The effects of task representations on decision making performance are expected to be mediated by elaboration. For groups with distributed information to be able to perform well they need not only to exchange information, but also to use the information in coming to a decision (e.g., Gigone & Hastie, 1993; Winquist & Larson, 1998). Rather than investigating the role of information exchange per se in the current study we therefore focused on the role of elaboration of information. Elaboration of information consists of exchange of information, individual-level processing of the information, feeding back the results of this individual-level processing into the group, and discussion and integration of its implications (van Knippenberg et al., 2004; cf. Hinsz et al., 1997) and is likely to be more important for the effective use of distributed information than information exchange per se (van Ginkel & van Knippenberg, 2004).

The extent to which knowledge about the distribution of information leads to elaboration of decision-relevant information in groups with distributed information is likely to depend on the extent to which the groups develop shared task representations for elaboration. One reason why decision making groups often fail to integrate information possessed by their members may lie in the groups' focus on pooling preferences to reach an agreement, which can go at the expense of processing information (cf. Hastie & Pennington, 1991; Wittenbaum, Stasser, & Merry, 1996). Group members' understanding of their task and specifically of the extent to which the task requires careful elaboration rather than merely pooling preferences may affect the extent to which they focus on elaboration when working on a decision making task. The way group members perceive their task is reflected in the (shared) task representations they adopt. A shared task representation has been defined as "any task/situation relevant concept, norm, perspective, or process that is shared by most of the group members" (Tindale et al., 1996, p. 84) and concerns how a group of people collectively perceive the task they are working on. When groups share task representations that underscores the importance of extensive exchange and discussion of information as well as the need to refrain from trying to reach an agreement too early in the process, which we refer to as *shared task representations for elaboration*, groups should process more information and perform better on group decision making tasks. Evidence for this can be found in a study by van Ginkel & van Knippenberg (2004) that compared elaboration and decision performance in groups in which members shared an experimentally induced task

representation for elaboration with groups in which members did not share such a task representation. Results showed that groups that shared the task representation for elaboration processed more information and performed better than groups that did not share the task representation.

In this study we argue that when group members have knowledge about information distribution this knowledge could lead to shared task representations for information elaboration. When groups know about the existence of the different informational roles in their group this knowledge is likely to affect their perceptions of and ideas about their task (cf. Brandon & Hollingshead, 2004). When group members are aware that they all possess different knowledge and combine this with the fact that they are to work on a particular task together as a team, they could see the fact that they have to cooperate together on the task as an indication that their specific knowledge is valuable for the task. They could therefore come to see that their informational resources should be capitalized upon. In other words, knowing about the existence of different informational roles is likely to affect what is perceived as the best strategy for goal attainment. Furthermore, this knowledge may also lead them to deduct that the task is more about information integration, that is, about using all information available to the group to find an optimal solution, than it is about making a group judgment all members can agree with (cf. Stasser & Stewart, 1992). Thus, their knowledge about the distribution of information can lead to the adoption of a task representation for elaboration, which in turn should lead to higher group decision making performance.

Based on previous studies (Littlepage et al., 1997; Stasser et al., 2000; Stasser et al., 1995; Stewart & Stasser, 1995) we predicted that groups that have knowledge about the distribution of information engage in more elaboration of decision relevant information (*Hypothesis 1a*) and perform better (*Hypothesis 1b*) than groups that do not have knowledge about the distribution of information. Moreover, based on the discussion above we expect the effect of knowledge about the distribution of information to be mediated by shared task representations for elaboration *(Hypothesis 2)*.

Reflection

The extent to which knowledge about the distribution of information is likely to result in a task representation that emphasizes the need for elaboration would seem to depend on the time that group members take to reflect on the task and on what the distributed information within the group means for the group task. The notion that reflecting on a task before proceeding with task performance can promote group performance is in line with findings of several studies in team reflexivity that show that reflexivity can positively affect team process and performance (Carter & West, 1998; Schippers, Den Hartog, Koopman, & Wienk, 2003; Tjosvold, Chun, & Ziyou, 2003). Indeed West (1996) proposed that teams that are reflexive are more adaptive and effective in the execution of their task because they have more comprehensive and more shared cognitive representations of their work. Thus, when team members have a clear representation of their team in terms of who knows what,

reflection should lead to the adoption of more appropriate task representations. When group members do not take time to reflect, they are less likely to develop task representations for elaboration.

Accordingly, we expect that the effect of knowledge about the distribution of information on elaboration and decision making performance is moderated by the extent to which group members reflect on their task. Knowledge about the distribution of information leads to more information elaboration (*Hypothesis 3a*) and higher quality decisions (*Hypothesis 3b*) when groups reflect (vs. do not reflect) on the group task before performing the task. Moreover, shared task representations for elaboration are expected to mediate the interaction of reflection and knowledge about the distribution of information on performance (*Hypothesis 4*).

Awareness of Sharedness

A second factor that we propose affects the extent to which knowledge about the distribution of information leads to elaboration and high-quality decisions is the extent to which group members are aware that everybody shares the knowledge about the distribution of information. When group members have knowledge about the distribution of information this does not necessarily mean that they also are aware of other group members having this knowledge as well. However, there are reasons to believe that when members are aware of members sharing this knowledge, this awareness can have an additional effect on behavior. Awareness of sharedness, also referred to as meta-level sharedness (Kerr & Tindale, 2004; Klimoski et al., 1994; Tindale & Kameda, 2000), is a relatively new concept that has not yet received much research attention. However, there exists some evidence for the potential effects of awareness of sharedness. Van Ginkel and van Knippenberg (2004) found that the effect of shared task representations on elaboration and performance was larger when group members were aware of sharing task representations than when they were not aware of sharing them. An increase in psychological safety as a result of awareness of sharedness was shown to explain this finding. While as far as we know van Ginkel and van Knippenberg (2004) is the only study that empirically tested the effects of awareness of sharedness, there are also some indications that the effects of group-level administration of interventions intended to aid team performance are stronger than individual-level administration of the same interventions (Liang et al. 1995; Liljenquist, Galinski, & Kray, 2004). This may be a sign of the effects of awareness of sharedness, because the shared experience of the intervention may have heightened awareness of the cognitions induced by the intervention.

The awareness of sharedness of knowledge about the distribution of information (i.e., shared team representations) may set the stage for the emergence of shared task representations. When group members are aware that everybody knows about the different informational roles that are present in their group, this may suggest that other group members operate on the basis of this knowledge, and thus invite group members to consider the implications of this knowledge for their approach to the task

as well. Furthermore, the increase in psychological safety that may follow from awareness of sharedness may make it more likely that group members act in ways congruent with their representations (van Ginkel & van Knippenberg, 2004). Thus, awareness of sharedness of knowledge about distributed information may invite task representations based on this information.

Therefore, we expect that the effect of knowledge about distributed information on elaboration and decision making performance is moderated by awareness of sharedness. Knowledge about the distribution of information more strongly affects information elaboration (*Hypothesis 5a*) and decision making (*Hypothesis 5b*) when group members are aware of sharing the knowledge about distributed information. Furthermore, we expect shared task representations to mediate the interaction of awareness of sharedness and knowledge about the distribution of information (*Hypothesis 6*).

Finally, elaboration is expected to mediate the relationship between shared task representations and performance (*Hypothesis 7*). (See Figure 1 for a graphic representation of our research model).

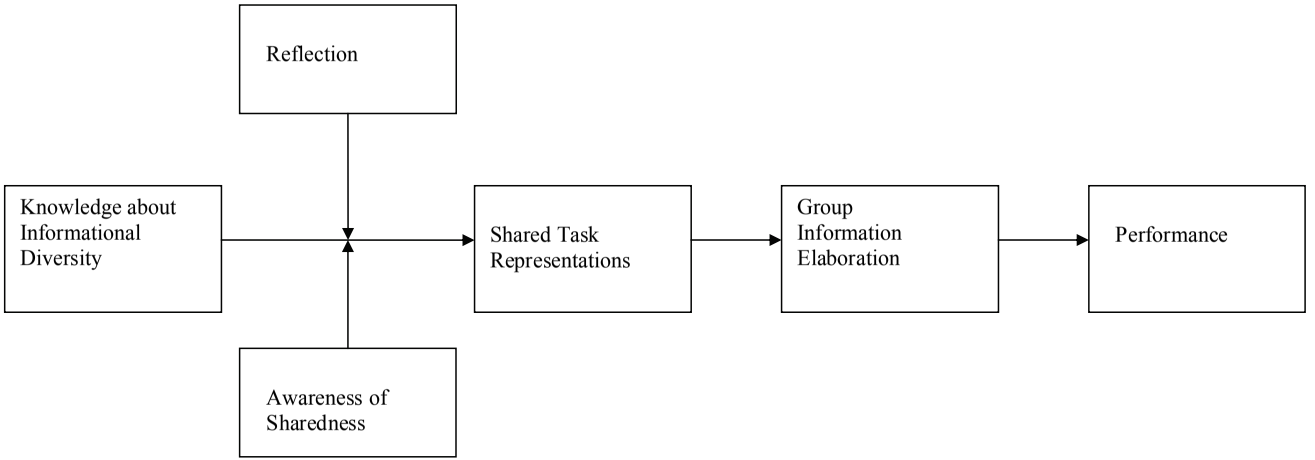
We put these hypotheses to the test in an experiment in which we manipulated knowledge about the distribution of information, reflection on the group task, and awareness of sharedness. The experimental nature of the study not only allowed us to reach conclusions about causality, but also allowed us to use audio-video data for relatively objective and unobtrusive behavioral measurement of elaboration of decision-relevant information.

Method

Design and Participants

The experiment had a 2 (knowledge about the distribution of information: yes/no) X 2 (reflection: yes/no) X 2 (awareness of sharedness: yes/no) design. A total of 375 students (240 men and 135 women) were assigned to 125 three-person groups. Due to technical problems audio-video data were lacking for six groups. Because there is no reason to suspect these groups to behave any differently form the other groups, the groups were kept in the analyses (listwise deletion was used in the regression analyses). Groups were randomly assigned to one of the eight conditions (between 14 and 17 groups per condition). Due to problems with the audio-video system data on elaboration are missing for six of the groups. The majority of the participants were either business administration students (55 %) or economy students (40 %). Their mean age was 21.1 (SD = 1.97). For their participation they received a compensation of 10 euros (approximately 12 USD).

Group Performance as a Function of the Experimental Conditions, Shared Task Representations, and Group Information Elaboration



Experimental Task

The task was a cooperative decision making task inspired by the Towers Market task (Weingart, Bennet, & Brett, 1993). While the original task was designed as a negotiation task, the adaptation was such that the current task was a purely cooperative decision making task. So, contrary to the original task, each group member represented all interests. The task concerns the organization of a small market center that contains a bakery, a florist, and a greengrocery. Participants are told that they function as an independent advisory committee that is to aid the three stores in making three interrelated decisions about the temperature for the market center, the division of maintenance costs between three stores, and the organization of marketing campaigns. To do this all participants were given information on the preferences of the three stores and on the relative importance of the three issues to the stores. In addition they were told to take the interests of all three stores into account. For each issue, groups could choose from a limited number of options. Based on all available information a hierarchy in the quality of the decision options existed (i.e., some combinations of decision options served the interests of all stores better than others). All members received some information on all three stores. The information items were partially based on another adaptation of the task (Beersma & De Dreu, 2002) and partially designed for this study.

Following prior research in group decision making, part of the decision-relevant information was given to all group members and part of the information was given to only one of the group members (cf. Stasser & Titus, 1985). Items of information necessary for making optimal decisions were distributed between the group members, so that for all members to be able to learn about these items groups had to share the information. For every decision issue there were always three items of information that were crucial for reaching an optimal decision, one concerning the bakery, one concerning the florist, and one concerning the greengrocery. Each of these informational items was uniquely assigned to one of the group members. For each decision issue group members always received this crucial, unshared information on the same party (e.g., member 1 always got additional information on the bakery, member 2 on the florist, and member 3 on the greengrocery). To make the task more complex, some irrelevant information about the three stores was also included (this information was always given to all members). Groups were told that the information the members received might differ.

Experimental Manipulations

Knowledge about the distribution of information was manipulated by means of a written instruction. In the knowledge about the distribution of information condition (from here on we will refer to this condition as knowledge condition) groups were informed about the existence of different informational roles before starting with the group task. They were instructed that each member had always been given some extra information on a certain store, but was given information on the other

two stores as well. In addition they were told about which store they possessed more information and about which stores each of the other members possessed more information. The information was presented to them in writing and by means of a small map of the table showing which person with extra information on what store would sit where at the table. In the no-knowledge condition group members were not notified about the group members having more information on one particular store (although in the general instructions that all groups received it did say that group members might receive information that differed somewhat from each others) and were not given a map.

Reflection was also manipulated by means of written instructions. The instructions were aimed at encouraging group members to develop appropriate mental representations of the task based on their knowledge of the task. Participants were told that research had shown that people can perform better on task when they have a clear notion of what the task is about and how it could best be approached, even if that notion is based on only a limited amount of knowledge of the task. Participants were asked to take a few minutes to think about the potential nature of the group task and what would be likely to lead to high or low performance based on what they had learned about the group task thus far. Because in the no-knowledge condition participants had not been told much else about the group task other than that they would have to reach a joint decision, participants in the no-knowledge condition were not necessarily expected to benefit from the additional reflection time. Groups in the knowledge condition, in contrast, were given the knowledge about the distribution of information instructions and therefore could use the reflection time to consider what the information about the distribution of information implied for the nature of the group task.

Finally, to manipulate awareness of sharedness differences between the ways in which group members received their task instructions were created. Group members' task representations or ideas about the task are likely to be based on the instructions of the task they were given, because this is likely to be the only knowledge participants have about their task. Therefore, awareness of sharedness was manipulated through the way groups received their instructions about the task (van Ginkel & van Knippenberg, 2004). Participants in the awareness of sharedness condition were given their task instructions while they were already seated together as a group at one table, so that they could clearly see everyone's task instructions. Furthermore, groups in the awareness of sharedness were explicitly told that they all received the exact same instructions and that for their group functioning it would be important that they all shared the same ideas about the task. To ensure that it was clear to groups in this condition that they all had the same idea about the task, they were also invited to very briefly (within two minutes) read their instructions out loud. On the other hand, groups in the no-awareness of sharedness condition were given their task instructions while they were still seated apart as individuals in different corners of the room, so they could not see each others instructions. Moreover, to ensure that they would not just assume they all got the same task instructions they were told that allegedly for purposes of mimicking reality in organizational decision making groups that may also have diversity

of experiences, knowledge, and ideas with a task, they might not all receive the exact same task instructions. Furthermore, the instructions were given in different-colored files to create the illusion that the content of the files might differ. To ensure that the two minutes time to repeat the instructions out loud in the awareness of sharedness condition would not lead to a confound between the manipulations and the extent to which participants could rehearse their instructions, groups in the no-awareness of sharedness condition were instructed to briefly summarize their instructions individually.

Measures

Performance scores for decision quality were based on the extent to which the decision for each decision issue matched the relatively objective standard for decision quality based on all available information. Based on all available information a hierarchy in correctness of the different decision alternatives existed (for instance, one decision option was consistent with all information, one consistent with most information, one with only the information that was given to all group members). A pre-test was used to insure that this hierarchy was indeed clear if decision makers were given the full set of information. On two of the decision issues groups could attain a score ranging from 1 to 3 and on the other two issues groups could attain a score ranging from 1 to 4 (whether a three or a four-point scale was used had to do with the total amount of available decision options, that is when more decisions options were available a higher score on that issue could be attained). Because all four decision issues were designed to let decision quality be contingent on information exchange and processing, and optimal decisions were contingent on an integration of stores' interests over issues, a performance score (ranging from 4 to 14) aggregated over the four issues was calculated.

As a manipulation check for the knowledge about the distribution of information manipulation people were asked to indicate which group member they believed had more information on which party. Because we did not want people in the no-knowledge condition to think about the possibility of distributed information before starting with the group task, the measure was administered after completion of the group task, risking that people in the no-knowledge condition had learned about the distributed information during the group task. Although we realized this might lead to a higher score in the no-knowledge condition and therefore smaller differences between the conditions, this seemed to be inevitable.

As a manipulation check for pre-task reflection one question was used to assess whether participants understood that they would perform better when they would form a clear idea about the task before they started.

Awareness of sharedness of representations was measured using two questions on a 7-point scale. The questions were "I believed the members of my group perceived the task in the same way I did" and "I believed the members of my group shared the ideas I had about the group task" ($\alpha = .75$).

To measure task representations participants were asked to write a short description of what

they believed was most important for their task. Like the manipulation check for knowledge about the distribution of information, this measure was also administered after group task completion. Participants' written descriptions of the task were coded for the use of language congruent with task representations for elaboration. The extent to which group members mentioned (a) exchanging information, (b) discussion of information within the group, (c) the extent to which information needs to be exchange and/or discussed *before* a group decision making, and (d) the importance of having to reach an agreement and/or using decision strategies, such as majority rule or letting one person make the final decision, aimed at reaching an agreement (reverse coded) for the group task were coded by two coders ($\kappa = .76$). The four categories were aggregated into one overall task representation score.

Audio-video recordings were used to measure elaboration. Two coders (blind to the experimental conditions) watched the videos and rated elaboration using a coding scheme that has been used before (van Ginkel & van Knippenberg, 2004) ($\kappa = .88$). This coding scheme yields scores on a 7-point scale, where each scale point is operationalized in terms of specific behavioral standards observable from the audio-video recordings. The coding scheme, as described below both takes into account the number of crucial items of information that were considered and the extent to which the items of information were processed. Therefore groups received one score for total information processing per decision issue, rather than separate scores for separate informational items. Scores were aggregated over decisions issues into one group score.

A score of "1" was given when all information was completely ignored by all three group members and the group immediately started with exchanging preferences. A score of "2" was given when one of the members did mention a crucial item of information, but none of the other members reacted to it (either by saying something or by nodding or by clearly looking at the person that mentioned it) or used the item in making a decision or when only the non-crucial information was clearly mentioned in such a way that it did not serve to validate a group members' pre-discussion preference. A score of "3" was given when one of the members mentioned an item of information and at least one of the other members reacted to it, but after this the group as a whole still for some reason failed to integrate it with the other information. A score of "4" was given when one crucial piece of information was mentioned by at least one of the group members, with the other two members clearly reacting to the mentioning of the information or (for instance by asking a question about it, by combining it with another piece of information, or by drawing a conclusion from it with regard to what the best decision option would be in light of this information) integrating it with other information. Or when two pieces of crucial information were mentioned, with at least two members clearly reacting to the mentioning of the information, but with the group as a whole failing to integrate both items of information in coming to a decision. A score of "5" was given when one crucial piece of information got fully discussed by all members and integrated with other information and at least one other piece of information was clearly discussed by at least two of the three group members, however without

their discussion influencing the use of that item of information by the group as a whole. Or when all three crucial items of information were clearly mentioned, with at least two members clearly reacting to it, but with the group as a whole failing to integrate any of the three items with the other information. A score of "6" was given when at least two pieces of crucial information were fully discussed by the whole group and integrated with the other information. A score of "7" was given when all three crucial items of information were clearly and fully discussed, with the group clearly having drawn conclusions with regard to what the best decision option would be in light of this information. To determine the total score a mean score over the four decision issues was calculated.

Procedure

On arrival participants in all conditions were told they were going to participate in a experiment that examined group decision making. They were seated apart from each other and were given the task and basic task instructions. The basic task instructions existed of a brief introduction to the task and a description of what participants were supposed to do. Subsequently, participants in all three conditions worked on the task individually to ensure that everyone studied all information before starting. After finishing the individual task in the sharedness condition people were seated at one table as a group. They then received the instructions as described under manipulations and were given a minute or two to talk about it. In the no-sharedness condition, after finishing the individual task people were instructed to stay seated and again received all instructions. After finishing everything people in the no-sharedness condition were also seated at one table as a group.

From this point on, the procedure was identical again for all conditions. Groups were told that they were allowed to review the task booklets with the task background information during the group task and to read from them out loud to the other group members. However, they were also told not to show their task booklets to the other members. All groups were told they had a maximum of 25 minutes to finish the task. When groups were still not finished after 25 minutes they were asked to finish the task. The time groups worked together on the task varied from two to 27 minutes (average time being approximately 13 minutes). After finishing the task, participants were seated alone again and received a questionnaire. After answering the questions they were debriefed, paid, and dismissed.

Results

Preliminary Analyses

$A_{wg(1)}$ values were calculated to determine the level of analyses for each variable (Brown & Hauenstein, 2005). A cut-off score of .70 has been reported as a threshold level (Brown & Hauenstein, 2005). Shared task representations had a mean $a_{wg(1)}$ value of .89, signaling agreement that warrants analysis at a group level.

Manipulation Checks

For all analyses 2 (Knowledge about distributed information: yes/no) X 2 (reflection: yes/no) X 2 (Awareness of sharedness: yes/no) analyses of variances were used. Scores on the knowledge about the distribution of information manipulation check were determined by assigning people one point for completing the map correctly and no points for completing it incorrectly. Thus, a lower score indicated that more group members did not know which group member was given more information on which store. A significant difference between the knowledge and no-knowledge condition was found, $F(1, 118) = 45.75$, $p < .01$, $\eta^2 = .28$. While 92 % of the groups in the knowledge condition correctly indicated which members had been given more information on what store, only 54 % of the groups in the no-knowledge condition were correct (note that these percentages were assessed after group discussion). No differences as a function of the reflection and awareness of sharedness manipulations were found or any of interactions were found. Also, no significant interactions were found.

On the second manipulation check for knowledge about the distribution of information groups in the knowledge condition ($M = 5.50$, $SD = .61$) scored significantly higher than groups in the no-knowledge condition ($M = 4.64$, $SD = .82$), $F(1, 118) = 43.71$, $p < .01$, $\eta^2 = .27$, while there were no significant main effects for the reflection and awareness of sharedness manipulation or interaction effects. These findings indicate that groups in the knowledge about the distribution of information condition had more knowledge about the distributed information than groups in the no-knowledge condition.

On the manipulation check for reflection as expected only an effect for reflection was found, $F(1, 118) = 14.89$, $p < .01$, $\eta^2 = .04$, with groups in the reflection condition ($M = 6.08$, $SD = 1.36$) scoring higher than groups in the no-reflection condition ($M = 5.53$, $SD = 1.44$). No effects for knowledge about the distribution of information, awareness of sharedness or any of the interactions were found. Thus, it seems that the reflection manipulation also had the desired effect.

Concerning the awareness of sharedness measure, groups in the awareness of sharedness condition ($M = 5.58$, $SD = .66$) scored significantly higher than groups in the no-awareness of sharedness condition ($M = 5.30$, $SD = .68$), $F(1, 118) = 5.85$, $p < .05$, $\eta^2 = .05$, while there were no significant differences for reflection, knowledge about the distribution of information, or any of the interactions. This indicates the awareness of sharedness manipulation worked as well.

Task Representations for Elaboration

A significant main effect of knowledge about the distribution of information on task representations for elaboration was found, $F(1, 118) = 5.02$, $p < .05$, $\eta^2 = .04$, with groups in the knowledge condition ($M = 1.37$, $SD = .52$) scoring higher on task representations than groups in the no-knowledge condition ($M = 1.17$, $SD = .46$). Furthermore, in line with expectations the main effect

of knowledge was qualified by an interaction between knowledge and reflection, $F(1, 118) = 5.86$, $p < .05$, $\eta^2 = .05$. Inspection of the simple main effects showed that, as expected, reflection only led to a higher degree of task representations in the knowledge condition. Under conditions of knowledge about the distribution of information, groups in the reflection condition scored higher on task representations for elaboration ($M = 1.52$, $SD = .52$) than groups in the no-reflection condition ($M = 1.22$, $SD = .49$), $F(1, 118) = 5.90$, $p < .05$, $\eta^2 = .05$, while under conditions of no-knowledge no differences between the reflection condition ($M = 1.11$, $SD = .40$) and the no-reflection condition ($M = 1.23$, $SD = .51$) were found. No other main or interactions effects were found.

Information Elaboration

A 2 X 2 X 2 analysis of variances was used to test for differences on elaboration. As predicted in Hypothesis 1a a main effect for knowledge about the distribution of information was found, $F(1, 112) = 11.74$, $p < .01$, $\eta^2 = .10$, with groups in the knowledge condition ($M = 4.71$, $SD = 1.03$) scoring higher than groups in the no-knowledge condition ($M = 4.05$, $SD = 1.24$). No other main effects were found. As predicted 2-way interactions were found between reflection and knowledge about the distribution of information, $F(1, 112) = 23.00$, $p < .01$, $\eta^2 = .17$, and awareness of sharedness and knowledge, $F(1, 112) = 18.87$, $p < .01$, $\eta^2 = .15$.

Tests of simple main effects showed that under conditions of reflection groups processed more information in the knowledge condition ($M = 5.20$, $SD = .91$) than in the no-knowledge condition ($M = 3.78$, $SD = 1.04$), $F(1, 112) = 30.98$, $p < .01$, $\eta^2 = .21$, while under conditions of no-reflection there were no differences between the knowledge condition ($M = 4.18$, $SD = .88$) and the no-knowledge condition ($M = 4.34$, $SD = 1.16$), $F(1, 112) = .37$, $p = .54$, $\eta^2 = .00$. This is in line with Hypothesis 3a. Furthermore, simple main effects analyses showed that within the knowledge condition groups in the reflection condition showed more elaboration than groups in the no-reflection condition, $F(1, 112) = 14.83$, $p < .01$, $\eta^2 = .11$, while within the no-knowledge condition groups scored higher in the no-reflection condition than in the reflection condition, $F(1, 112) = 4.67$, $p < .05$, $\eta^2 = .04$.

As predicted in Hypothesis 6a analyzing simple main effects for the interaction between awareness of sharedness and knowledge resulted in similar findings. Under conditions of awareness of sharedness groups in the knowledge condition ($M = 5.08$, $SD = .84$) processed more information than groups in the no-knowledge condition ($M = 3.74$, $SD = .81$), $F(1, 112) = 26.57$, $p < .01$, $\eta^2 = .19$, while under conditions of no awareness of sharedness no differences between the knowledge condition ($M = 4.31$, $SD = 1.07$) and the no-knowledge condition ($M = 4.38$, $SD = 1.33$) were found, $F(1, 112) = .07$, $p = .79$, $\eta^2 = .00$. Moreover, within the knowledge condition groups in the awareness of sharedness condition scored higher than groups in the no-awareness of sharedness condition, $F(1, 112) = 8.10$, $p < .01$, $\eta^2 = .07$, but in the no-knowledge condition effects were reversed, $F(1, 112) = 5.86$, $p < .05$, $\eta^2 = .05$, with groups in the no-awareness of sharedness condition scoring higher than groups in the

awareness of sharedness condition. We will come back to the change of direction of the effects in the no-knowledge condition in the discussion section. No other significant effects were found.

Performance

A 2 X 2 X 2 analysis of variance was used to analyze decision-making performance. Results for performance to a great extent mirror results for elaboration. As predicted in Hypothesis 1b, a main effect for knowledge about the distribution of information was found, $F(1, 118) = 5.70$, $p < .05$, $\eta^2 = .05$, with groups in the knowledge condition ($M = 11.16$, $SD = 1.48$) performing better than groups in the no-knowledge condition ($M = 10.47$, $SD = 1.67$). No other main effects were found. Again interactions were found between reflection and knowledge, $F(1, 118) = 5.08$, $p < .05$, $\eta^2 = .04$, and awareness of sharedness and knowledge, $F(1, 118) = 5.64$, $p < .05$, $\eta^2 = .05$.

In line with Hypothesis 3b analyzing simple main effects yielded significant differences between the knowledge condition ($M = 11.66$, $SD = 1.43$) and the no-knowledge condition ($M = 10.39$, $SD = 1.63$) within the reflection condition, $F(1, 118) = 10.60$, $p < .01$, $\eta^2 = .08$, while there were no differences between the knowledge condition ($M = 10.65$, $SD = 1.38$) and the no-knowledge condition ($M = 10.55$, $SD = 1.73$) within the no-reflection condition, $F(1, 118) = .06$, $p = .81$, $\eta^2 = .00$. Moreover, in the knowledge condition groups in the reflection condition performed better than groups in the no reflection condition, $F(1, 118) = 6.60$, $p < .01$, $\eta^2 = .05$, while in the no-knowledge condition there were no significant differences between groups in the reflection and no-reflection condition, $F(1, 118) = .16$, $p = .69$, $\eta^2 = .00$.

For awareness of sharedness similar result were found. While within the awareness of sharedness condition groups scored higher under conditions of knowledge ($M = 11.52$, $SD = 1.23$) than under conditions of no-knowledge ($M = 10.23$, $SD = 1.31$), $F(1, 118) = 11.10$, $p < .01$, $\eta^2 = .08$, no differences between knowledge condition ($M = 10.77$, $SD = 1.65$) and the no-knowledge condition ($M = 10.71$, $SD = 1.95$) were found within the no awareness of sharedness condition, $F(1, 118) = .02$, $p = .88$, $\eta^2 = .00$. Furthermore, within the knowledge condition groups in the awareness of sharedness condition scored higher on performance than groups in the no-awareness of sharedness condition, $F(1, 118) = 3.80$, $p = .05$, $\eta^2 = .03$, whereas in the no-knowledge condition there were no significant differences between the awareness of sharedness condition and the no-awareness of sharedness condition ($M = 10.71$, $SD = 1.95$), $F(1, 118) = 1.44$, $p = .18$, $\eta^2 = .01$. Thus, these findings support Hypothesis 6b.

Mediational Analysis

Hypothesis 2, 4, and 6 predicted that shared task representations for elaboration mediate respectively the relationship between knowledge about distributed information and performance, the interaction of knowledge and reflection on performance, and the interaction of knowledge and

awareness of sharedness on performance. Furthermore, Hypothesis 7 states that elaboration mediates the relation between shared task representations and performance. Hierarchical regression analysis in combination with Sobel tests were used to test for mediation (see Baron & Kenny, 1986). In step one performance was regressed on knowledge about the distribution of information, reflection, awareness of sharedness, and four dummy variables representing respectively knowledge about the distribution of information x reflection, knowledge about the distribution of information x awareness of sharedness, reflection x awareness of sharedness, and knowledge about the distribution of information x reflection x awareness of sharedness (see Table 1 for all statistics of the mediation analysis).

The next step consisted of entering the task representations into the model. After adding task representations, the main effect of knowledge about information distribution disappeared, thereby confirming Hypothesis 2. It was predicted in Hypothesis 4 that after task representations for elaboration were added to the model, the interaction of reflection and knowledge would disappear, which was indeed the case. However, because regression of task representations on the interaction between knowledge and awareness of sharedness was not significant, task representations can not mediate the interaction. So, Hypothesis 6 was not confirmed. The last step entailed entering elaboration into the model. While the Sobel test for the decline in effect size of the effect of task representations on performance was significant, $z = 3.56$, $p < .01$, the effect of task representations on performance remained significant after adding elaboration into the model, indicating that elaboration only partly mediated the relation. This provides partial support for Hypotheses 3.

Table 1

Results of Mediational Analyses.

	Performance							
	Model 1		Model 2			Model 3		
	β	ΔR^2	β	ΔR^2	*z*	β	ΔR^2	*z*
Knowledge of ID	- .18*	.03*	- .12		1.98*	.01	.	
Reflection	- .16	.03	- .13			- .07		
Awareness of sharedness	- .05	.00	- .12			- .07		
Knowledge of ID X Reflection	.20*	.04*	.11		2.10*	- .08		
Knowledge of ID X Awareness	.19*	.04*	.14			- .04		
Reflection X Awareness	- .10		- .13			- .10		
Knowledge of ID X Reflection X Awareness	- .11		- .06			- .05		
Task Representations			.37**	.12**		.23**	.04*	3.75**
Information Elaboration						.60**	.22**	

Note. In model 1 all main effects and interactions between the experimental variables were added. In model 2 shared task representations was added and in model 3 information elaboration was added. *z*-values for the decrease in Beta's tested with Sobel tests. $^{*}p < .05$, $^{**}p < .01$.

Discussion

Decision making groups with distributed information often make suboptimal use of their informational resources. Knowledge about the distribution of information - knowledge about who knows what - has consistently been shown to have a positive effect on group information exchange and the quality of group decision making, and the present study too confirms this basic finding. Previous research has, however, not been able to identify the process through which knowledge of distributed information engenders group information processing (Stasser et al., 2000). The present study extends research in the effects of knowledge about distributed information by showing that knowledge about the distribution of information affects group members' shared task representations. We found that shared task representations emphasizing information elaboration mediated the relation between knowledge about the distribution of information and performance. Identifying shared task representations as the process mediating between knowledge of distributed information and elaboration also allowed us to extend research in this area in another way – by identifying reflection and awareness of sharedness as moderators of the effectiveness of knowledge of distributed information in engendering high-quality decisions.

We found that when group members possessed knowledge about the distribution of information they were more likely to process information and to perform well when they reflected on their group task before starting than when they did not engage in reflection. Shared task representations were shown to mediate this interaction between reflection about the task and knowledge about distributed information. Furthermore, we found that especially when group members were aware that other members shared the same knowledge about the task, knowledge about the distribution of information was associated with more elaboration and higher decision making performance. Besides providing more insight into the conditions under which knowledge about the distribution of information can facilitate group decision performance, these findings underscore the role of shared task representations for elaboration and group decision making performance.

We did not find that shared task representations for elaboration mediated the interaction of awareness of sharedness and knowledge about the distribution of information on performance. This may be due to the way we measured shared task representations. Because assessing task representations before the group task may result in the measure contaminating the manipulation, the task representations had to be assessed after the group interaction. This is likely to have increased noise in the measurement, making it harder to detect differences in task representations that were present at the onset of the group task. The fact that we did find significant differences in task representations between the knowledge and no-knowledge condition, and that we found that the interaction between knowledge about the distribution of information and reflection was mediated by task representations may have to do with the strength of the reflection compared with the awareness of sharedness manipulation. Making group members think about the consequences of the existence of

different informational roles for their task (like it was done in the reflection manipulation) is likely to quite directly affect group members' task representations. Making group members aware of the fact that all members share similar knowledge about the distribution of information in contrast is likely to have a more indirect effect on task representations. Accordingly, the latter may have been harder to detect in the post hoc measurement than the former. The fact that an interaction between awareness of sharedness and knowledge about the distribution of information was found is congruent with the notion that awareness of sharedness is conducive to the formation of task representations emphasizing elaboration, but obviously based on the present data we cannot conclude that this was indeed the case.

Finally, we found that elaboration partially mediated the relation between task representations and performance. The fact that we found partial rather than full mediation seems to indicate that besides elaboration, other factors may play a role in determining group decision quality. Based on the data of the current study we can only speculate about the exact nature of these factors, but it might be the case that the extent to which group members let their ultimate decision be influenced by information elaboration as opposed to more subjective preferences plays a role. Shared task representations may not only impact the level of group elaboration, but also the extent to which the decision following group elaboration is influenced by elaboration, rather than by any pre-discussion preferences that may still be present. Put differently, group members that share task representations for elaboration perceive information as valuable for the decision making process. As a result, in addition to group members mentioning and discussing more information, information may also have a stronger impact on the actual decision. Thus, task representations for elaboration may not only affect the extent to which information is exchanged and integrated, but also the weight put on this discussion (i.e., instead of, for instance, on more subjectively defined personal preferences) in reaching a final decision. Unfortunately, because a large part of the above process is likely to take place solely in group members heads we were not able to substantiate this reasoning based on the audio-video data.

One interesting finding concerns what happened when people did not possess knowledge about the distribution of information, but did reflect on the task or were aware that other members had similar knowledge about information distribution. We found that in the no-knowledge condition the effects of reflection and awareness of sharedness on elaboration reversed direction, with reflection and awareness of sharedness now leading to less rather than to more elaboration. Although in the no-knowledge condition the effects of reflection and awareness of sharedness on performance were not significant, the direction of the effects was similar to the effects on elaboration. An explanation for the change of direction may lay in the kind of "default" representation that decision making groups are likely to adopt. There are some indications that during the decision making process groups are especially preoccupied with finding common ground, which distracts their attention from elaboration. For instance, research on jury decision making has shown that having to work together on a decision task with others can lead people to employ more judgment-driven strategies (i.e., start with pooling

individual judgments and after this pool information only based on the judgments) rather than information-driven strategies that are typically employed by individuals when working alone (Hastie & Pennington, 1991). In line with this reasoning, Wittenbaum, Stasser, and Merry (1996) found that when group members believed they were about to participate in a group decision making session as compared to a group recall session, they tended to focus more on information which they believed the other members would also have than on distributed information. Our interpretation of these findings is that group members' understanding of the decision making task centered on the need to find common ground more than the elaboration of information (which should have let them to focus on information they believed the other would not have). It may have been the case that when groups were not given knowledge about the distribution of information, reflecting on the task only reinforced group members' default perceptions about the importance of finding common ground. Likewise, believing that other members also share this default perception may encourage group members to also openly act in ways that are congruent with this default perception.

In the present study reflection was shown to moderate the effect of knowledge about the distribution of information on performance. While research on individual-level reflection seems limited, during the last years more and more studies have shown the beneficial effects of group-level reflection or reflexivity for group performance (Carter & West, 1998; De Dreu, 2002; Schippers et al., 2003; Tjosvold et al., 2003). West (1996) proposed that a reason why teams are more adaptive and effective in the execution of their task when they are reflexive is that they have more comprehensive and shared cognitive representations of their work. The findings of the present study are in line with the reasoning that reflection can impact shared task representations and this way group performance. More attention for shared task representations may help researchers gain more insight into the process of team reflexivity.

It has become increasingly clear that social sharedness can be an important aspect in group functioning. Numerous studies have shown how various factors that are shared within groups such as information, preferences, identity, and meta-knowledge tend to have a bigger impact on group behavior and outcomes than factors that are unshared (Tindale & Kameda, 2000; Tindale, Kameda, & Hinsz, 2003). Furthermore, there seems to be mounting evidence for the influence of shared task cognition on group behavior and performance (e.g., Marks, Sabella, Burke, & Zaccaro, 2002; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005; Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2001). This study contributes to sharedness research by showing how shared task representations can form within groups and affect group member behavior and decision performance. Specifically, we were able to show that shared knowledge of information distribution can affect group performance by engendering shared task representations that emphasize information elaboration. We know relevantly little about the ways in which group members develop (shared) task cognition. What we do know about shared task cognition development stems from studies that have examined how

several techniques, designed to impact groups' shared cognition of the task (e.g., group training, Moreland et al., 1998; leader debriefing, Marks et al., 2002; Marks, Zaccaro, & Mathieu, 2000) foster the development of shared task representations. However, the current study showed that shared task cognition can also follow from shared cognition about the team. While Brandon and Hollingshead (2004) discussed the possibility that shared task representations lead to shared team representations, the current study seems to be the first study to provide empirical evidence for the notion that representations of the task may follow from representations of the team. In the present study group members were able to construe representations of their task based on knowledge about information distribution. It may be possible that also in other situations with different task types (for instance where performance is less dependent on information elaboration) shared representations of the team feed into shared representations of the task, which consequently affect group processes and performance. Further investigating how group members' task representations are influenced by representations of the team may prove to be an important avenue for future research.

Second, this study provides more evidence that awareness of sharedness can be of importance for group functioning. The effect of knowledge about the distribution of information was shown to be stronger when group members were aware of sharing this knowledge. This is in line with the findings of an earlier study that showed that when group members are aware of sharing certain task representations this can have beneficial effects for group functioning and performance (van Ginkel & van Knippenberg, 2004). This finding seems to indicate that awareness of sharedness, not only of task representations but also of team knowledge underlying task representations, can be an important variable affecting group member behavior (Tindale & Kameda, 2000). However, because we did not find that shared task representations mediated the interaction between awareness of sharedness and knowledge about information distribution this conclusion has to be very tentative.

Whereas the current study showed the mediating role of shared task representations for a task in which groups had to deal with distributed information, shared task representations may also play a role for performance on different kind of tasks that rely less heavily on information exchange. Shared task representations may also prove to mediate between knowledge about the distribution of roles or skills within the team and performance. Thus far empirical studies on shared mental models of the team mainly concentrated on increased coordination and social validation as explanations for the effects on group performance (Liang et al., 1995; Moreland et al., 2000; Peterson et al., 2000). Although coordination and social validation have been shown to be able to account for the effects of knowledge about members' skills and abilities, knowing about the division of skills within a team may also affect perceptions about the strategy best used to accomplish the task. When group members have knowledge about each other's skills and abilities, this knowledge could result in shared task representations that foster coordination in a way similar to how they foster information exchange on distributed information tasks when group members have knowledge about the distribution of

information. So, shared task representations may (partially) mediate the effect of knowledge about group members' skills and abilities on coordination.

It must be noted that the effects of knowledge about the distribution of information on task representations may only occur under certain conditions. Whether or not knowledge about the distribution of information will lead to task representations for elaboration and promote elaboration is likely to also depend on whether distributed information is perceived as purposely designed to be there, for instance like usually is the case in cross-functional teams, or whether its presence is seen as merely of coincidental nature. Moreover, when reasons for team composition other than functionality of distributed information for increasing the team's collective pool of knowledge are (more) prevalent (e.g., political reasons), this should decrease the likelihood that knowledge about information distribution results in the development of task representations for elaboration. Put differently, just having knowledge about the existence of information distribution in and of itself is likely to be insufficient to lead to the adoption of a task representation for elaboration. Distributed information also has to be regarded as something purposeful and useful. Although based on the present study we cannot conclude anything about the effects of the perceived value of the distributed information, the above reasoning is in line with findings of research into the effects of diversity beliefs. Diversity beliefs have been defined as beliefs about the value of diversity for work group functioning (van Knippenberg & Haslam, 2003). There are indications that the effects of group diversity on group performance are dependent on diversity beliefs, with some beliefs leading to higher group performance than others (Ely & Thomas, 2001; van Knippenberg, Haslam, & Platow, 2004). In a similar fashion, when group members hold the belief that the main reason for the existence of distribution of information within a decision group is mostly because of reasons other than the value of information for the decision to be made, this may not lead to task representations emphasizing information elaboration.

Chapter 4

The Effects of Team Reflexivity on the Development of Shared Task Representations in Decision Making Groups with Distributed Information.

Organizations tend to rely more and more on groups or teams for purposes of decision making (Lawler, Mohrman, & Ledford, 1995). One important reason for using teams rather than individuals lies in the greater amount of resources that teams have compared to individuals (Cohen & Levinthal, 1990; Kozlowski & Bell, 2003; Madhavan & Grover, 1998; Tindale, Kameda, & Hinsz, 2003). In sharp contrast to this optimistic view research has shown that groups dealing with distributed information often struggle with the use of their informational resources. Not only do groups often fail to discuss information that only one of the group members possesses (Stasser & Titus, 1985; Wittenbaum & Stasser, 1996), when they do exchange information they often fail to integrate it adequately (Gigone & Hastie, 1993; Winquist & Larson, 1998), resulting in suboptimal decision quality. What seems to be fundamental for the extent to which groups rely on their informational resources in the decision making process is group members' understanding of their decision task (van Ginkel & van Knippenberg, 2004). In an experiment van Ginkel and van Knippenberg (2004) showed that decision groups with distributed information that were stimulated to form shared task representations emphasizing the exchange and integration of information discussed more information and made higher quality decision than groups that were not stimulated to form such task representations. This indicates that group members often may fail to see the necessity of a discussion of distributed information. An important question then is how groups develop an adaptive understanding of their task.

There are indications that groups usually are not inclined to discuss their members' underlying ideas about the task and how to approach it. When there appears to be no direct need for discussing such meta-cognitions about task approach (e.g., in terms of a conflict or performance feedback), decision making groups are unlikely to discuss issues concerning their perceptions or ideas about how to approach the task (Hollingshead 1998; Mohammed & Ringseis, 2001). As a result groups can have limited opportunity to adapt less adaptive ideas that members' may have about how to deal with the group task that could result in lower group performance. Put differently, the extent to which group members discuss their perceptions of the task and how to approach it before they start with the decision making will affect the likelihood they will find out about differences in their task representations. Moreover, it is likely to affect the subsequent opportunity group members have to develop task-appropriate representations. The process of discussing ideas about the task, task goals, and possible strategies has also been referred to as *team reflexivity* (West, 1996). In the present study

we investigate the notion team reflexivity affects group performance by increasing the extent to which group members share task-adaptive representations.

Shared Task Representations and Group Information Elaboration

Shared task representations have been defined as "any task/situation relevant concept, norm, perspective, or process that is shared by most of the group members" (p. 84, Tindale, Smith, Steiner, Filkins, & Sheffey, 1996). The extent to which group members' task representations emphasize information exchange and discussion as an important aspect of their task influences the way they handle their distributed informational resources. A common fault that is often made by members of decision making groups is that they focus too much on reaching an agreement through pooling preferences, which goes at the expense of discussing information. For instance, research on jury decision making has shown that having to work together on a decision task with others leads many group members to employ more judgment-driven strategies (i.e., start with pooling individual judgments and after this pool information only based on the judgments) rather than information-driven strategies that are typically employed by individuals when working alone (Hastie & Pennington, 1991). In line with this reasoning, Wittenbaum, Stasser, and Merry (1996) found that when group members believed they were about to participate in a group decision making session as compared to a group recall session, most members focused more on information which they believed the other members would also have than on distributed information. Our interpretation of these findings is that group members' understanding of the decision making task centered on the need to find common ground more than the elaboration of information.

For high performance on distributed information tasks it is necessary for members to exchange information, to carefully consider the information and its implications, and to discuss and integrate the implications, a process that has also been referred to as *group information elaboration* (van Knippenberg, De Dreu, & Homan, 2004). The extent to which group members have mental representations of their tasks that focus on information elaboration rather than on pooling preferences affects the way groups go about discussing information. When group members believe that information elaboration is important for making a good decision they are more likely to make effective use of their informational resources (van Ginkel & van Knippenberg, 2004, 2005). In contrast, if they perceive pooling preferences and finding common ground to be an adaptive way to go about their task, they will be less likely to elaborate on unshared information and more likely to come to an agreement, without considering all the available information. Thus, task representations that mainly emphasize ways in which an agreement can be reached by relying less on information elaboration are likely to foster low-quality decisions.

Reflexivity

The process of discussing the group task, goals, and how those goals can best be reached, that is the process of team reflexivity (West, 1996), is likely to be a vital determinant of the extent to which groups can develop shared task representations that are appropriate for the task at hand. Team reflexivity has been quite consistently shown to be beneficial for group functioning and has been linked to several team outcome variables like performance, satisfaction, innovation, and commitment (Carter & West, 1998; De Dreu, 2002; Schippers, Den Hartog, Koopman, & Wienk, 2003; Tjosvold, Chun, & Ziyou, 2003).

Although thus far there does not seem to be any empirical evidence linking reflexivity to shared cognition, West (1996) proposed that teams that are reflexive are more adaptive and effective in the execution of their task because they have more comprehensive and more shared cognitive representations of their work. By collectively reflecting on their task, groups should be more likely to discover possible differences in how they perceive their task than when they are solely concerned with getting the task done. Reconciliation of differences in group members' task representations should subsequently lead to more shared and higher quality representations.

Whereas group members' initial focus may be on finding common ground, once they are confronted with the notion that the task requires exchange and integration of information, through the process of collectively reflecting on the task, they will be likely to adopt this alternative representation. In contrast, when groups do not reflect on their task, group members are unlikely to ever consider alternative ways to approach their task (Mohammed & Ringseis, 2001). Besides the fact that sheer confrontation with alternative representations should at least increase the likelihood of members' considering these representations, we believe that when confronted with the task-adaptive notion that integration of distributed information is important, people should be more likely to adopt this representations than any less-adaptive representations, because it has a persuasive advantage in that it will 'ring true'. This means that reflexivity can help groups to develop task-adaptive representations, which will lead to higher group performance.

The Present Study

Reflexivity is expected to lead to higher decision quality, because it is likely to increase the extent to which members adopt task-adaptive representations. To be able to demonstrate this, in the present study we compared the effects of reflexivity in a condition in which group members differed in the extent to which they held task-adaptive representations with a condition in which all members already hold task-adaptive representations. We expected that the effects of reflexivity would be stronger when not all members have task-adaptive representations than when all members have adaptive task representations, because in the former situations reflexivity would increase the degree to which members hold adaptive representations. However, even when all members initially already hold

task-adaptive representations reflexivity may still be able to contribute to higher performance, albeit to a lesser degree, because reflexivity can still increase the degree to which members are aware of sharing similar representations. There is evidence that shows being aware of sharing cognitive representations can have a positive effect on group functioning and performance, through its positive effects on psychological safety (van Ginkel & van Knippenberg, 2004). Thus, reflexivity may also influence group behavior by affecting awareness of representation sharedness.

Based on the discussion above we propose that reflexivity is expected to have a stronger effect on group members' task representations emphasizing information elaboration *(Hypothesis 1)*, group information elaboration *(Hypothesis 2)*, and group decision performance *(Hypothesis 3)* in groups in which members initially hold different, not all equally task-adaptive representations, than in the control condition, where all members hold representation that emphasizes information elaboration. The interaction of reflexivity and the number of members holding task-adaptive representations is expected to be mediated by the extent to which group members adopt representations emphasizing information elaboration *(Hypothesis 4)*. Finally, group information elaboration is expected to mediate the relationship between shared task representations and performance (*Hypothesis 5*).

Hypothesis 1-5 were tested in an experiment, in which we manipulated whether or not groups reflected and the degree to which members held task-adaptive representations emphasizing information elaboration or less-adaptive representations emphasizing agreement seeking. We relied on audio-video data to code group information elaboration, because audio-video data tend to be more reliable and provide a richer source of information than self-report data (Weingart, 1997).

Method

Design and Participants

The experiment had a 2 (reflexivity: yes/no) X 2 (diverse task representations/control) design. A total of 252 freshmen (172 women and 56 men) at a Midwestern university in the USA participated in the experiment for course credit. They were assigned to 84 three-person groups. Their mean age was 18.8 (*SD* = 1.04). Groups were randomly assigned to conditions. For six groups audio-video data were not available due to technical problems. Because there is no reason to expect these groups to differ from the other groups, they were kept in the analyses and listwise deletion was used in the mediational analyses.

Experimental Task

The task used in this study was a cooperative decision making task inspired by the Towers Market task (Weingart, Bennet, & Brett, 1993). Although the original task was meant as a negotiation task, the task was changed to make it a purely cooperative decision making task. So, contrary to the original task, each group member now represented all interests. In the task, groups were required to make a decision about three interrelated issues. The issues concerned three aspects of the organization

of a small market (temperature for the market center, division of maintenance costs between three stores, organization of marketing campaigns). Group members were given information on the preferences of three stores concerned with the organization (a bakery, a vegetable market, and a florist), on the relative importance of the three issues to the stores, and were told to always take the interests of all three stores into account. All members received some information on all three stores. The informational items were partially based on the original task, partially on another adaptation of the task (Beersma & De Dreu, 2002), and partially designed for this study.

Following prior research in group decision making, part of the decision-relevant information was given to all group members and part of the information was given to only one of the group members (Stasser & Titus, 1985). Items of information necessary for making good decisions were distributed between the group members, so that for all members to be able to learn about these items groups had to share the information. For every decision issue there were always three items of information that were crucial for reaching an optimal decision, one concerning the bakery, one concerning the florist, and one concerning the vegetable market. Each of these was uniquely assigned to one of the group members. These crucial items of information were always on the importance of the preference to the stores. For each decision issue group members received this crucial, unshared information on a different store (e.g., group member 1 received unshared information about the bakery on item 1, about the florist on item 2, etc., while group member 2 received crucial information about the florist on item 1 and about the vegetable market on item 2, etc.), to avoid any suggestion that they were to represent one of the stores rather than all. To make the task more complex, besides information necessary for making the correct decision some irrelevant information about the three stores was also included (this information was always given to all members). Groups were told that the information they received might differ between group members (Stasser & Titus, 1985). For each issue, groups could choose from a limited number of options. Based on all available information a hierarchy in the quality of the decision options existed (i.e., some combinations of decision options served the interests of all stores better than others).

Experimental manipulations

Task Representations. Task representations were manipulated through written instructions. A similar strategy was successfully adopted in van Ginkel and van Knippenberg (2004). Three different task representations were designed. The representations were based on research in group decision making as described in the introduction section. While representation (A) mainly focused on the importance of information processing, representations (B) and (C) focused more on ways in which agreements could be reached while relying less on distributed information. The instructions used for manipulating all task representations consisted of a detailed description of the task containing information about what behavior was most likely to lead to high performance and what to low

performance.

Instruction (A) described the task as requiring extensive exchange of individual members' information and critical discussion of this information, as well as the need to refrain from making a decision too early in the process. It said that research had shown that in group tasks like the present one it was most important that the decisions were based on all available information and that critically considering all information is therefore crucial for making high-quality decisions. Instruction (B) described the task as requiring compromises between the group members to be able to come to a high-quality decision. It said that research had shown that to attain high-quality decisions group members should be willing to sometimes change their minds for the sake of the group decision. Thus, group members were told that making compromises, in terms of not being too persistent in sticking to pre-discussion opinion and being willing to change one's mind was most likely to lead to high performance. Instruction (C) also described the task as requiring compromises, but this time it emphasized making compromises for the stores involved. It said that research had shown that on group tasks like this it was important to make sure that no one store is completely unsatisfied. That is, compromises should be spread out over stores, so that it is not always the same store that has to compromise. Although arguably representation C demands slightly more information elaboration since at least the preferences of the parties have to be known to all members, similar to instruction (B) in instruction (C) also lies the implicit notion that thorough discussion of (distributed) information is not necessary, because short-cuts can be used in attaining a group decision (e.g., either take the middle option that does not completely satisfy or ignore anyone's demands on every issue or let one store get what it wants on the first issue, the other on the second, etc,).

Because of the nature of the task used in the current study (high-quality decisions can only be made when underlying information is processed), representation (A) should lead to the highest level of performance. Representations B and C are similar in that they both emphasized types of behavior that are likely to result in making a group decision before all information was discussed.

In the condition where all members had similar representations (control condition) all members were presented with description (A). In the diverse condition one member was presented with description (A) one with description (B), and one with description (C).

Reflexivity. A written instruction was used to manipulate group reflexivity. In the reflexivity condition, group members received a written instruction that discussed the relevance of reflecting on the task and how it should be approached before starting with the group task. The instruction said that research had shown that decision making groups can work more effectively if they take time to collectively reflect on their task and what is important for being able to achieve high performance on the task. In addition, in the reflexivity condition groups were given some time (maximally five minutes) to very briefly discuss their ideas about the group task. In the no-reflexivity condition groups did not receive this instruction.

Measures

Performance scores on the decision issue were determined by comparing the decision made by the group to an objective standard. The objective standard was based on which decision option best fitted all available information. Based on all information there was always one decision option that was clearly superior to the others. A pre-test was used to insure that this indeed was the case. On two issues, groups attained a score ranging from 1 to 4 depending on how well the group performed and on one issue groups attained a score ranging from 1 to 3. A total performance score, ranging from 3 to 10, was calculated by aggregating the scores attained by a group on the three decision issues.

As manipulation check for the task representations, descriptions of the representation written by the participants were coded on the extent to which they mentioned (a) exchanging and/or discussing information, (b) group members having to be cooperative and/or making compromises, or (c) the parties having to make compromises. The task representations described by the group members were then compared with the actual representations given to them.

Reflexivity was measured using five statements. Participants had to rate on a 7-point scale ranging from "completely disagree" to "completely agree" to what extent they agreed with the statements. An example is "During the group task we talked about our task approach" (α = .78).

The extent to which participants developed task representations for information elaboration was measured using a questionnaire existing of seven statements. Again a 7-point scale was used ranging from "completely disagree" to "completely agree". Example of some statements are "For high-quality performance on the task:…It is crucial for the task to discuss the information possessed by all of the group members", "…I do not consider it to be useful to have an extensive discussion about a single issue" (R), and "…reaching an agreement with the other group members is more important than exchanging information" (R) (α = .67).

Audio-video recordings were used to measure group information elaboration. Information elaboration was coded at the group level. Two coders (blind to experimental conditions) rated group information elaboration (κ = .82). Before information processing was coded all videos were watched once and based both on these observations and theory on distributed information in group decision making a seven-point scale was developed, anchored with specific behavioral standards observed in the videos.

A score of "1" was given when information was completely ignored by all three group members and the group immediately started with exchanging preferences. A score of "2" was given when one of the members did mention a crucial item of information, but none of the other members reacted to it (either by saying something or by nodding or by clearly looking at the person that mentioned it) or used the item in making a decision. A score of "3" was given when one of the members mentioned an item of information and at least one of the other members reacted to it, but after this the group still failed to integrate it with the other information. A score of "4" was given when

one crucial piece of information was mentioned by at least one of the group members, with at least two of the other three members clearly reacting to the mentioning of the information (for instance by asking a question about it, by combining it with another piece of information, or by drawing a conclusion from it with regard to what the best decision option would be in light of this information) or when two pieces were mentioned, but with the group as a whole failing to integrate both items of information in coming to a decision. A score of "5" was given when one crucial piece of information got fully discussed by all members and integrated with other information and at least one other piece of information was clearly discussed by at least two of the three group members, however without their discussion influencing the use of that item of information by the group as a whole. A score of "6" was given when at least two pieces of crucial information were fully discussed by the whole group and integrated with the other information. A score of "7" was given when all three crucial items of information were clearly and fully discussed by at least two of the three members, with them clearly having drawn conclusions with regard to what the best decision option would be in light of this information.

Procedure

Upon arrival participants were seated apart and handed a consent form, the task, and an answer form. Subsequently, participants in all conditions studied the task materials individually. Next, participants were handed the task representation descriptions and were given approximately five minutes to read them, after which the descriptions were taken away and participants were asked to briefly describe their task representation in their own words. Next, in the no-reflexivity condition participants were seated together as a group, given a new answer form, and asked to make the decisions as a group. In the reflexivity condition, participants were also seated as a group, but before starting with the task they were given the reflexivity instructions. After the reflexivity manipulations, groups in the reflexivity condition were also given the group task, answer sheet, and instruction. Groups received a maximum of 25 minutes for making the decisions. If they were still not finished after 25 minutes, which rarely happened, they were asked to finish the task and were given an additional two minutes to do so. After finishing the task, participants were seated alone again and received a questionnaire. After answering the questions they were debriefed and dismissed.

Results

Preliminary Analyses

To determine the level of analysis mean $a_{wg(1)}$ values were calculated for each variable (Brown & Hauenstein, 2005). Cut-off scores of .60 or .70 have been reported (Brown & Hauenstein, 2005). The mean $a_{wg(1)}$ value for task representations for information elaboration (.91) and reflexivity (.68) were above the .60 cut-off point, which warrants analysis at the group-level.

Manipulation checks

Written descriptions of group members' task representations were coded and compared to the representations that were given to the group members. 90% of all participants described the manipulation that had been presented to them. This indicates that by far the majority of group members indeed adopted the representation correctly. Note that this does not necessarily mean that 10% did not adopt the representation given to them, only that they failed to describe it. The number of different representations in a group reported by group members was counted. Comparing the mean number of representations in homogenous groups (M = 1.26, SD = .50) with that in heterogeneous groups (M = 2.33, SD = .74) and that in reflexivity groups (M = 1.76, SD = .88) with that in no-reflexivity groups (M = 1.79, SD = .77) with analyses of variances yielded significant differences only for the diverse task representations versus control condition manipulation, $F(1, 81) = 58.26$, $p < .01$, $\eta^2 = .54$ and not for the reflexivity manipulation, $F(1, 81) = .01$, $\eta^2 = .00$. No interactions were found. These results indicate that groups in the diverse representations condition indeed had more diversity in their representations than groups in the control condition.

Comparing mean scores on reflexivity in the different conditions with an analysis of variances yielded significant differences between the reflexivity and no-reflexivity condition, $F(1, 81) = 14.09$, $p < .01$, $\eta^2 = .15$, with groups in the reflexivity condition (M = 5.03, SD = .71) scoring higher than groups in the no-reflexivity (M = 4.36, SD = .93) condition. No significant differences between the diverse and control condition were found, $F(1, 81) = 2.78$, $\eta^2 = .03$, and no interaction effects were found $F(1, 81) = .96$, $\eta^2 = .01$. This indicates the reflexivity manipulation worked as well.

Shared Task Representations emphasizing Informational Elaboration

Consistent with Hypothesis 1, when results were compared with 2 x 2 analyses of variances an interaction between reflexivity and diverse versus similar task representations was found on shared task representations emphasizing information elaboration, $F(1, 81) = 6.94$, $p < .01$, $\eta^2 = .08$. Inspection of simple main effects revealed that while within the control condition there were no significant differences between the reflexivity and the no-reflexivity condition, $F(1, 81) = 1.96$, $\eta^2 = .02$ within the diverse condition groups in the reflexivity condition scored significantly higher than groups in the no-reflexivity condition, $F(1, 81) = 22.31$, $p < .01$, $\eta^2 = .22$. Results showed that groups in the reflexivity condition scored higher on task representations for information elaboration than groups in the no-reflexivity condition, $F(1, 81) = 19.09$, $p < .01$, $\eta^2 = .19$. As for the diverse task representations versus control manipulation, groups scored significantly higher in the control condition than in the diverse condition, $F(1, 81) = 6.03$, $p < .05$, $\eta^2 = .07$. (see Table 1 for means, standard deviations, and confidence intervals for the simple main effect analyses).

Information Elaboration

Consistent with Hypothesis 2, comparing results with 2 x 2 analyses of variances yielded an interaction between reflexivity and diverse versus similar task representations on group information elaboration, $F(1, 75) = 8.74$, $p < .01$, $\eta^2 = .11$. Inspection of simple main effects for information elaboration showed that reflexivity led to higher information processing both under conditions of diverse task representations, $F(1, 75) = 27.98$, $p < .01$, $\eta^2 = .27$, and under conditions of similar task representations, $F(1, 75) = 3.94$, $p < .05$, $\eta^2 = .05$. However the effects were stronger under conditions of diverse task representations. Furthermore, while within the no-reflexivity condition, groups elaborated more on information when they were not diverse, $F(1, 75) = 11.51$, $p < .01$, $\eta^2 = .13$, there were no differences on information elaboration between the diverse and control condition within the reflexivity condition, $F(1, 75) = .36$, $\eta^2 = .00$. Furthermore, a significant main effect for reflexivity was found on group information elaboration, $F(1, 75) = 29.58$, $p < .01$, $\eta^2 = .29$. Finally, groups in which all members held representations emphasizing information elaboration, elaborated more on information, $F(1, 75) = 10.17$, $p < .01$, $\eta^2 = .12$ than diverse groups.

Decision Making Performance

Consistent with Hypothesis 3, using 2 x 2 analyses of variances, an interaction between reflexivity and diverse task representations versus similar task representations on and performance was found, $F(1, 81) = 4.11$, $p < .05$, $\eta^2 = .05$. Inspection of simple main effects for performance yielded a very similar pattern of results compared to what was found for information elaboration. Reflexivity was shown to lead to higher performance in both the diverse, $F(1,81) = 18.76$, $p < .01$, $\eta^2 = .19$, and control condition, however the effects were much stronger in the diverse than in the control condition, $F(1, 81) = 3.94$, $p < .05$, $\eta^2 = .05$. Furthermore, while within the no-reflexivity condition groups performed better under conditions of homogeneity of task representations, $F(1, 81) = 11.04$, $p < .01$, $\eta^2 = .12$, a similar effect was not observed in the reflexivity condition, $F(1, 81) = 1.01$, $\eta^2 = .01$. In addition, a significant main effect for reflexivity was found on performance, $F(1, 81) = 21.07$, $p < .01$, $\eta^2 = .21$. Finally, groups in which all members held representations emphasizing information elaboration performed better than diverse groups, $F(1,81) = 10.72$, $p < .01$, $\eta^2 = .12$.

Mediational Analyses

Hypothesis 4 predicted that shared task representations for information elaboration mediate the relation between the interaction of reflexivity and the task representations manipulation on performance. In addition, Hypothesis 5 predicted that group information elaboration mediates the relations between shared task representations for information elaboration and performance. Hierarchical regression analyses were use to test these hypotheses (Baron & Kenny, 1986; Yzerbyt, Muller, & Judd, 2004). Below we first report a series of non-hierarchical regression analyses which

are required to be able to test for mediation. Regression of the experimental manipulations (which were dummy-coded) will not be discussed as these results are already covered in the discussion of the analysis of variances.

First, in two separate analyses performance was regressed on shared task representations for information elaboration ($\beta = .59$, $R^2 = .35$, $F(1, 81) = 43.13$, $p < .01$) and group information elaboration ($\beta = .79$, $R^2 = .62$, $F(1, 75) = 126.31$, $p < .01$). Next, group information elaboration was regressed on shared task representations ($\beta = .57$, $R^2 = .32$, $F(1, 75) = 36.19$, $p < .01$). The significant results of the relations tested above imply that the first condition for mediation is satisfied. Below the mediation models are be discussed.

We first tested whether shared task representations for information elaboration mediated the main effect of reflexivity, the interaction of reflexivity and the diverse task representations versus control manipulation, and the main effect of the diverse task representations versus control manipulation (see Table 2 for statistics of the regression analyses and Sobel tests). In step one, reflexivity, diverse representations versus control manipulation and a dummy variable representing the interaction between reflexivity and the diversity of task representations versus control manipulation were entered into the model. Next, shared task representations were added to the model along with dummy variables representing the interaction of shared task representations and reflexivity and shared task representations and diversity. As Yzerbyt et al. (2004) discuss in case of mediated moderation where the independent variables are also expected to affect the mediator, interactions between the mediator variable and the independent variables need to be included to control for potential contamination of the interaction between the independent variables by the interaction between the independent variable and the mediator. Last, group information elaboration was also added to the model. As can be seen in Table 2, shared task representations partly mediated the relation between reflexivity and performance. Furthermore, confirming Hypothesis 4, shared task representations mediated the relation between the interaction of the diverse task representations versus control manipulation and reflexivity on performance. Finally, as predicted in Hypothesis 5 group information elaboration was shown to mediate in the relation between task representations and performance.

Discussion

For effective use of distributed information in decision making groups it is crucial that group members have an understanding of the informational requirements of the task (van Ginkel & van Knippenberg, 2004). There are indications that without groups are unlikely to discuss their underlying ideas about or mental representations of a task (Hollingshead, 1998; Mohammed & Ringseis, 2001). Furthermore, when it comes to decision making in groups with distributed information, most group members have representations that are not highly adaptive for making high-quality group decisions (Wittenbaum et al, 1996; van Ginkel & van Knippenberg, 2004). The present study tried to further our

Table 1

Means, Standard Deviations, and 95 % Confidence Intervals (CI) on Individual Task Representations for Information Elaboration, Perceived sharedness, Information Elaboration, and Performance.

	Reflexivity								No Reflexivity							
	Diverse				Control				Diverse				Control			
	M	*SD*	CI		*M*	*SD*	CI		*M*	*SD*	CI		*M*	*SD*	CI	
			Lower	Upper			Lower	Upper			Lower	Upper			Lower	Upper
Task representations	6.11_a	.31	5.97	6.25	6.09_a	.33	5.96	6.23	5.53_b	.50	5.29	5.76	5.95_a	.38	5.77	6.14
Information elaboration	5.21_a	1.04	4.70	5.73	5.29_a	1.38	4.70	5.87	2.62_b	.92	2.15	3.09	4.52_a	1.82	3.64	5.40
Performance score	8.38_a	1.32	7.80	8.98	8.79_a	1.38	8.21	9.38	6.20_b	1.51	5.49	6.91	7.95_a	1.81	7.08	8.82

Note. Different subscripts within rows mean values differ from each other at the $p < .05$ level.

Table 2

Results of Mediational Analyses.

	Performance							
			+ Shared task representations			+ Information elaboration		
	β	ΔR^2	β	ΔR^2	*z*	β	ΔR^2	*z*
Diverse	$-.26^{**}$	$.07^{**}$	-.17		1.95^{*}	-.01		
Reflexivity	$.47^{**}$	$.22^{**}$	$.34^{**}$		2.63^{**}	.07		
Diverse x Reflexivity	$.23^{*}$	$.05^{*}$	.13		2.06^{**}	-.04		
Task Representations			$.35^{**}$	$.11^{**}$		.14		4.47^{**}
Task Representations x Reflexivity			-.16	.02		.12		
Task Representations x Diversity			-.08	.00		.05		
Information Elaboration						$.65^{**}$	$.21^{**}$	

Note. *z*-values for the decrease in Beta's tested with Sobel tests, *p*-values one- tailed for Sobel tests. $^{*}p < .05$; $^{**}p < .01$.

knowledge on what affects the development of task-adaptive representations within groups. We argued that the extent to which groups develop task-adaptive representations depends on the extent to which groups talk about the tasks, goals, and how to deal with the group task. Our results indeed showed that group reflexivity determines group members' representations of their task. More specifically, for groups in which members initially do not all have adaptive representations, reflexivity promotes the degree to which group members adopt shared task representations emphasizing information elaboration.

In addition, we showed that the effects of reflexivity are stronger when not all members have adaptive representations than when they do, which confirms the reasoning that an important function of reflexivity is to get group members to develop an adaptive understanding of their task. Moreover, task representations emphasizing information elaboration mediated the interaction between group reflexivity and the degree to which group members started out with task-adaptive representations and performance.

The present study contributes to the existing literature in several ways. First, it contributes to what we know about reflexivity by demonstrating how shared task representations can explain some of the effects of group reflexivity. While during the last years there has been mounting evidence for the beneficial effects of reflexivity for group performance (Carter & West, 1998; De Dreu, 2002; Schippers et al., 2003; Tjosvold et al., 2003), not much empirical attention has been given to the potential role of shared cognition. An important reason to expect group reflexivity to positively affect performance, however, seems to be the fact that reflexivity may lead to change in group members' understanding of their task. From this perspective it is somewhat surprising that what arguably should be a core process mediating the influence of reflexivity has not received empirical attention in reflexivity studies. The present findings provide important evidence for the mediating role of shared cognition

Second, the present study contributes to research on the development of shared (task) cognition. Thus far, only a few studies have investigated how shared task cognition can develop within groups (e.g., through team training, Moreland et al., 1998; team leader debriefing, Marks et al., 2000). Moreover, the few studies that have looked at the development of shared task cognition always examined the development of shared cognition in groups in which members enter the group without a well-developed representation of their task. Very little seems to be known about the development of shared task cognition in groups in which members have different task representations (cf. Mohammed & Ringseis, 2001). This seems somewhat strange in light of the fact that organizational (decision making) groups tend to become more and more diverse (Denison et al., 1996; Williams & O' Reilly, 1998), and diversity on dimensions such as functional background, education, and ethnicity is likely to go hand in hand with diversity in terms of group members' task representations (van Knippenberg & Schippers, in press; Zenger & Lawrence, 1989). Examining ways in which sharedness of

representations can be promoted in such groups seem especially important, because diversity in task representations could easily go completely unnoticed (Hollingshead 1998; Mohammed & Ringseis, 2001), or diversity may only express itself by conflicts about group members' preferred strategies or communication styles and when not dealt with may decrease effective group processes (Hinsz, Tindale, & Vollrath, 1997). In addition, in light of the growing evidence for positive effects of shared cognition on group performance (e.g., Cannon-Bowers, Salas, & Converse, 1993; Klimoski & Mohammed, 1994; Marks et al., 2002; Marks et al., 2000; Mathieu et al., 2005; Rentsch & Klimoski, 2001), examining factors that affect sharedness seems to be of great importance. By showing that group reflexivity can increase the degree to which members develop shared task representations, this study illustrates one way in which shared task cognition may be promoted in groups that are diverse with respect to their task representations. Examining other ways may prove to be an interesting avenue for future research.

What we know thus far about the development of mental representations in groups mainly seems to come from studies that examine sharedness per se (Marks, Sabella, Burke, & Zaccaro, 2002; Mohammed & Ringseis, 2001; Moreland, Argote, & Krishnan, 1998). That is, little still seems to be known about what affects the degree to which task representations are adaptive for high group performance. Yet, often group performance depends on the degree to which task representation are task-adaptive, rather than on sharedness per se (cf. Edwards, Day, Arthur, & Bell, 2006) or on both sharedness and adaptiveness (Marks, Zaccaro, & Mathieu, 2000; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005). In line with this reasoning, in the present study we focused on the development of task-adaptive rather than shared representations.

Of course, this study is not without its limitations. As mentioned above, this study is conducted under certain boundary conditions that may limit the generalizability of the results. That is, reflexivity may be more likely to result in group members adopting task-adaptive representations when the likelihood that an adaptive representation is discussed within a group increases. This is probably more likely to happen when at least one group members already holds this representations before group interaction. Second, the positive effect of reflexivity on group performance is probably more likely to occur when task-adaptive representations have a bigger advantage over less adaptive representations. So, when for some reason less-adaptive representations would have an advantage over adaptive representations, we do not expect a similar effect of reflexivity. Under these circumstances reflexivity may even lead group to share less-adaptive representations, which may result in lower group performance. However based on the current data, we can only speculate about this. Future research may test these notions.

A second, more general, limitation concerns the use of a laboratory experiment with a student sample. The experimental nature of present study was chosen for its potential to allow for testing causal relations and because it allowed us to gather audio-video data, rather than in a quest for

establishing external validity (Brown & Lord, 1999; Mook, 1983). However, previous studies have found that results of laboratory studies are often replicated in field study (Dipboye, 1990, van Knippenberg & van Knippenberg, 2005). This not withstanding, it would of course be highly valuable to replicate the results in a field setting using pre-existing teams in organizations.

An obvious implication for practice that may be derived from this study is that reflexivity could be used as a means to foster the development of more task-adaptive representations in groups. There are some indications that through relatively simple means, like a relatively short instruction reflexivity can be promoted in teams (cf. Okhuysen & Eisenhardt, 2002; Schippers & Edmondson, 2006). As decision groups often may have a maladaptive understanding of their task that could lead them to make insufficient use of their informational resources, it seems valuable for organizations to invest in getting groups to develop a more adaptive understanding. Compared to the potential benefits in term of higher-quality decisions made by decision groups, fostering reflexivity through a short instruction or training seems a rather small investment.

Chapter 5
Distributed Information and Group Decision Making: Effects of Group Leaders' Task Representations

Critical decisions in organizations are often left to groups rather than to individuals. While one reason for the use of groups may lie in trying to increase commitment to and satisfaction with a decision, a key reason for the use of groups centers on the assumption that groups possess more decision-relevant resources (Tindale, Kameda, & Hinsz, 2003). Yet, numerous studies have demonstrated how groups fail to live up to the expectations. Not only do groups often fail to exchange their individual informational resources within the group (cf. Stasser & Titus, 1985; Stasser, 1999), when they do so, they often fail to put the resources to good use and integrate them in coming to a decision (Gigone & Hastie, 1993; Winquist & Larson, 1998). Group members' understanding of their decision task seems to be fundamental for the extent to which groups rely on their informational resources in the decision making process is (van Ginkel & van Knippenberg, 2004, 2005). In an experiment van Ginkel and van Knippenberg (2004) showed that when decision groups with distributed information were stimulated to form shared task representations emphasizing the exchange and integration of information, they discussed more information and made higher quality decision than groups that were not stimulated to form such task representations. This indicates that group members often may fail to see the necessity of a discussion of distributed information. An important question then is how groups develop an adaptive understanding of their task.

A key source of influence on group members' understanding of their task is likely to be their leader. Making sense of and clarifying the task environment (Hill & Levenhagen, 1995; Weick, 2001) and giving direct instructions on how to deal with a task (House, 1971; Yukl, 1998) have been regarded as essential leader behaviors. Moreover, group leaders in particular have been recognized to be essential for the development of shared understanding in groups (Kozlowski, Gully, Salas, & Cannon-Bowers, 1996). As (internal) group leaders have been shown to play an important role in decision making groups as well (Larson, Christensen, Abbott, & Franz, 1996; Larson, Foster-Fishman, & Franz, 1998), group leaders are likely to be a primary source of influence for group members' representations of their group decision making task.

In the present study we examine the effect of group leaders on group members' task representations and the extent to which they adjust them in an adaptive or a less adaptive fashion. We argue that during group interaction group members will adapt their task representations in such a way to match their group leader's task representation. Consequently, when a group leader has adaptive task-representations groups should perform better than when a group leader has more maladaptive representations or when no group leader is present.

Shared Task Representations and Group Information Elaboration

Shared task representations have been defined as "any task/situation relevant concept, norm, perspective, or process that is shared by most of the group members" (p. 84, Tindale et al., 1996). The extent to which group members' task representations emphasize information exchange and integration as an important aspect of their task, is likely to influence the way they use their distributed informational resources. A common fault that decision making groups seem to make is that they focus too much on finding common ground, which goes at the expense of discussing (distributed) information. That is, group members often seem to think a good way to deal with a group decision task is to pool preferences and to try to reach an agreement based on these preferences, rather than on the underlying distributed information. For instance, research on jury decision making has shown that having to work together on a decision task with others can lead people to employ more judgment-driven strategies (i.e. start with pooling individual judgments and after this pool information only based on the judgments) rather than information-driven strategies that are typically employed by individuals when working alone (Hastie & Pennington, 1991). In line with this reasoning, Wittenbaum, Stasser, and Merry (1996) found that when group members believed they were about to participate in a group decision making session as compared to a group recall session, they tended to focus more on information which they believed the other members would also have than on distributed information. Our interpretation of these findings is that group members' understanding of the decision making task centered on the need to find common ground more than on the elaboration of information.

For high performance on decision making tasks with distributed information it is necessary for members to exchange information, to carefully consider the information and its implications, and to discuss and integrate the implications, a process that has also been referred to as *group information elaboration* (van Knippenberg, De Dreu, & Homan, 2004). The extent to which group member have mental representations of their tasks that focus on information elaboration rather than on pooling preferences affects the way groups go about discussing information. When group members believe that information elaboration is important for making a good decision they are more likely to make effective use of their informational resources (van Ginkel & van Knippenberg, 2004, 2005). In contrast if they focus more on reaching an agreement and perceive pooling preferences and finding common ground to be an adaptive way to go about their task, they will be less likely to elaborate on distributed information and more likely to come to an agreement that is based on less (distributed) information. Thus, task representations that mainly emphasize ways in which an agreement can be reached by relying less on information elaboration are likely to foster lower-quality decisions.

Group leadership

Group leaders are likely to be a critical source of influence on group members' understanding of the informational requirements of their task (cf. Kozlowski, 1998; Kozlowski et al., 1996; Zaccaro,

Rittman, & Marks, 2001). Although the emphasis in leadership research has tended to be on leaders' effectiveness in mobilizing and motivating followers (e.g., van Knippenberg, van Knippenberg, De Cremer, & Hogg, 2004; Yukl, 1998), several researchers have identified clarifying task requirements and making sense of ambiguous situations as important leader roles (cf., House, 1971; Reicher & Hopkins, 2001; van Knippenberg & Hogg, 2003; Yukl, 1998). In addition, there is evidence that pre-briefings or task instructions given to groups before they start working can influence group behavior through their influence on members' mental representation of their task (Marks, Zaccaro, & Mathieu, 2000; van Ginkel & van Knippenberg, 2004). Marks et al. (2000) showed that a debriefing before the team started working influenced the accuracy of group members' mental representations of the task and the degree to which were shared within the team. Although the studies above seem to hint at group leaders' potential influence on members' task representations, to our knowledge thus far no study has examined how leader behavior can affect members' task representations during group interaction.

Yet, during interaction with group members group leaders could exert great influence on the way group members think about their task. Because group leaders are more likely to give directions on how to approach the group task (House, 1971; Yukl, 1998), group leaders' ideas on how to approach the task are probably are more visible and than any group member's ideas. In addition, leadership roles create the expectation with both the followers and the person in the leadership position that the person in the leader role will be more influential (cf. Berger, Wagner, & Zelditch, 1985; van Knippenberg, van Knippenberg, & van Dijk, 2000). Moreover, the legitimate power that follows from being in a formal leadership position gives the person in this position 'the right' to influence or give directions to others (French & Raven, 1989; Yukl, 1998). In sum, because group leaders are likely to voice their task representations through directions and comments during group interaction and group members are likely to turn to leader for clues and directions on how to deal with the task, group leaders' task representations are likely to be more visible and influential than members' representations. As a result during group interaction group members are likely to develop task representations that are more similar to their leader's representations.

Based on the discussion above, we propose that when a group leader with task representations that emphasize information elaboration is present, groups elaborate more on information *(Hypothesis 1a)* and reach higher quality decisions *(Hypothesis 1b)* than when a group leader is present that has representations that have a stronger emphasis on agreement-seeking. In addition, groups with a leader with a task representations that emphasize information elaboration are expected to elaborate more on information *(Hypothesis 2a)* and to reach higher quality decisions *(Hypothesis 2b)* than groups without a group leader.

No or only small differences are expected between situations in which there is no group leader and situations in which there is a group leader with task representations emphasizing agreement-seeking. Groups that have a group leader with a less-adaptive task representation may

perform slightly worse, because in this condition the less adaptive task representations are more likely to be shared by members, which should increase the impact on behavior (Tindale & Kameda, 2000). However, when no leader is present it also seems unlikely that the group as a whole will consider more information, since it does not seem very likely that group members adapt their task representations based on different task representations held by another group member who has no special influence (i.e., like influence stemming from a formal leader position) (cf. Mohammed & Ringseis, 2001; van Ginkel, Tindale, & van Knippenberg, 2006).

The effects of a group leader on performance are expected to be mediated by task representations held by the group members (i.e., not including the group leaders' task representation) (*Hypothesis 3*). In addition, because task representations are likely to directly result in a higher or lower degree of information elaboration, depending on the type of task representations, the effects of group members' task representations on performance are expected to be mediated by group information elaboration *(Hypothesis 4)*.

Hypothesis 1-4 were tested in an experiment, in which we manipulated whether or not a group leader was present and if so whether the group leader held task-adaptive representations emphasizing information elaboration or less-adaptive representations emphasizing agreement-seeking. Because audio-video data tend to be more reliable and provide a richer source of information than self-report data (Weingart, 1997), we relied on audio-video data to code leadership behavior and group information elaboration.

Method

Design and Participants

The study had a one-factor design with three levels (group leader with task representations that emphasize elaboration, group leader with task representations that emphasize agreement-seeking, no group leader). A total of 285 business and economy students were assigned to 95 three-person groups. One group was excluded from the analyses, because the person randomly selected to be the group leader indicated not to be willing to fulfill this role, leaving 282 participants (90 women and 192 men) and 94 groups. Groups were randomly assigned to one of the three conditions (31 in the leader elaboration condition, 31 in the leader agreement-seeking condition, and 32 in the no-leader condition). For four of these groups, due to technical problems no audio-video data for measuring elaboration and leadership behavior were available. Because there are no reasons to expect these groups to differ from the other groups, groups were kept in the analyses for the analyses that did not involve audio-video data (listwise deletion was used for the analyses). The majority of participants were business administration students (87.1 %). Their mean age was 21.3 (SD = 3.6). For their participation they received a compensation of 10 euro (approximately 12 USD).

Experimental Task

The task used in this study was a cooperative decision making task inspired by the Towers Market task (Weingart, Bennet, & Brett, 1993). While the original task was meant as a negotiation task, the adaptation was such that the current task was a purely cooperative decision making task. The task concerns the organization of a small market centre that contains a bakery, a florist, and a vegetable market. Participants are told that they will function as an independent advisory committee that is to aid the three stores in making three interrelated decisions about the temperature for the market center, the division of maintenance costs between three stores, and the organization of store space. To do this all participants were given information on the preferences of three stores and on the relative importance of the three issues to the stores. In addition they were told to take the interests of all three stores into account. Group members received some information on the three stores. The informational items were partially based on the original task, partially on another adaptation of the task (Beersma & De Dreu, 2002) and partially designed for this study.

Following prior research in group decision making, part of the decision-relevant information was given to all group members and part of the information was given to only one of the group members (Stasser & Titus, 1985). Items of information necessary for making good decisions were distributed over group members, so that for all members to be able to learn about these items groups had to share the information. For every decision issue there were always three items of information that were crucial for reaching an optimal decision. Each of these was uniquely assigned to one of the group members. For each decision issue group members received this crucial, unshared information on a different store (e.g., group member 1 received unshared information about the bakery on item 1, about the florist on item 2, etc., while group member 2 received crucial information about the florist on item 1 and about the vegetable market on item 2, etc.). To make the task more complex, besides information necessary for making the correct decision some irrelevant information about the three stores was also included (this information was always given to all members). Three of the four group members received approximately the same amount of information. For practical reasons the fourth member received a little less information than the others, because this person never received any crucial, unique information (information not possessed by the other members). Groups were told that the information they received might differ (Stasser & Titus, 1985). For each issue, groups could choose from a limited number of options. Based on all available information a hierarchy in the quality of the decision options existed (i.e., some combinations of decision options served the interests of all stores better than others).

Experimental Manipulations

Group leaders were randomly selected from the group. The person selected to be the group leader and the other group members were informed about this by the experimenter. The group and the

designated leader were told the leader would participate together with the other members on the group task and that he or she would be responsible for the way in which the group worked together. The leader's main task was to ensure the decision making process proceeded in an optimal fashion and to take action whenever he or she believed this was necessary. To make sure the designated leader was capable of fulfilling the role, he or she was given additional instructions about the leader role and how to fulfill this role. This instruction included specific behavioral descriptions of what the leader might do to ensure optimal group processes (e.g., ask team members for contributions, encourage more quiet members to contribute, keep track of the time, etc.). The designated leader was informed that if he or she felt that he or she would not be able to fulfill the role, he or she could inform the experimenter and the group could simply continue the work without a leader. The person selected as a leader was ensured that this would not be a problem or hinder the experiment, because for other purposes groups without a leader were also necessary (only one person indicated that he did not want to be a leader). Finally, before groups started with the decision making task, the experimenter took the group leader apart to answer any questions he or she might have and subsequently reminded the group as a whole about the fact that one person was a selected to fulfill the group leader role.

To manipulate task representations, written instructions were used. Three task representations were designed that described different ways to approach the decision task. The representations were based on research in group decision making as described in the introduction section. While representation (A) mainly focused on the importance of information processing, both representations (B) and (C) focused on ways in which agreements could be reached while relying less on distributed information. More specifically, representations (B) and (C) focused on reaching an agreement through making compromises, rather than through discussing all available information. Representations were presented to participants through written instructions. The instructions consisted of a detailed description of the task containing information on what behavior was most likely to lead to high performance and what to low performance.

Instruction (A) described the task as requiring extensive exchange of individual members' information and critical discussion of this information. It said that research had shown that on group tasks like the present one it was most important that the decisions were based on all available information and that critically considering all information is therefore crucial for making high quality decisions. Instruction (B) described the task as requiring compromises between the group members to be able to come to a high quality decision. It said that research had shown that to attain high quality decisions group members should be willing to sometimes change their minds for the sake of the group. Thus, group members were told that making compromises, in term of not being too persistent in sticking to your opinion and being willing to change ones mind was most likely to lead to high performance. Instruction (C) also described the task as requiring compromises, but this time it emphasized making compromises for the stores involved. It said that research had shown that on group

tasks like this it usually was necessary for the stores involved to make compromises and that therefore stores may not be able to get what they want on all the decision issues. Furthermore, it said that no one store should give in more than the other stores on the total of decision issues. Rather, compromises should be spread out over both issues and stores, such that no one store has to given in on all issues.

Although arguably representation C demands slightly more information elaboration since at least the preferences of the stores have to be known to all members, similar to instruction (B) in instruction (C) also lies the implicit notion that thorough discussion of (distributed) information is not necessary, because short-cuts can be used in attaining a group decision (e.g., either take the middle option that does not completely satisfy or ignore anyone's demands on every issue or let one store get what it wants on the first issue, the other on the second, etc.). Because the task is designed as such that when all information is taken under consideration compromises are unnecessary, compromises at both the level of the group and the level of the stores basically can be seen as shortcuts to the process of discussing information that are unlikely to lead to high quality decisions (decisions that satisfy all needs when all available information is considered).

In every group one member was presented with description (A) one with description (B), and one with description (C). In the group leader with representations emphasizing elaboration condition, the member with representation (A) was selected as the group leader, while in the group leader with representations emphasizing agreement-seeking condition in half the cases the member with representation (B) was selected as the group leader and in the other half the member with representation (C).

Measures

Task representations were measured using questionnaires. Participants were asked to rate the extent to which they believed several actions would either harm or help performance on the group decision task on a 7-point scale, ranging from -3 (harms performance severely) to 3 (helps performance severely). This way of measuring mental representations has been successfully employed before (Webber, Chen, Payne, Marsh, & Zaccaro, 2000). Seven statements were used to assess task representations emphasizing information elaboration. A few examples of statements are "basing a decision on all available information", "continue with discussing information even when we all agreed", "exchanging information", and "end the discussion when we all agreed" (R) (α = .60). To measure task representations for agreement-seeking eight statements were used. Because task representations (B) and (C) are theoretically quite similar in that they both emphasize the importance of making compromises for the decision task, one scale was used to measure these task representations. A few examples of statements are "quickly trying to reach an agreement", "changing your mind for the purpose of reaching an agreement", "making sacrifices for the purpose of reaching an agreement" , and "making sure all parties make some compromises" (α = .63).

Leader behavior was measured using audio-video coding. Two coders counted how often group members displayed a series of leadership behaviors like asking the other members for information, ideas, opinions, etc., making meta-remarks about the group process (e.g., remarks about the need for information exchange, refraining from making a decision, the need for making compromises), and asking members if they agreed with something before a group decision was made ($\kappa = .69$). A mean score was computed by taking the mean over the total amount of leadership behavior displayed at each of the three decision issues.

Audio-video recordings were used to measure group information elaboration. Information elaboration was coded at the group level. Two coders (blind to experimental conditions) rated group information elaboration ($\kappa = .70$). Before information processing was coded all videos were watched once and based both on these observations and theory on distributed information in group decision making a seven-point scale was developed, anchored with specific behavioral standards observed in the videos.

A score of "1" was given when information was completely ignored by all three group members and the group immediately started with exchanging preferences. A score of "2" was given when one of the members did mention a crucial item of information, but none of the other members reacted to it (either by saying something or by nodding or by clearly looking at the person that mentioned it) or used the item in making a decision. A score of "3" was given when one of the members mentioned an item of information and at least one of the other members reacted to it, but after this the group still failed to integrate it with the other information. A score of "4" was given when one crucial piece of information was mentioned by at least one of the group members, with at least two of the other three members clearly reacting to the mentioning of the information (for instance by asking a question about it, by combining it with another piece of information, or by drawing a conclusion from it with regard to what the best decision option would be in light of this information) or when two pieces were mentioned, but with the group as a whole failing to integrate both items of information in coming to a decision. A score of "5" was given when one crucial piece of information got fully discussed by all members and integrated with other information and at least one other piece of information was clearly discussed by at least two of the three group members, however without their discussion influencing the use of that item of information by the group as a whole. A score of "6" was given when at least two pieces of crucial information were fully discussed by the whole group and integrated with the other information. A score of "7" was given when all three crucial items of information were clearly and fully discussed by at least three of the four members, with them clearly having drawn conclusions with regard to what the best decision option would be in light of this information.

Results

Preliminary Analysis

To determine the level of analysis mean $a_{wg(1)}$ values were calculated for each variable (Brown & Hauenstein, 2005). Cut-off scores of .60 or .70 have been reported (Brown & Hauenstein, 2005). The mean $a_{wg(1)}$ value for task representations emphasizing information elaboration and task representations emphasizing agreement-seeking were both above cut-off point (respectively .91 and .90). These variables were therefore analyzed at the group-level. Furthermore, because we are interested in how group members' task representations are influenced by their leader, in the leader conditions we omitted the leader's representations from the aggregation, because including the leader's representation would make it impossible to determine whether any increase or decrease would occur because the influence the leader has on the group or because of the sheer level of the leaders' own task representation.

Manipulation Checks

To see whether the manipulation of task representations had worked participants were asked to briefly describe what they believed would be the best way to go about the group task. These descriptions were then compared with the instructions that had been presented to them by two coders ($\kappa = .91$). Of all participants who were asked to describe their ideas about the task 93% described something that resembled the instruction they had been given. That is, 93% percent seemed to indeed have adopted the representation that was presented to them in their instruction. The remainder of the participants either did not write down anything, described another representation than the one they had been presented with, or wrote down something completely different. This seems to imply the manipulation of task representations had worked.

To test whether the manipulation of group leadership had worked audio-video coding was used. Comparing the amount of leadership behaviors displayed in each condition with contrast analyses showed that in both the leader elaboration condition ($M = .60$, $SD = .26$) and the leader agreement-seeking condition ($M = .57$, $SD = .27$) more leader behavior was displayed than in the leaderless groups ($M = .32$, $SD = .24$) $t(87) = 4.04$, $p < .01$, $\eta^2 = .16$ for the contrast between the leader elaboration and leaderless condition and $t(87) = 3.66$, $p < .01$, $\eta^2 = .13$ for the contrast between the leader agreement seeking and the leaderless condition. In addition, when we only compared differences between the three group members within the leader conditions using contrast analyses in a within subjects design analysis of variances. Results yielded significant differences between the group leader and both individual group members, $F(1,60) = 47.47$, $p < .01$, $\eta^2 = .45$ and $F(1,60) = 59.40$, $p < .01$, $\eta^2 = .51$, while there were no differences between the two non-leader members, $F(1,60) = .87$, $p = .35$, $\eta^2 = .02$. This indicates the leadership manipulation works.

Furthermore, we tested whether group members selected to carry out the group leader role indeed not only displayed leader behavior, but also behavior congruent with the task representation that had been presented to them. For this purpose a second leader behavior variable was created that reflected the extent to which the group leader either encouraged members to elaborate on information or to find common ground. This variable consisted of four specific leader behaviors: asking group members for information, commenting on the importance of considering information, asking group members for their initial pre-discussion preferences, commenting on the importance of making compromises and reaching an agreement (the last two behaviors were coded reversely, $\alpha = .64$). A higher value on the measure corresponds to the leader behavior that is more strongly aimed at encouraging exchange and integration of information, rather than the discussion of preferences and making compromises. Analysis of variances yielded significant differences between the conditions in leadership behavior, with the leader elaboration condition ($M = .61$, $SD = .44$) scoring higher than the leader agreement-seeking condition ($M = -.25$, $SD = .32$), $F(1, 60) = 75.66$, $p < .01$, $\eta^2 = .56$.

Table 1

Means, Standard Deviations, and 95 % Confidence Intervals (CI) of Leader elaboration Condition, the No-Leader Condition, and the Leader Agreement-seeking Condition on Task Representations emphasizing Information Elaboration (TR elaboration) , Task Representation emphasizing Agreement-seeking (TR agreement-seeking), Information Elaboration, and Performance.

	Leader elaboration				No Leader				Leader agreement-seeking			
	M	*SD*	CI		*M*	*SD*	CI		*M*	*SD*	CI	
			Lower	Upper			Lower	Upper			Lower	Upper
TR elaboration	$.44_a$	.56	.23	.64	$.07_b$	.53	-.12	.26	$.01_b$	.55	-.19	.21
TR agreement-seeking	$.49_a$	.48	.31	.66	$.77_b$	.40	.62	.92	$.82_b$	.42	.66	.97
Information elaboration	5.76_a	1.05	5.36	6.15	4.11_b	1.30	3.63	4.60	4.29_b	1.33	3.80	4.78
Performance score	8.71_a	.94	8.37	9.05	7.81_b	1.40	7.31	8.32	7.19_b	1.42	6.67	7.72

Note. Different subscripts within rows mean values differ from each other at the $p < .05$ level.

Group Information Elaboration

To test for differences between the conditions in information elaboration planned contrasts were computed. Hypothesis 1a predicted that groups in the leader elaboration condition elaborate more on information than groups in which a leader with task representations emphasizing agreement-seeking is present. In line with Hypothesis 1b, results showed that groups in the leader elaboration

condition scored higher on group information elaboration than groups in the leader agreement-seeking condition, $t(87) = 4.64$, $p < .01$, $\eta^2 = .20$. Hypothesis 2a predicted that groups in the leader elaboration condition elaborate more on information than groups in which no group leader is present. Results showed that indeed groups elaborated more in the leader elaboration condition than in the leaderless condition, $t(87) = 5.17$, $p < .01$, $\eta^2 = .24$. This confirms Hypothesis 2a. Finally, no significant differences on information elaboration were found between groups in the no-leader condition and groups in the leader agreement-seeking condition, $t(87) = -.57$, $p = .57$, $\eta^2 = .00$. (See Table 1)

Group Decision Making Performance

Using planned contrast analysis, we found that groups in the leader elaboration condition performed better than groups in the leader agreement-seeking condition, $t(91) = 4.68$, $p < .01$, $\eta^2 = .19$. This is in line with Hypothesis 1b. In addition, it was found that groups in the leader elaboration condition performed better than groups in the leaderless condition, $t(91) = 2.79$, $p < .01$, $\eta^2 = .08$, which confirms Hypothesis 2b. Finally, groups without a group leader performed marginally better than groups in the leader agreement-seeking condition, $t(91) = 1.93$, $p = .06$, $\eta^2 = .05$.

Mediational Analysis

Hypothesis 3 predicted that the effects of the experimental conditions on performance are mediated by group members' shared representations of the task. Hierarchical regression was used to test this hypothesis. First, group members task representations were aggregated by simply taking the mean (note that the a_{wg} value warranted group-level analysis) over group members' representations. In the two group leader conditions only the task representations of the two members (not including the leader) were aggregated. To keep the number of members whose task representations were aggregated in the no-leader condition similar to the number in the two leader conditions, here we also conducted the analyses over only two of the three group members (the two members not sitting in the chair in which the leader sat in the leader conditions). Differences in group members' representations emphasizing information elaboration and agreement-seeking between the three experimental conditions were tested. As expected, groups in the leader elaboration condition scored higher on representations emphasizing information elaboration than groups in the leader agreement-seeking condition, $t(91) = 3.09$, $p < .01$, $\eta^2 = .09$ and groups in the no-leader condition, $t(91) = 2.68$, $p < .01$, $\eta^2 = .07$. Moreover, groups in the leader elaboration condition also scored significantly lower on task representations emphasizing agreement-seeking than groups in the leader agreement-seeking condition, $t(91) = -2.98$, $p < .05$, $\eta^2 = .09$ and groups in the no-leader condition, $t(91) = -2.57$, $p < .05$, $\eta^2 = .07$. No significant differences were found between the leader agreement-seeking condition and the no-leader condition on either task representations emphasizing information elaboration, $t(91) = .44$, $p = .66$, $\eta^2 = .00$, or task representations emphasizing agreement-seeking, $t(91) = -.43$, $p = .67$, η^2

= .00. To test for possible mediation, first two dummy variables representing the differences between the three experimental conditions were created and performance was regressed on the dummy variables. In the next step, both task representations were entered into the model one by one. It was found that, in line with Hypothesis 3, entering task representations into the model led to a significant decrease in β size for both dummy variables as tested with a Sobel test (see Table 2 for all statistics for the mediational model). Moreover, adding one task representation into the model when the other was already present led to a significant increase in overall variance explained by the model, indicating that both task representations are able to contribute to the models explanatory power. Finally, Hypothesis 4 predicted that group information elaboration mediates between task representations and group decision performance. To test this, in the last stage information elaboration was added to the model, which led to a significant decrease in relationship strength between both types of shared task representations and performance. Whereas the relation between task representations emphasizing agreement-seeking and performance disappeared completely, the relation between task representations emphasizing information elaboration and performance remained significant. This partly confirms Hypothesis 4[1].

Table 2

Results of Mediational Analyses.

	Performance										
			+ Task representations emphasizing information elaboration			+ Task representations emphasizing agreement-seeking			+Information elaboration		
	β	ΔR	β	ΔR^2	z	β	ΔR^2	z	β	ΔR^2	z
Dummy1	- .30*	.08**	- .21		2.11**	- .13		2.01**	.12		
Dummy2	- .53**	.20**	- .41**		2.29**	- .33*		2.19**	- .12		
TR Information elaboration			.32**	.09**		.30**			.20*		3.02*
TR agreement-seeking						-.28*	.07*		- .14		3.43**
Information elaboration									.58**	.22**	

Note. Dummy 1 represents the difference between the leader elaboration condition and the no-leader condition and dummy 2 represents the difference between the leader agreement-seeking and leader elaboration condition. z-values for the decrease in βs tested with Sobel tests, * $p < .05$, ** $p < .01$, p-values one-tailed for Sobel tests. Note that entering task representations emphasizing agreement-seeking into the model before task representations emphasizing information elaboration in an alternative model not reported here, led to a highly similar model.

Discussion

For effective use of distributed information in decision making groups' it appears critical that group members have an understanding of the informational needs of their task (van Ginkel & van Knippenberg, 2004). However, decision group members often seem to have a less than adaptive understanding of the informational requirements of their task. Furthermore, there are indications that group members are unlikely to disuses issues concerning their underlying task representations (Hollingshead 1998; Mohammed & Ringseis, 2001). As a result, they may have very limited opportunity to change maladaptive ideas that could result in lower group performance. Therefore, it is of great importance to identify what makes group members develop adaptive representations of their task.

It was shown that a group leader's task representation can affect group information elaboration and decision making performance through its effect on group members' task representations. When a group leader was present that had task representations emphasizing exchange and integration of information, group members elaborated more on information than when either a group leader that had task representations emphasizing reaching an agreement or no group leader was present. Moreover, group members' task representations mediated the difference in group decision performance between groups with a group leader with task representations emphasizing elaboration and groups in which no leader was present. The difference between groups with a leader with task representations for elaboration and groups with a leader with a task representation for agreement-seeking was partly mediated by group members' task representations.

Although we predicted that task representations also fully mediate the relation of difference between the two leadership conditions on performance, in hindsight it seems likely that differences in leadership behaviors also result in other differences than just differences in members' task representations. Based on the current data we can only speculate about the nature of these differences, but it may be the case that the different leadership behaviors displayed not only affected what group members believed to be the best way to work on the task, but also group members' feeling of how safe or accepted it was to discuss information. For instance, if a leader encourages members to discuss distributed information, members may feel more like discussing information is not only useful for the task, but also accepted by the group than when a leader never asks about information, but only focuses on preferences. The above reasoning is in line with research that showed that leadership behavior is an important determinant of psychological safety (Edmondson, Roberto, & Watkins, 2003), and that psychological safety influences the degree of group information use (Edmondson, 1999, 2003; van Ginkel & van Knippenberg, 2004). Furthermore, it is also possible that sometimes group members did adapt their behavior in line with their group leader's behavior, but that this did not result in any underlying changes in members' task representation. For instance a group member might come forward with information when the leader asks for it, but does not necessarily have to adjust his or her

perceptions about the role of information for the task. This is in line with the notion that followers may comply with their leaders' ideas, without actually internalizing them or being committed to them (Kelman, 1958; Yukl, 1998).

Information elaboration was shown to mediate the effect of both types of task representations on group decision quality, although the effect of task representations emphasizing information elaboration on performance was only partly mediated. The fact that we did not find full mediation here could be explained by the effect of group members' task representations on the extent to which they individually process or think about distributed information. That is, when group members believe that basing a decision on all information is very important, they might not only mention more information or react to someone else's information, but also give new information mentioned by someone else more serious thought. Although this might be partly reflected by their behavior as coded, this individual-level processing is likely to also be partially outside the domain of behavioral observation.

As expected only marginal performance differences and no elaboration differences were found between situations in which no group leader was present and situations with a group leader with task representations for agreement-seeking. Note that in every group there always was one group member with a task representations emphasizing information elaboration present. These findings then confirm that only when the person with adaptive representations was the group leader he or she substantially influenced other members' representations and was able to promote a higher level of group information elaboration and group performance. This indicates that indeed a group leader has more influence on members' task representations than a non-leader member.

Groups' use of distributed information has been identified as an important determinant and bottleneck for the quality of group decisions. In addition, group leaders have long been recognized as influential for important group processes and the quality of group outcomes. In the present study we therefore combined these aspects of group functioning and focused on how group leaders can promote a more thorough group-level use of distributed information. The findings of the present study that the presence of a group leader promotes sharedness of group members' task representations confirms the notion that a group leader can be an important source of sharedness or coherence of mental models (Kozlowksi et al., 1996). Although research has shown how leaders' can affect group members shared task representations with a pre-task debriefing that does not allow interaction between leaders and members (Marks et al., 2000), to our knowledge this is the first study to show how leaders' can impact members representations through their behavior during group interaction. By showing a group leader's effect on group members' task representations during group interaction, the present study extends our knowledge about ways through which an adaptive understanding of the task can be promoted in groups.

While previous studies have shown that leaders are more likely to repeat information (Larson et al., 1996) and that using a directive or participative leadership style can the extent to which group

members exchange information (Larson et al., 1998), this study has shown that there is a third important way in which leaders can affect groups' use of distributed information. Group leaders' influence on group information use, through its effect on members' task representations, may also be able to explain some of the arguably inconsistent findings of the study by Larson et al. (1998). Larson et al. (1998) showed that groups were more likely to mention information when a participative as compared to a directive group leader was present. Yet, a participative leadership style did not result in higher decision making performance. The fact that more information was mentioned, but that this did not result in higher performance could imply that although a participative leadership style may result in members mentioning more information it does not necessarily result in more information elaboration. Put differently, simply mentioning or exchanging information does not have to imply integration of the information in coming to a decision (cf. Gigone & Hastie, 1993; Winquist & Larson, 1998) and a participative leadership style could result in more information exchange, but not integration. A reason for this could be that although groups with a participative leader may feel freer to have an open discussion of information and to disagree with the leader than groups with a directive leader, they do not necessarily have to understand the need for integrating available distributed information for making a high quality decision. So, even though they might mention more information, the necessity of actually using their distributed information might not have been clear regardless of the leadership style. The fact that no differences were found in the extent to which directive or participative leaders repeated other members' distributed information seems to corroborate the reasoning that also participative leaders might have underestimated the value of distributed information. Therefore, a participative leadership style may not be sufficient to foster high performance in decision making groups with distributed information, because a participative leadership style does not necessarily increase groups' understanding of the informational requirements of their task.

This study contributes to research on shared cognition in small groups by showing how groups can come to develop task-adaptive representations. There seems to be mounting evidence for the effects shared task-adaptive cognition can have on group functioning and group performance (cf. Cannon-Bowers, Salas, & Converse, 1993; Klimoski & Mohammed, 1994; Marks, Sabella, Burke, & Zaccaro, 2002; Marks, Zaccaro, & Mathieu, 2000; Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005; Rentsch & Klimoski, 2001). Nonetheless, research has only started with examining what affects the development of cognition in groups (e.g., Mohammed & Ringseis, 2001; Marks, Zaccaro, & Mathieu, 2000; Liang, Moreland, & Argote, 1995; van Ginkel & van Knippenberg, 2005). Moreover, even less seems to be known about the development of shared task cognition in groups in which members initially have different task representations (cf. Mohammed and Ringseis, 2001), which could make the development of shared task-adaptive representations more difficult. This, even though organizational (decision making) groups tend to become more diverse (Denison et al., 1996;

Williams & O'Reilly, 1998), and diversity on dimensions such as functional background, education, and ethnicity is likely to go hand in hand with diversity in terms of group members' task representations (van Knippenberg & Schippers, in press; Zenger & Lawrence, 1989). This study demonstrated that a group leader can foster shared adaptive task representations in groups during by explicating and advocating their own task representations group interaction.

In the present study we focused on how internal group leaders influence group members' representations. Although many decision making groups may have a member that functions as an internal leader, there exist of course also decision making groups that rely completely on self-management. Yet, even these teams are likely to have a team leader in the form of a manager that is held responsible for the teams' performance (cf. Kowzlowski et al., 1996). It may be interesting to see to what extends these findings would hold for such external team leaders. One probable determinant of the degree to which group leaders affect members' representations is the amount of leader-team interaction. As the prevalence of leader-team interaction decreases, the impact of leaders on members' representations is likely to decrease as well. Accordingly, the influence of external leaders, who are not part of the team, may be much smaller than the effects of internal leaders. It could be worthwhile to further validate this reasoning through further studies, not only for purposes of research, but also for practice. If internal leaders are able to exert more influence on members' representations than external leaders, organizations could choose to appoint an internal leader for tasks for which group members are more likely to have a less adaptive understanding (e.g., decision making situations where distributed information is critical) rather than relying on an external leader.

Of course this study is not without its limitations. One obvious limitation concerns the use of a laboratory experiment with a student sample, which may make it harder to generalize results to organizational settings. The experimental nature of present study was chosen for its potential to allow for testing causal relations and because it allowed us to gather audio-video data, rather than in a quest for establishing external validity (Brown & Lord, 1999; Mook, 1983). However, previous studies have found that results of laboratory studies are often replicated in field study (Dipboye, 1990, van Knippenberg & van Knippenberg, 2005). Nonetheless, it would be highly valuable to replicate the results in a field setting using existing teams in organizations.

Finally, an implication for practice that may be derived from this study concerns the importance of training group leaders. First, the findings of the present study show that it is important that a group leader has an adaptive representation of the group task. It was shown that while a group member with an adaptive representation in a group leader role could substantially aid group performance, a group member with a maladaptive representation in the group leader role only harmed group performance. This signals the importance of a group leaders understanding of the group task for group performance. Training may be employed to make sure a group leader indeed has an adaptive understanding of how the group task could best be approached. In addition, for a group leader's task

representation to influence members' representations, it is also important that group leaders are able to advocate his or her representation to group members in an effective way. For this purpose, if necessary organizations may also need to apply training to make sure group leaders are able to accomplish this.

Footnotes

[1] To provide further evidence for our manipulations, we also tested to what extent leader behavior affected group members' task representations, elaboration, and decision quality. Because there is no leader behavior in the condition in which there is no leader, for this purpose a second mediational model was tested only in the two leadership conditions. First, performance was regressed on the experimental conditions. Next, leader behavior was added into the model. After leader behavior was entered into the model along with the experimental conditions, it led to a significant reduction in the effect size of the experimental conditions on performance, rendering the effect insignificant. Following, the two task representations were entered into the model, after which also the effect of leader behavior turned insignificant. Finally, again elaboration was entered into the model, which similar to the previous model led to a significant decrease in relationship strength between both types of shared task representations and performance. Whereas the relation between task representations emphasizing agreement-seeking and performance disappeared completely, the relation between task representations emphasizing information elaboration and performance remained significant. Statistics of this mediational model are available from the authors upon request.

Chapter 6
General Discussion

In many influential teams in organizations essential knowledge and information is distributed over team members (e.g., top management teams, new product development teams). Therefore, decision making groups with distributed information arguably are one of the most important types of groups that can be found in organizations. However, research has repeatedly shown how such groups fail to make optimal use of its members' distributed information, which often results in lower quality decisions (cf. Larson et al., 1994; Stasser et al, 1999; Wittenbaum & Stasser, 1996). It therefore is of great importance to identify factors that affect decision making groups' use of distributed information. In this dissertation I argued that group members' understanding of their task and its informational requirements is critical for groups' use of distributed information. A fundamental reason for groups' insufficient use of distributed information is that groups often fail to see the necessity of information elaboration. Not only may groups be quite capable to come to an agreement without extensive consideration of information, it sometimes may even be easier to come to an agreement without considering distributed information (cf. Wittenbaum et al., 1996). However, when distributed information is relevant for making high-quality decision, not making effective use of this information is likely to result in lower-quality decisions. The aim of this dissertation was to examine the role of group members' shared task representations for the manner in which groups handle distributed information. In addition, I sought to explore antecedents of task-adaptive shared representations in groups. Below I briefly summarize the main findings and contributions of each chapter of the dissertation.

Summary of the Main Findings

Chapter two focused on demonstrating that groups' understanding of the role of information elaboration is imperative for decision quality in groups with distributed information. The findings reported in this chapter constitute importance first evidence for our claim that the degree to which decision making groups elaborate on information and make high-quality decisions depends on their understanding of the role of information for their group task. We found that decision making groups with shared task representations emphasizing information elaboration elaborated more on information and made higher quality decisions, than groups that did not share such representations. Moreover, the finding that experimental groups (in which we promoted the development of representations emphasizing elaboration) made higher quality decision than control groups indicates that decision making groups may often lack this understanding when not instructed about it. Furthermore, chapter two also focused on the role of awareness of sharedness of representations. When group members share similar representations they do not necessarily have to be aware of it. However, we argued that

when group members are aware of having similar representations, this should positively affect group performance. Awareness of sharedness was argued to remove psychological barriers (e.g., fear of evaluation) that can hinder information elaboration, because it increases the level of psychological safety. We showed that when group members are aware of sharing task representations the effects of information elaboration and performance indeed are stronger than when group members share task representations without being aware of it.

Chapter three focused on the value of the concept of shared task representations for explaining other research findings. We showed that shared task representations emphasizing information elaboration are able to explain the positive effects of knowledge about the distribution of information on group decision making quality. Although numerous of studies have shown that decision making groups with distributed information perform better when they have knowledge about which group member knows what (who has information on what topic) (Littlepage et al., 1997; Stasser et al., 1995; Stasser et al., 2000; Stewart & Stasser, 1995), it thus far remained unclear why exactly knowledge about the distribution of information has these effects (Stasser et al., 2000). However, with the concept of shared task representations we were able to provide an explanation for the effect of knowledge about the distribution of information. We argued that the knowledge that each member has specific information increases the degree to which information is seen as valuable for the task. Moreover, based on the idea that shared task representations explain the effect of knowledge about the distribution of information, we were able to identify two factors, sharedness and reflection, that can moderate the effect of knowledge about the distribution of information. Identification of these moderator variables is important, not only because it helps us to better understand the effect of knowledge about the distribution of information on group decision performance, but also because it provides a leverage point for influencing the effect of knowledge about the distribution of information that could be applied for practice.

In chapter four we argued that group reflexivity (West, 1996), or put differently, the extent to which group members discuss their task goals and approach, is essential for the degree to which groups develop task-adaptive representations. We showed that the level of group reflexivity influenced the development of shared adaptive- task representations in groups. Furthermore, the effect of reflexivity was shown to be stronger in situations in which not all members hold adaptive representations than in situations in which all members hold adaptive representations. As expected, this interaction was mediated by shared task representations. This corroborates the notion that reflexivity can foster group decision making performance through its positive effect on the degree to which group members develop adaptive representations of their task. Besides the fact that this chapter was able to identify reflexivity as an essential factor for the development of task representations, an important contribution of this chapter lies in demonstrating the mediating role of shared task representations in the relation between team reflexivity and performance. Although, the very reason to expect reflexivity to have a positive effect on group performance arguably is that reflexivity may lead

to changes in group members' understanding of their task, as far as we know this is the first study to show that shared cognition may follow from group reflexivity.

Finally in chapter five, we argued that because giving directions and clarifying and making sense of the task environment is typical leader behavior, group leaders should be able to exert considerable influence on group members' understanding of the task. We showed that a group leader indeed can influence whether group members develop adaptive or more maladaptive representations of their task. Group members in groups with a leader developed task representations that were similar to the representation held by the leader. In groups in which the group leader held representations that emphasized information elaboration, this subsequently led to more information elaboration and higher group decision quality. On the other hand, in groups in which the leader had representations emphasizing agreement-seeking, the higher correspondence between group leader and members' representations led to lower-quality decisions. Leaderless groups performed only marginally better than groups with a leader with task-representations emphasizing agreement-seeking. Because in all groups there was one member with task-adaptive representations, these findings underscore that only when a member with task-adaptive representations has some kind of extra influence (e.g., has a leadership position) group members may change their own task representations to be more in line with the adaptive representation during group interaction.

Implications and Contributions

The present dissertation contributes to existing research in several ways. First, it identifies a new factor, shared task representations, that affects the degree to which decision making groups with distributed information use their informational resources. Groups' ineffective use of distributed information is a well established research finding that over the years has drawn much research attention (e.g., Larson et al., 1994; Wittenbaum & Stasser, 1996). Although earlier research addressing this issue has made great progress in identifying factors affecting groups' use of distributed information, like team knowledge about group member expertise (Stewart & Stasser, 1995) and group member familiarity (Gruenfeld et al., 1996), we believe that by demonstrating the effects of shared task representations, in this dissertation we have identified a factor that lies at the base of groups' use of distributed information. The fact that shared task representations were able to explain the effect of knowledge about the distribution of information as was shown in chapter three seems to corroborate this idea.

Second, this dissertation contributes to research on shared cognition. Over the last decades there has been mounting evidence demonstrating the influence of groups' shared mental representations of their task on several group processes, like communication, coordination, cooperation, and group performance (e.g., Cannon-Bowers et al.,1993; Klimoski & Mohammed, 1994; Marks et al., 2002; Marks et al., 2000; Mathieu et al., 2005; Rentsch & Klimoski, 2001). However, thus far the notion that shared task representations determine behavior has never been applied to groups' information

elaboration in decision making groups with distributed information. Arguably, the only studies to investigate the effect of groups' shared mental representations on information elaboration in decision making groups with distributed information are studies examining shared mental representations of the team, rather than of the task. By applying the concept of shared task representations to decision making groups with distributed information, it extends knowledge on shared cognition of the task that thus far mainly concentrated on a specific type of group tasks (i.e. low-fidelity simulation tasks) in which performance is dependent on different processes like coordination. We showed that shared cognition can also impact group performance on group tasks in which different group processes (i.e., information elaboration) play a role.

Furthermore, within studies of shared cognition, the notion that not sharedness per se, but also or especially the degree to which cognition is task-adaptive or appropriate, is of importance for group processes and group performance is becoming more prevalent in studies on shared cognition (cf. Edwards et al., 2006; Marks et al., 2000; Mathieu et al., 2005). The present dissertation is consistent with this line of research in that it has argued that the degree to which groups hold task-adaptive representations, rather than degree to which any type of representation is shared determines the quality of group decisions. Although sharedness of maladaptive representations was not directly manipulated, chapter five did show that when a factor that is likely to increase sharedness of maladaptive representations is present (i.e., a member with a less adaptive representation holds a group leader position), this will not result in higher group performance. From this perspective, the current dissertation provides more evidence that it is not sharedness per se, but rather the extent to which shared cognition is facilitative of high task performance that determines the level of group performance.

In addition, this study contributed to the existing literature by providing empirical evidence for the role of awareness of sharedness. The present dissertation is the first to demonstrate that awareness of sharedness indeed can be an important part of socially shared cognition. Nonetheless, although awareness of sharedness usually is not explicitly addressed in research on shared task cognition, in some studies awareness of sharedness may still play a role. Certain effects that are attributed to sharedness are likely to - at least to some degree - also to depend on awareness of sharedness. For instance, when shared mental models are expected to affect the level of implicit coordination present in a group (cf. Blicksenderfer, Cannon-Bowers, & Salas, 2000), it seems imperative that group members do not only have a shared idea of how to deal with a task, but also that they realize that the other members share the idea. If group members are not aware of having similar mental models they may believe they need to speak up more about what needs to be done and how, because they do not know the other members know what needs to be done and how it needs to be done. Accordingly, shared mental models may impact group processes and performance to a lesser extent when group members are not aware of sharing them. More attention for awareness of sharedness may lead to more insights in group functioning in general and the effects of shared task representations or shared

cognition in particular.

The last three chapters were able to contribute to what we know about the development of task-relevant shared cognition in groups. Although in the present dissertation the emphasis lay more on examining factors that affect the development of task-adaptive representations rather than on sharedness of representations per se, it may be argued that group reflexivity and group leadership will also lead to higher sharedness of representations. Examining what affects sharedness of representations seems valuable both from a theoretical and a practical perspective. From a theoretical perspective, there seems to be more and more evidence for positive effects of shared cognition on group processes and outcomes (Marks et al., 2002; Marks et al., 2000; Mathieu et al., 2000; Mathieu et al., 2005; Rentsch & Klimoski, 2001). In light of this, it is interesting to examine what can foster shared cognition in groups. Although a few studies already identified some factors (e.g., team training, Moreland, Argote, & Krishnan, 1998; team leader debriefing, Marks, Zaccaro, & Mathieu, 2000), these studies looked at groups in which members started without well-developed representations. However, development of sharedness in groups in which members already have developed their own representations is likely to be more difficult and little still is known about this (Mohammed & Ringseis, 2001).

From a practical perspective examining factors that affect the development of shared cognition in more diverse groups seems especially important. As decision making groups in organizations tend to become more and more diverse, the likelihood of diversity in members experiences with a certain task and therefore diversity in their ideas about a task increases (van Knippenberg, & Schippers, in press; Zenger & Lawrence, 1989). Because, for high performance on many group tasks diversity in group members underlying task representations may not be desirable, it is important to examine ways to minimize this diversity. As this dissertation indicates two ways of achieving this are by making groups reflect on their task before they start working on it or in case a formal group leader is present (which is likely to be the case for most groups) through making sure the leader has an adaptive understanding of the task and that he or she is able to communicate it to group members.

Finally, an obvious implication for practice that may be derived from the dissertation as a whole is that it is vital to pay attention to group members' understanding of their group tasks. Although, there is no direct evidence that shows the prevalence of task representations that emphasize agreement-seeking and finding common ground in organizational decision teams, several studies on what might be referred to as unsuccessful group decisions, do seem to indicate that also in pre-existing organizational decision teams tendencies to find common ground may pose a problem (Herek, Janis, & Huth, 1987; Tetlock, Peterson, McGuire, Chang, & Feld, 1992). To remedy such tendencies organizations may have to provide decision making teams with training on what strategies more likely lead to high and low quality decisions. This dissertation then suggests that in this training the emphasis should be on getting teams to focus on exchanging and discussing all available

distributed information possessed by members and resisting from trying to reach a decision before all team members feel all relevant distributed information is discussed. Furthermore, team members could be instructed to not discuss any of their personal preferences until all members feel all distributed information is considered. In addition, if a team member does by accident discuss decision options or preferences before sufficient information is considered, other members could point out the importance of refraining from talking about potential decisions, before information is discussed. So if, for instance, a team of managers from different departments of an organization have to decide as a team how to deal with a certain situation in the organization (e.g., a financial crisis, an increasingly competitive environment), they could be instructed to first only discuss everything relating to only their own department (e.g., things the other managers have no or little knowledge about). Only after they feel they have discussed everything that could be of importance, they should continue with examining different possible solutions and how these solutions relate to what they have just discussed. According to the findings of chapter two, such training should be given to the team as a whole rather than to the team members individually. Training the team as a whole should increase the likelihood that teams develop a sense of safety. This should subsequently facilitate the discussion of information that otherwise may potentially threaten someone's position in a group (e.g., information that argues against a position that information of other members argues for). In case it is not possible to train the team as whole, another option, as suggested by chapter 5, might be to give one team member an intensive training on how to make group decisions as well as on how to get the other team members to adopt this approach. If a formal team leader is present, the easiest way would probably be to train the team leader. In case no formal team leader is present a team member could be appointed as a (temporary) team leader.

Directions for Future Research

In the present dissertation we examined how groups' shared understanding of their task and various factors that can affect this understanding influence the extent to which decision making groups with members that hold different informational resources rely on these resources when making decisions. Because thus far relatively was known about how groups' understanding of their task can impact decision performance, we chose to rely on an experimental approach that allowed for resting causal relations. Moreover, an experimental approach allowed us to use a combination of several different types of measurements, which yielded audio-video data, objective performance data, written documents, and self-report questionnaire data. Whereas, the results over experiments are consistent and generalize over types of operations, measurements, and populations, and a first recommendation for future research would be to replicate the current findings in a field study. Replication of our findings in a field setting, using pre-existing teams would substantially boost our confidence in our findings.

In addition, it would be interesting to examine the effects of shared task representations in decision making groups that are not purely cooperative. For groups in the studies reported in this dissertation only a group goal of reaching high-quality decisions was created by offering bonus money for high-performing groups. However, besides the group goal of reaching a good decision, group members of decision making groups in organizations may also have their own personal goals that motivate them (Wittenbaum, Hollingshead, & Botero, 2004). For instance, when a company is downsizing and layoffs are necessary, a group of managers making the decision who to fire probably want to fire those employees that will be missed least. However, one member may also have a personal incentive to make sure a friend will not be fired. The effects of shared task representations emphasizing elaboration are likely to be attenuated when group members hold more or stronger personal goals besides their group goal. When group members have personal motives these motives are likely to have an impact on their behavior, which may decrease the effect that shared task representations can have on behavior. Nonetheless, whether shared task representations emphasizing elaboration affect group performance or not may to some degree also depend on the source of mixed-motives in groups. One reason why group members may have hidden agendas could be because of insufficient trust within the group. When group members are concerned others will take advantage of them when they disclose certain information, it may lead them not to share information (cf. Edmondson, 2004). In this situation shared task representations emphasizing elaboration may still positively affect performance, because they could foster a higher level of psychological safety. If group members are aware other members also believe discussing and integrating group members' unique information is important and valuable, it can create the expectation that other members will not take advantage of someone when he or she comes forward with information. This way it may promote a higher level of goal alignment and therefore elaboration within such groups.

Another possible avenue for future studies may lie in examining the effects of shared task representations emphasizing information elaboration on different types of tasks, like for instance more creative tasks. For the task used in the experiments reported in this dissertation, creativity was not of much importance for the quality of group performance. Groups had to choose from a series of options presented to them and, because there always was an objectively correct answer, high group performance had to do more with intellective capabilities than with creativity (McGrath, 1984). However, for tasks with a stronger creative component (e.g., tasks where groups need to generate ideas through group brainstorming), task representations that emphasize information elaboration could potentially also positively influence group performance. Because shared task representations emphasizing elaboration increase they extent to which group members discuss information and viewpoints, they are likely to result in a more diverse range of perspectives and ideas brought into the discussion. Having to integrate these diverse perspectives may in turn stimulate more creative and innovative ideas and solutions (Ancona & Caldwell, 1992; Bantel & Jackson, 1989). Accordingly, shared task representations emphasizing information elaboration may not only lead to higher quality

decisions, but perhaps also to more creative outcomes. Because the task used in this dissertation did not allow for much creativity, future research could put these predictions to the test using a different type of group task.

Finally, future research could also examine other ways or causes that may give one group member a greater degree of influence over others members' representations. In chapter five we showed how group leaders have a greater impact on other members' task representations than non-leader members. It was argued that the greater degree of influence that is likely to follow from a group leader position is critical for the effect on others' representations. However, besides a formal group leader position, there seem to be many other factors that could result in one member having greater influence over other members. For instance, factors like group member status (Berger, Fisek, Norman, & Zelditch, 1977; Tyler & Blader, 2002), the degree to which group members hold knowledge similar to other members' knowledge (i.e., cognitive centrality: Kameda, Ohtsubo, & Takezawa, 1997), or more generally, group member prototypicality (van Knippenberg & van Knippenberg, 2005; van Knippenberg et al., 2000) could lead one member to have a greater influence on the other group members. In a similar way to how influence stemming from a formal group leader position affects members' task representations, the influence stemming from these factors may also lead one member to have a greater impact on other members' representations and subsequently on group performance. Future research could examine whether these and perhaps still other factors that could lead members to exert greater influence in groups, result in members having more influence on other members' task representations.

Conclusion

Because an important reason for relying on groups for decision making purposes rather than on individuals has to do with their greater amount of informational resources, it is vital to understand when and why groups make efficient use of their informational resources. In the present dissertation we demonstrate how group members' understanding of the task influences the way they capitalize upon their informational resources. When group members have an understanding of the informational demands of their task they are more likely to integrate distributed information in making a decision and to make high-quality decisions. In addition, we showed how the construct of shared task representations emphasizing information elaboration can be applied to explain research findings on the effect of knowledge about distributed information. Furthermore, we identified how shared task representations can come to exist within groups. Over the chapters we consistently found that shared task representations explained the effects of our experimental manipulations on group decision quality. As a whole this dissertation was able to provide important new insights in information use in groups with distributed information. Although there of course remain many questions still to be answered, our results highlight the importance of shared task representations for understanding groups' use of distributed information and group decision quality. Paying attention to group members'

task representations will hopefully, also for future studies, prove a to be fruitful means to further our knowledge of the functioning of decision making groups.

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Samenvatting
Summary in Dutch

Groepen zijn vandaag de dag zijn groepen niet meer weg te denken uit organisaties. De functies van groepen in organisaties variëren van advies geven, service verrichten, produceren, ontwikkelen tot onderhandelen en vrijwel alle grote organisaties maken gebruik van groepen (Lawler, Mohrman, & Ledford, 1995). Een belangrijke functie voor groepen bestaat uit het nemen van beslissingen. Het veelvuldige voorkomen van topmanagement teams in organisaties laat zien hoe er veelal gedacht wordt dat belangrijke beslissingen beter over gelaten kunnen worden aan groepen dan aan één enkel individu. Hoewel er meerdere redenen kunnen bestaan om een beslissing aan een groep in plaats van aan een individu over te laten (bvb., vergroten van draagvlak, creëren van commitment), lijkt een van de belangrijkste redenen toch wel dat vaak "twee meer weten dan één" (Tindale, Kameda, & Hinsz, 2003). In vergelijking met individuen beschikken groepen over een breder scala aan informatie, kennis, en inzichten, waardoor zijbetere beslissingen zouden moeten kunnen nemen.

In tegenstelling tot deze positieve reflecties over groepsbesluitvorming, heeft onderzoek veelvuldig laten zien dat besluitvormingsgroepen vaak niet adequaat gebruik maken van de diverse informatie waarover groepsleden beschikken. Verschillende experimenten hebben laten zien dat informatie die slechts één groepslid tot zijn of haar beschikking heeft minder wordt besproken in groepen dan informatie waarover alle groepsleden beschikken. (Stasser, 1999; Stasser & Titus, 1985; Wittenbaum & Stasser, 1996). Daarnaast bestaat er meer algemeen bewijs uit veldstudies, waaruit ook blijkt dat groepen er vaak niet in slagen de diverse informatie van groepsleden voldoende te benutten (cf. Simons, Pelled, & Smith, 1999).

Om de diverse informatie waarover groepsleden beschikken te kunnen benutten moet de informatie eerst uitgewisseld worden en op individueel niveau worden verwerkt. Vervolgens zal de informatie door de groep besproken en geïntegreerd moeten worden. Dit proces van uitwisseling en integratie van informatie wordt ook wel *informatie elaboratie* genoemd (van Knippenberg, de Dreu, & Homan, 2004). Op basis van onderzoek naar groepsbesluitvorming kan er geconcludeerd worden dat groepen niet alleen onvoldoende informatie uitwisselen, maar ook onvoldoende op informatie elaboreren (e.g., Gigone & Hastie, 1993; Winquist & Larson, 1998). Wanneer de unieke informatie van groepsleden relevant is voor de besluitvormingskwestie kan onvoldoende elaboreren op de ze informatie door de groep lieden tot een lagere kwaliteit beslissing. Omdat vrijwel alle belangrijke besluitvormingsgroepen in organisaties, zoals top management teams en productontwikkelingteams, uit personen met diverse informatie lijken te bestaan, is het van groot belang om te begrijpen wat de informatie elaboratie in dergelijke groepen beïnvloedt.

Taak Representaties

Hoewel er verschillende factoren zijn die de mate waarin groepen op informatie elaboreren lijken te beïnvloeden, richt ik mij in dit proefschrift op namelijk de manier waarop groepsleden over de taak denken of de taak zien, of in andere woorden hun cognitieve taakrepresentaties. Taakrepresentaties lijken een fundamentele factor die aan informatie elaboratie in groepen ten grondslag ligt. Toch is er tot nu toe weinig aandacht geweest voor de rol van taakrepresentaties in groepsbesluitvorming. Hoewel er weinig direct bewijs is voor de rol van cognitieve representaties in informatie gebruik door groepen, zijn er een aantal studies die laten zien dat groepen zich het belang van informatie uitwisseling en integratie voor groepsbesluitvormingstaken onvoldoende lijken te realiseren (cf. Hastie & Pennington, 1991; Pennington & Hastie, 1993; Wittenbaum, Stasser, & Merry, 1996). Groepsleden hebben tijdens de besluitvorming de neiging zich vooral te richten op het vinden van 'common ground' en het bereiken van een overeenkomst, waardoor zij minder aandacht hebben voor informatie uitwisseling en integratie. Met andere woorden, besluitvormingsgroepen lijken aan te nemen dat hun taak vooral bestaat uit het bespreken van individuele voorkeuren om zo tot een gemeenschappelijke keuze te komen, in plaats van het bespreken van informatie die individuele groepsleden bezitten en op basis van deze informatie tot een keuze komen(cf. Hastie & Pennington, 1991; Pennington & Hastie, 1993; Wittenbaum, et al. 1996). In het huidige proefschrift laat ik aan de hand van experimenten zien dat wanneer groepsleden een adequaat begrip hebben van de rol van informatie uitwisseling en integratie voor de besluitvormingstaak (i.e., een taakrepresentatie hebben die het belang van informatie uitwisseling en integratie benadrukt), ze meer op informatie elaboreren en betere beslissingen nemen. Daarnaast wordt er ingegaan op hoe taakrepresentaties kunnen ontwikkelen binnen groepen.

Het doel van hoofdstuk twee was het toetsen van of taakrepresentaties inderdaad van belang zijn voor de mate waarin groepsleden ongedeelde informatie gebruiken bij groepsbesluitvorming en voor de kwaliteit van beslissingen. In een experiment vergeleken we de kwaliteit van beslissingen en de mate waarin er op informatie wordt geëlaboreerd in groepen waarin groepsleden taakrepresentaties hadden die het belang van informatie elaboratie benadrukken of niet. Uit de resultaten bleek dat groepen met taakrepresentaties die informatie elaboratie benadrukten inderdaad betere beslissingen namen en meer informatie bespraken. De bevindingen van dit hoofdstuk geven belangrijke eerste steun voor het idee dat informatie gebruik en de kwaliteit van beslissingen afhankelijk is van de manier waarop groepsleden over de taak denken. Daarnaast laat het hoofdstuk zien dat een adequaat begrip van het belang van informatie uitwisseling en integratie vaak ontbreekt.

Daarnaast was hoofdstuk twee ook gericht op het onderzoeken van de rol van 'awareness of sharedness' . Wanneer groepsleden dezelfde taakrepresentaties delen hoeft dit niet automatisch te betekenen dat zij zich hier ook bewust van zijn. Echter, we verwachtten dat wanneer groepsleden zich ervan bewust zijn dat ze een representatie van de taak die de rol van informatie uitwisseling en integratie benadrukt delen, dat dit een positief effect zou moeten hebben op informatie elaboratie en

besluitvormingskwaliteit. Awareness of sharedness kan psychologische barrières, zoals angst voor evaluatie, die informatie elaboratie kunnen hinderen, wegnemen. We lieten zien dat wanneer groepsleden zich ervan bewust zijn dat andere groepsleden een dezelfde taakrepresentatie deelden, de effecten van de taakrepresentaties inderdaad sterker waren dan wanneer alle groepsleden dergelijke taakrepresentaties hadden, maar zich er niet van bewust waren dat anderen dezelfde representatie deelden.

In hoofdstuk drie hebben we aangetoond dat het notie dat taak representaties de mate van informatie elaboratie bepalen in staat is om ook andere onderzoeksbevindingen te verklaren. We lieten zien dat gedeelde taakrepresentaties die informatie uitwisseling en integratie benadrukken de positieve effecten van kennis over de distributie van informatie op besluitvormingskwaliteit kan verklaren. Verschillende onderzoeken hebben laten zien dat besluitvormingsgroepen waarin groepsleden verschillende relevante informatie bezitten beter presteren wanneer zij weten welk groepslid over wat voor soort informatie beschikt (Littlepage et al., 1997; Stasser et al., 1995; Stasser et al., 2000; Stewart & Stasser, 1995). Tot nu toe bleef echter onduidelijk wat dit effect precies veroorzaakte (Stasser et al., 2000). In hoofdstuk drie redeneerden we dat wanneer groepsleden kennis hebben over wie informatie over welk onderwerp bezit, deze kennis kan beïnvloeden hoe zij over de taak en rol van informatie denken. We voorspelden dat groepen waarin de leden kennis over de distributie van informatie in hun groep kregen, in grotere mate taakrepresentaties die het belang van informatie benadrukken ontwikkelen en daardoor meer informatie bespreken en betere beslissingen nemen. Daarnaast voorspelden we dat het effect van kennis over de distributie van informatie op besluitvormingskwaliteit gemodereerd zou worden door de mate waarin groepsleden reflecteerden over de aard van de taak en taakaanpak en of kennis over de distributie van informatie op groepsniveau dan wel op individueel niveau gepresenteerd werd. Taakrepresentaties die informatie elaboratie benadrukken werden verwacht de moderatie van respectievelijk reflectie en kennis, en de relatie tussen kennis over de distributie van informatie en besluitvormingskwaliteit te mediëren. Deze verwachtingen werden grotendeels bevestigd. Door middel van het aantonen van de rol van taakrepresentaties voor het effect van kennis van informatie distributie op besluitvormingskwaliteit, presenteerden we een verklaring voor een effect (i.e., het effect van kennis over distributie van informatie op besluitvormingskwaliteit) waarvoor tot nu toe nog geen adequate verklaring bestond. Daarnaast is ook de identificatie van reflectie en sharedness als potentiële moderatoren een belangrijke bijdrage van dit hoofdstuk. Identificatie van moderatorvariabelen draagt niet alleen bij aan het beter begrijpen van het effect van kennis over de distributie van informatie, maar toont ook een manier waarop het effect van kennis over de distributie van informatie beïnvloed kan worden. Dit kan van belang kan zijn voor toepassing van deze bevindingen in de praktijk.

In hoofdstuk vier lieten we zien hoe reflexiviteit (West, 1996), de mate waarin groepsleden taakaanpak en doelen bespreken, essentieel kan zijn voor de ontwikkeling van (gedeelde) taakrepresentaties in groepen. We vergeleken informatie elaboratie en besluitvormingsprestaties in

groepen die reflecteerden op de taak voordat ze begonnen met groepen die niet reflecteerden. Daarnaast manipuleerden we in hoeverre de groepsleden bij aanvang adaptieve taakrepresentaties hadden (i.e., taakrepresentaties die het belang van informatie elaboratie benadrukken). Groepen die reflecteerden op de taak voor ze eraan begonnen bleken in grotere mate gedeelde taakrepresentaties die het belang van informatie uitwisseling en integratie bendrukken te ontwikkelen dan groepen die niet reflecteerden. Dit leidde tot meer informatie elaboratie en een hogere kwaliteit beslissingen. Ook bleek het effect van reflexiviteit op de kwaliteit van beslissingen groter in situaties waarin niet alle groepsleden bij aanvang adaptieve taakrepresentaties hadden dan in groepen waarin dat wel het geval was. Zoals verwacht werd deze interactie tussen reflexiviteit en de mate waarin groepsleden bij aanvang adaptieve taakrepresentaties hadden op prestaties gemediëerd door de mate waarin groepsleden taakrepresentaties die informatie elaboratie benadrukken ontwikkelden. Dit is sluit aan bij het idee dat reflexiviteit groepsprestaties kan beïnvloeden vanwege het effect op de taakrepresentaties van groepsleden. Naast dat dit hoofdstuk reflexiviteit als een belangrijke determinant van de ontwikkeling van adaptieve taakrepresentaties in groepen wist aan te wijzen, ligt een andere bijdrage van dit hoofdstuk in het aantonen van de mediërende de rol die taakrepresentaties kunnen hebben in de relatie tussen reflexiviteit en groepsprestaties. Hoewel de belangrijkste oorzaak van het positieve effect van reflexiviteit op groepsprestaties lijkt dat reflexiviteit leidt tot veranderingen in taakbegrip (West, 1996), is de huidige studie voor zover we weten de enige studie die ook daadwerkelijk laat zien dat reflexiviteit kan leiden tot verandering in cognitie binnen groepen.

Ten slotte hebben we in hoofdstuk vijf gekeken naar het effect van leiderschap op taakrepresentaties. Het geven van aanwijzingen met betrekking tot taakuitvoer en het verduidelijken van de taak wordt in vele leiderschapstheoriëen gezien als vormen van leiderschapsgedrag die in belangrijke mate bijdraagt aan de taakprestaties van ondergeschikten (cf. House, 1971; Yukl, 1998). Hieruit volgt dat leiders een belangrijke bron van invloed kunnen zijn voor het taakbegrip of de taakrepresentaties van ondergeschikten. We lieten zien dat groepsleiders inderdaad de mate waarin groepsleden adaptieve of minder adaptieve taakrepresentaties ontwikkelden beïnvloedden. In een experiment werden informatie elaboratie en besluitvormingsprestaties van groepen zonder leider vergeleken met groepen met een groepsleider met taakrepresentaties die informatie elaboratie benadrukten en groepen met een groepsleider met taakrepresentaties die juist het belang van het vinden van ‘common ground’ en het bereiken van overeenstemming benadrukten. Er bleek dat in groepen waarin een groepsleider aanwezig was, groepsleden eenzelfde taakrepresentatie ontwikkelden als de groepsleider. Voor groepen, waarin de leider taakrepresentaties had die het belang van informatie elaboratie benadrukten, leidde dit tot meer informatie elaboratie en betere groepsbeslissingen. Echter, voor groepen met een groepsleider met taakrepresentaties die het belang van overeenstemming bereiken benadrukten, leidde het overnemen van de taakrepresentatie van de groepsleider door groepsleden juist tot minder informatie elaboratie en een lagere kwaliteit beslissingen. Groepen zonder leider presteerden niet beter dan de groepen met een leider met

taakrepresentaties die het belang van overeenstemming bereiken benadrukten. Omdat er in alle groepen altijd één groepslid was met taakrepresentaties die informatie elaboratie benadrukten, laten deze resultaten zien dat alleen wanneer dit groepslid extra invloed had, zoals volgt uit een groepsleiderpositie, groepsleden ook in grotere mate het belang van informatie elaboratie gingen zien.

Conclusie

In dit proefschrift hebben we in een aantal experimenten laten zien dat de taakrepresentaties die groepsleden hebben van invloed zijn op de mate waarin groepen op informatie elaboreren en op de kwaliteit van de door hen genomen beslissingen. Hoewel er natuurlijk nog vele vragen onbeantwoord blijven, leverden de resultaten van de studies gerapporteerd in dit proefschrift in onze ogen belangrijke nieuwe inzichten voor het gebruik van informatie in besluitvormingsgroepen op. Meer aandacht voor taakrepresentaties zal hopelijk ook voor toekomstig onderzoek een waardevol uitgangspunt blijken om onze kennis over het functioneren en presteren van besluitvormingsgroepen te vergroten.

Biography

Wendy van Ginkel was born on June 28, 1979, in Hilversum. After getting her secondary education diploma in 1997, she began studying Psychology at the University of Amsterdam in 1998. In 2002 she graduated cum laude in the field of Work and Organizational Psychology, after which she started working as a PhD student at the Rotterdam School of Management at the Erasmus University Rotterdam. The research reported in this dissertation was conducted between 2002 and 2006. Wendy currently works as an Assistant Professor at the department of Personnel Management and Organizational Behavior of the Rotterdam School of Management.

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The Use of Distributed Information in Decision Making Groups

The Role of Shared Task Representations

Organizations frequently rely on groups for purposes of decision making, because groups are supposed to posses more relevant informational resources than individuals, which should allow them to make higher-quality decisions. Yet, research has shown that groups tend to be quite poor users of their informational resources. That is, information that only one of the group members possesses gets exchanged less than information that all members possess. Moreover, when this information does get exchanged, groups often fail to adequately integrate it in coming to a decision. This can lead to lower-quality decisions than when groups fully capitalize upon individual members' unique information. It therefore is of importance to identify factors that affect decision-making groups' use of distributed information. In the present research I argue that group members' understanding of their task and its informational requirements is critical for groups' use of distributed information. A fundamental reason for groups' insufficient information use seems to be that groups often fail to see the necessity of elaborating on distributed information. Group members' understanding of the decision-making task often seems to centre more on the need to find common ground than on the discussion of information. In the present dissertation I examine the effect of groups' understanding of their decision task, as reflected in their shared task representations, on groups' use of distributed information by means of a series of experiments. I show that when groups hold task representations that stress the value of exchanging and integration distributed information before coming to a decision, they discuss more distributed information and make higher-quality decisions. In addition, I identify several factors, like group reflexivity and leadership, that are able to influence the development of shared task representations and therefore also group information use and performance in decision making groups with distributed information.

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