A Local Model of Information Sharing in Small Groups

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Abstract

This paper sketches a 2-step model of information processing in small groups in which the process of communication itself influences the quantity and quality of information mentioned during discussion. The first step in the model, activation, describes how information becomes available in short-term memory, such that it providing the basis for a potential contribution to discussion. It is a process based on coherence; activation is a function of antecedent and projected contributions to discussion. The second step describes the conditions under which members contribute or withhold active information. This decision can be based on a host of antecedent conditions or features of discussion. The model is applied to the problem of the shared information bias in groups.
A Local Model of Information Sharing in Small Groups

A relatively recent development in small group research is the characterization of groups as information processors (Hinsz, Tindale, & Vollrath, 1997). This trend is partly the result of a set of findings, based on Stasser and Titus’s (1985) seminal work, indicating decision quality is related to the extent to which members recall and mention information, as well as the group’s ability to assimilate mentioned information in ways that highlight the best decision alternative. In general, groups tend to manage their information resources poorly; individuals withhold or otherwise do not mention everything they know which, in turn, results in inadequately developed profiles of the decision alternatives. Researchers have offered several explanations for these findings, that have served as the basis for a series of interventions designed to improve both the presentation of information during discussions and the manner in which such information is used to draw inferences regarding the task and potential outcomes (see the reviews in Stasser & Titus, 2003; Wittenbaum, Hollingshead, & Botero, 2004).

The main argument of this paper is that explanations of information processing in small groups are based on faulty assumptions regarding the relation between information and interaction. Most research assumes, rightly, that individuals differ in the quantity and quality of their informational resources. The problem is that the communication process itself is treated as a medium through which information differences manifest themselves. Many scholars assume that members are compelled to mention information because of its characteristics, most notably the degree to which it is shared among group members prior to discussion. Other antecedent (to discussion) factors, including individual differences, roles, or context, purportedly amplify or attenuate the effects of information characteristics.
My claim is that the extent to which data are shared (i.e., every member knows it) or unique (i.e., only one member knows it) cannot, in principle, account for the extent to which such items are mentioned during discussion. Group interaction is coherent—a given contribution is related at some level (e.g., semantically, functionally, or structurally) to both previous and anticipated contributions (Corman & Kuhn, 2005; Pavitt & Johnson, 1999; Sanders, 1987; cf. Hewes, 1996). Thus, the reason that a unique item, for example, is contributed to discussion is that it has semantic, functional, or structural relevance for what is being talked about at a given moment in discussion (Corman & Scott, 1994). The fact that only one member knows an item does not make it relevant on the grounds described above.

In what follows, I describe a model of information sharing that specifies the role of communication in the development of a group's collective database. Drawing from different areas, including work on message production processes, participation in small groups, and social networks, I argue that information sharing is a local phenomenon, in which the activation of particular bits of information and the decision to use them in a particular manner occurs locally (i.e., with regard to immediately prior contributions and those that are projected to occur). Before describing the model in detail, I first offer scope conditions, as well as make some conceptual distinctions. I then address problems and issues with current research on information sharing, arguing that it makes untenable assumptions regarding communication processes and information sharing in groups.

Some Preliminaries

Groups Under Consideration

The issues this paper addresses apply to conventional decision-making groups, ones whose members must choose from among a set of plausible decision alternatives
and that have no artificial constraints on participation. Members are ostensibly reasonably well, if not equally well, informed regarding characteristics of the various decision alternatives, regardless of the means by which they acquire such information (e.g., experimental manipulation, experience at a particular rank or position within an organization, or research). Finally, contributions are not random (as is generally true of brainstorming groups) but are potentially responsive to previous contributions and influence subsequent comments, as members work to achieve consensus from potentially disparate initial preferences. Excluded then are brainstorming, clinical, self-help, study, and discovery groups.

Knowledge and Information

Although there has been much discussion regarding information processing in groups, the term “information” itself, at least as it applies to small group discussions, has not been adequately conceptually delineated. In most cases, information is used to describe both a datum that is committed to memory and one that is contributed to discussion (see Propp, 1999, footnote 1). The problem with treating the two in more or less the same way is that it ignores the fact that data as a cognitive construct can differ both morphologically and functionally from data that are contributed to discussion.

Regarding morphological differences, one might have committed to memory the datum “Hartford is the capital of Connecticut,” but need only respond with the word “Hartford” to the question “What's the capital of Connecticut?”1 Functionally, stored data typically are neutral; the uses to which they are put depends on the interaction context (O'Keefe & Lambert, 1995). For example, one might respond to “Isn't New Haven the capital?” with “Hartford is the capital”—it functions as a correction (among other things, e.g., a display of status). The datum itself is not stored as a correction—it is simply a proposition.
Following Propp (1999), the term \textit{knowledge} describes data as an entity in either long- or short-term memory. \textit{Information} refers to knowledge expressed as content within a contribution to discussion.

It is important to note that scholars distinguish between declarative and procedural knowledge (O'Keefe & Lambert, 1995; Wilson, 2002). The former refers to propositions of the type described above, whereas the latter concerns the steps necessary to produce an utterance (or series of utterances) in such a way to bring about a desired effect. Thus, continuing with the example above, “Hartford is the capital of Connecticut” is declarative knowledge, whereas procedural knowledge refers to the steps necessary to produce a correction. Clearly, the two are linked. Virtually any bit of information, however, can serve as a correction in the proper context. Declarative knowledge is typically of interest to scholars investigating information sharing, although procedural knowledge is obviously an important element in the process of information exchange.

Scholars are often interested in the relationships among knowledge units, as such relationships are often hypothesized to affect the contribution of information units to discussion. Two general types are evident. The first, \textit{inter-member}, concerns the connections of units across members. Most often, interest is in the proportion of those who possess or share a given unit. This is not surprising, as research on information exchange in groups has its roots in persuasive arguments theory (PAT), where novel arguments (those containing information not known to the rest of the group) are reportedly more persuasive than are arguments known to the group. \textit{Inter-unit} relationships refer to the connections among knowledge units irrespective of the group members who might (or might not) possess them. Consider how the two units “Gives multiple-choice exams” and “Gives only essay exams,” from the “choose the best
candidate” task (e.g., Larson, Foster-Fishman, & Keys, 1994), might be related. From an inter-member perspective, the item concerning essay exams is shared if all members possess that information, whereas the one involving multiple-choice exams is unique if only one member has that information. If one were interested in inter-unit connections, it is clear that both are topically related (teaching practices) and likely have other relations, as shall be noted below.

Of course, information units also have characteristics that are of import to group discussions, and such characteristics are used to develop a coding scheme to distinguish among them. Typically, but not always, information units are conceptualized and coded in ways that mirror those pertaining to knowledge units. For example, researchers interested in information pooling or hidden profiles code information as either shared or unique, with such designations based on experimental manipulation of knowledge units (e.g., by giving some data to all members, but other data to just one member). Doing so makes sense in light of the general research problem—to what extent are shared and unique information contributed to discussion, and how do such distributions affect decision quality? The point to be made below, however, is that coding schemes must evaluate units for their pragmatic (e.g., semantic, functional, and structural) characteristics in addition to their inter-member (e.g., shared or unique) characteristics.

The Influence of Discussion on Knowledge and Information

Any model involving the predicting of information distributions from knowledge connections must take into account that information is both an outcome of previous contributions of information to discussion and an influence on subsequent ones. As an outcome, information reflects some correspondence to the knowledge that generated it. As an influence, it activates certain knowledge units but leaves the remainder at resting
levels. These activated knowledge units continue the process by providing the basis for subsequent contributions to discussion. Further complicating matters is the fact that knowledge units might be connected in one or more ways, at different levels of abstraction (Greene, 1997; Pennington & Hastie, 1993). Once again, information is an outcome of these connections, as well as an influence on the connections that become salient in short-term memory.

It is important to note that the source of activation can be the contributions of others, the contributions by self, and the connections between knowledge units in long-term memory. Following Kenny and Cook (1999), activation of particular knowledge units via the contributions of one's colleagues is the partner effect—activation is from an external source. The actor-effect describes activation as a function of one's own contributions to discussion, or by the connections among knowledge units in long-term memory. The former is an external actor-effect, as one's contributions to discussion are designed to fit in with what has preceded it—hearing one's contributions in the context of discussion may activate subsequent thoughts (Levy, 1979). Connections within long-term memory are internal-actor effects, an example of which is train-of-thought (Nijstad, Stroebe, & Lodewijkx, 2003b).

In sum, knowledge refers to discrete data items that have been committed to memory, whereas information refers to data that appear in contributions made to discussion. Knowledge can be described as connected in one of two ways, among members and among units. Information is coded in ways that distinguish types based on theoretically relevant characteristics. Information is both an outcome and antecedent to the activation of knowledge, with activation occurring because of external (contributions to discussion) and internal (train-of-thought) stimuli.
Information Exchange and Interaction

In the previous section I drew a distinction between knowledge and information, in arguing that stored data are functional-neutral, and that information is not. This is not a unique claim, as Schegloff (1995), among others, has also explored this notion, although in a different way than here. In this section, I explore functionality in terms of relevance and coherence. The point is to show how information might be linked during discussion, which in turn sheds light on the inter-item connections of data. For as I will show below, it is these connections, not inter-member ones, that are potentially consequential for information exchange.

Relevance and coherence are two important concepts for understanding the constitutive nature of information exchange during group discussion. The terms are often used interchangeably, but as Sanders (1987) has noted, this is not accurate. Relevance refers to the possible ways in which a contribution might be related to its antecedent and contributions. Coherence is the specific interpretation of an utterance given its “commonalities with both its antecedents and consequents” (p. 84). Relevance refers to the several ways in which an utterance might be meaningful, whereas coherence is an achievement—it refers to the meaning or function that an utterance comes to have given its place or orientation in interaction (cf. Thagard, 1989).

It is perhaps helpful to illustrate relevance and coherence as they relate to group interaction with an example, one based on the standard information pooling research paradigm. Consider the “pick the best candidate” task often used in hidden profile studies (Larson et al., 1994). Participants imagine that they are members of a faculty search committee and that they must choose the best candidate from three “finalists.” They have been given a list of each candidate’s characteristics or qualifications, for
example, “Smith gives multiple-choice exams,” and memorize the information prior to group discussion. What follows is a hypothetical contribution (line A) and six subsequent plausible (i.e., relevant) responses:

A: I chose Smith because he gives multiple-choice exams.

B₁: And Jones gives just essay exams.

B₂: He also is well published in communication.

B₃: I chose Smith too.

B₄: I chose Martin.

B₅: I had that too.

B₆: I didn't have that.

Although there are multiple ways to characterize the relationship between A and the responses, it is sufficient for the moment to make gross generalizations. Line A advocates for Smith and gives his choice of testing format as a reason for doing so.² B₁ contains information about Jones's testing practices, but the information is negatively valenced—it is a point against Jones (and perhaps is simultaneously supportive of A’s advocation of Smith). Contribution B₂ provides information that is seemingly supportive of Smith while not openly critical of the other candidates, but it has nothing to do with testing practices. B₃ simply displays the speaker's alignment with the first speaker's preference, whereas B₄ shows that the two are not in agreement. Neither B₃ nor B₄ provides additional supporting or disconfirming evidence for either candidate. Finally, B₅ and B₆ indicate that the speaker did or did not, respectively, have the same information to memorize as the first speaker.³ Neither displays the speaker's preference.

The ways in which the possible responses above begin to cohere with the contribution in line A in the example above have consequences for information exchange.
In some cases (B_3, B_4, and possibly B_1), coherence provides for preference displays that, as research has shown, affect speaking distributions and the type of information that is presented in them (e.g., Greitemeyer & Schulz-Hardt, 2003; Weisband, 1992). In other cases (B_1 and B_2), it supports information exchange, whereby participants contribute to and build the collective database. Finally, coherence demonstrates (as in the cases of B_5 and B_6) that at least some of the information resources are or are not unique to participants, which has several affective and procedural outcomes (e.g., Wittenbaum, Hubbell, & Zuckerman, 1999).

Coherence is achieved via perceived relevance of one's contribution to the unfolding discourse. One way to conceptualize relevance is in terms of activation. Any given contribution has the potential, through a network of semantic associations, to start the process by which information (among other things) is retrieved from long-term memory (Nijstad, Diehl, & Stroebe, 2003a). Thus, line A above creates the potential for activation of information of many kinds, including testing practices, teaching practices in general, positive information regarding Smith, negative information about the other candidates, one's preference for a particular decision, information identical to that in line A, and the recognition that no such data existed in long-term memory. Importantly, there is a bevy of information that is not retrieved from long-term memory, simply because there is insufficient connection between it and the data contained in line A.

The following section takes the issues discussed to this point and applies them to research on information sharing. Following that, I will to build a model of information exchange that expands on the elements above.

*Information Sharing Research*

A previous section distinguishes between information and knowledge, and
regarding the latter identifies two types of connections, inter-member and inter-unit, among knowledge units. The purpose of this section is to bring these constructs to bear on information sharing research, in showing that its reliance on inter-member connections among units cannot, in principle, account for information exchange in groups. As I will discuss more fully in subsequent sections, inter-unit connections are integral to the process.

The Seminal Study

The scholarly literature addressed here has its roots in Stasser and Titus's (1985) seminal study on information influence on decision making. This rationale for that study rested on persuasive arguments theory (see Burnstein & Vinokur, 1977; Vinokur, Trope, & Burnstein, 1975), in which characteristics of information, including its novelty (in the sense that other members have not previously heard or otherwise encountered it) and its weight (i.e., its persuasiveness) influence decision making (including such phenomena as choice-shift and group polarization). The premise in Stasser and Titus was that shared information (i.e., not novel in the sense that everyone knows it) that points toward a suboptimal decision is not influential during discussion, as (a) participants cannot, presumably, be influenced by hearing information he or she already possesses, and (b) such information is consistent with existing choice preferences. Unique information (e.g., information that only one member knows) that points to the optimal or correct decision (or away from the suboptimal one), when mentioned during discussion, should be more persuasive than is shared information, and should ultimately illuminate or highlight the correct choice.

Stasser and Titus (2003), in a very humble and enlightening account of their original work, noted that participants failed to discuss unique information, which in turn
prevented groups from making the correct or optimal choice. The counterintuitive nature of the findings in the original study instigated a series of subsequent studies, most of which (a) confirmed the shared information bias found in Stasser and Titus (1985), and (b) searched for factors that improved or predicted patterns of information sharing in groups. That research has been reviewed and critiqued recently by Wittenbaum et al. (2004), who noted that models of information exchange that followed in the wake of Stasser and Titus’ findings made untenable assumptions about the factors that influence participants’ choice to share or withhold information. Although I believe their critique has considerable merit, Wittenbaum et al. do not go far enough in addressing the nature of process and its relation to information.

*Three Untenable Assumptions*

The most important issue involving this research is that it treats information as an outcome of knowledge distributions (among other things) rather than as both an outcome and an influence. Doing so creates accounts of information exchange that are fatally flawed. To see how this is so, it is instructive to consider the three major explanations of information exchange Wittenbaum et al. (2004) identify. The first is collective information sampling (CIS), the second preference-consistency, and the third social comparison. The CIS perspective reflects a probabilistic model and assumes that shared knowledge will be discussed by the group because its distribution among all members makes it more likely to be recalled than will unique information. Preference-consistency simply means that members more positively evaluate knowledge that is consistent with their initial preferences, and that this leads to the discussion of shared information over that of unique. Finally, the social comparison explanation posits that the discovery one has knowledge in common with others confers a sense of legitimacy and credibility on
that knowledge (as well on the persons who possess it).

All three explanations rely on or presuppose inter-member distributions of knowledge—some proportion is shared, and the remainder unique. No effort is made to address inter-item connections. These explanations further assume that some process makes known or reveals the inter-member distributions of knowledge—members can discover which items are unique or shared. This is an implausible assumption, as there is no such inter-item connection among units—there is no meta-knowledge that identifies which units are shared or unique. Consider two items from the “candidate” task, “Gives multiple-choice exams” and “Gives essay exams only.” Imagine that both are shared—each member receives these two items (among others) to memorize. Finally, imagine that member A says, “I like Smith because he gives multiple-choice exams.” According to the explanations above, the mentioning of this shared item should instigate some process, either cognitive or affective, that leads others to contribute additional shared information, including “Gives essay exams, only.” The problem is that the two items in question have no connection that identifies them as shared which means that the second item cannot be activated on that basis. This is not to say the second item cannot be activated—it is related to the first item in one of several ways (e.g., they are both about testing practices) and may become a constituent in short-term memory. But it is a mistake to say it became active because it was shared among members. Given discussion above regarding activation, relevance, and coherence, the item becomes active because of the relation between a colleague's contribution to discussion and knowledge in long-term memory.

Given the preceding, the three explanations for information sharing (CIS, preference-consistency, and social comparison) fall prey to one or more of three faulty
assumptions regarding activation. The first assumption, applicable to all three explanations, is that of inter-member knowledge activation, whereby activation occurs because of particular distributions of knowledge among members. As noted, this in principle cannot be an explanation for information exchange, as the knowledge units in question have no meta-knowledge associated with them regarding the distribution of data units. Inter-unit connections are responsible for activation processes during group discussion.

The second untenable assumption, largely related to the CIS, is that of probabilistic activation, that activation or recall is due to chance factors. Certainly, the odds of a given piece of information being contributed to discussion increases as the number of persons who know that information increases, but the mechanism for activation is not chance-based. If that were true, contributions to interaction would be random as well—interaction would not display any meaningful coherency. As Pavitt and Johnson (1999, 2002) have demonstrated, discussion is nothing if not coherent. Thus, explanations based on the CIS can be dismissed out of hand.4

Both the social-comparison and preference-consistency explanations fall prey to the third assumption, that of global availability. The assumption is that the entirety of a participant’s information resources is active and available for expression at any point in discussion. According to this view, all that prevents a person from contributing any given datum are social, motivational, or contextual concerns. Because shared information evokes certain cognitive and affective responses, participants are more likely to respond with shared information than with unique contributions. The problem here is that such responses do not provide the basis for the connections among units. For example, one might say, “I chose Smith because he gives essay exams.” If the other
members had this same item to memorize, they might very well confer a sense of legitimacy or verity of it, as well as perceive the speaker to be more credible.

Legitimacy, verity, and credibility, however, are not the basis for connections among items. Thus, activation of subsequent knowledge units cannot occur on these grounds—the connections must be inherent in the knowledge items themselves.

In sum, previous work on information sharing ignores the process aspect of information exchange. The process is recursive, with information functioning as an outcome of and an influence on the connections among knowledge units. By ignoring process, models of information sharing conflate the effect of inter-member knowledge connections with those that are inter-unit. In the following sections, I outline a model that is sensitive to the recursive nature of information.

Types of Coherence During Information-Sharing Discussions

In this section, using transcriptions of information-sharing discussions, I identify several means by which information units are connected during discussion. Although there are likely many ways to describe such connections (O'Keefe, 1987), I have drawn primarily from Geva, Mayhar, and Skorick’s (2000) taxonomy of information resources during negotiation, as well as research involving argument structure. The connections of interest are based on similarity at a variety of levels of abstraction because, as noted above, activation (from both internal and external sources) is based on similarity. The identification of these information connections allows one to understand the complexity of the connections of knowledge-units, as well as the process that activates some units but not others.

The first type of connection among information units is content similarity, and the use of the term here is consistent with “assertion,” as Meyers and Brashers (1998) use
the term, as well as with “propositional content” as used in speech act theory. It refers only to the words and phases used in speech, not to the functions (e.g., promise or threat) to which content is put (Sanders, 1987; Searle, 1969). The second level of similarity is inference, which is the implication one may draw from a set of data propositions (Gouran, 2003). Similarity may also be a function of the valence of information or inferences. Valence refers to the extent to which a datum moves decision makers toward or away from a particular decision alternative (Hoffman, 1994; Hoffman & Maier, 1979; Propp, 1997). The final dimension of similarity is individual preference. Participants often begin discussion stating their preferences, some of which are done tepidly, others with more conviction (Davis, 1973; Parks & Nelson, 1999; Stasser, 1998). Structure refers to the organization of information in particular ways (Stohl, Redding, Jablin, & Putnam, 1987).

I illustrate these dimensions of similarity by analyzing two transcripts of discussion data from 4-person groups in which the “candidate” task was used. The contributions are presented at turn level rather than smaller units (e.g., thought units), and the punctuation is conventionally placed. The text in italics is unique (i.e., given to just one member prior to discussion to analyze), the text in bold shared (all members received the same information). The line numbers refer to speaking turns.

Group 2005-2-22-2

1 A: I liked number two.5

2 B: Martin was the first one. So Smith was the second one.

3 D: Jones was third.

4 B: I thought Martin was the best because in the instructions it said not to base it on
an easy teacher, base it on other things. I just thought *he had more experience* and he was *an expert in communication*. I think it is realistic that *you can miss two to three days*. That is pretty cool because some teachers are really strict on attendance policy and you get points off and it didn’t seem like he was anything like that.

5 D: Yeah, that is cool.

6 B: I think **multiple choice exams** are pretty self explanatory. Pretty easy as long as you know the information you will be able to pinpoint. Whereas the **other ones had essay formats** which makes it a little tougher on the student. I think Jones was the only one who gave one exam.

7 A: **The final**.

8 B: Yeah, I don’t like that because then you don’t see how you are doing. If you screw up on that then you are screwed.

9 D: Yeah.

10 A: The thing I liked about Martin no Smith was the essays I kind of liked. Just because it is something different with multiple choice you either memorize it or you didn’t. That might not be to great. **I also liked how they said the lectures were interesting**. I am kind of big on that. I am just trying to go to class everyday this semester and if I do and I get something out of the lecture it will actually keep my attention with the course.

11 C: Yeah

12 B: Yeah
13 D: Yeah

14 A: Then if I actually know what is going on and stuff. That is what I really liked about that one.

15 B: That is true because Martin did show a lot of videos which I think can be a little boring. But at the same time I think Smith is the one that didn’t allow outside speakers and sometimes the outside speakers give you different views on things.

16 A: That is true.

17 B: Rather than hearing the same voice every time.

18 C: I think also with Smith since he was the only one that allowed the essay tests which I think is good because it proves what you really know rather than just memorizing answers for multiple choice.

The connections among information units in this extract are based primarily on valence or topic (or a combination of the two). This is evidenced first by the items provided by B in line 4 support her choice (Martin). The first two items are unique, the third shared. These items are connected because they are positively valenced toward her choice. In line 6, however, B focuses on teaching practices, comparing those of the other candidates to that of Martin—she clearly favors Martin's testing format. All three of the items are shared. In that sense, the information units are topically related, although there is clearly a valence aspect to it as well.

Participant A begins a comparatively lengthy turn in line 10 by picking up the issue of testing practices as advanced by B in previous turns. She does so by referencing Smith's use of essay exams and why such testing practices are desirable in comparison to
multiple-choice exams. This is in opposition to B's point concerning the desirability of multiple-choice exams which her preference, Martin, used. A takes a somewhat tack, by focusing on teaching practices in a slightly different way, that is, offering a unique information item regarding Smith's habit of giving interesting lectures. Although this part of A's contribution goes in something of a new direction, it is still clearly tied to the issue of testing practices.

The next substantive contribution (line 15) by B continues on with the topic of “interestingness,” which is clearly tied to A's comments in line 10. B appears to give the “interestingness” point to A regarding Smith. B goes on, however, to note that Smith didn't allow outside speakers which seems to be a point in favor of Martin's willingness to bring a diversity of viewpoints into class, but also indirectly suggests that Smith's teaching practices are not as interesting as would first appear (“rather than hearing the same voice every time”). Finally, C (line 18) returns to the issue of testing practices, in repeating what A mentioned several lines previously regarding Smith's use of essay exams and bolstering the point regarding the function of such exams. The point is in Smith's favor. Again, topic and valence appear to be what unify the information in this extract.

An important point concerning information connections in this extract is that some occur within a participant's turn, and others across them. B's comments in lines 4 and 6 are examples of the former, as are A's comments in line 10. Line 10, however, shows A being responsive to B's remarks about teaching, and A's contribution in line 15 is clearly connected to A's in line 10. As noted above, a participant's contributions may be affected by his or her previous comments and may affect his or her subsequent comments. In addition, one's comments affect the responses made by others.
The final point is that unique information is presented not because it is unique, but because it happens to be related to other information items topically, or in terms of valence. Although the extent to which information is shared among members might appear on the surface to be a feature that connects some informative contributions, that connection is incidental to other substantive connections among information units.

The previous extract and its analysis touch on only valence and topic as the basis for connections among information units. The following transcription provides evidence that more concrete issues, including content and structure, affect subsequent information exchange. The same transcription conventions apply to this extract as applied to the one presented above.

Group 2005-2-28-5

1 A I wanted Smith.
2 C Same.
3 A You did too.
4 C Uh huh.
5 B I said Martin.
6 D I was in between Smith and Jones.
7 B I was between Martin and Smith. Do you guys want to say why you chose Smith?
8 A I wanted Smith just because even though the only downfalls I saw were no film and no outside people but he was knowledgeable, his discussions were interesting, he made them come to class so they are coming to class and
they will probably enjoy it more, his lectures are interesting. I would learn you know what I mean so I don’t think the films or the outside speakers would matter and the essay tests mean a lot because having essay tests you have to know the material you have to learn it and you have to process it.

Maybe the easy A is just because everyone is going to class.

9 B Right

10 D Yeah that is what I thought

11 A So that is why I liked him the best

12 C I felt the exact same thing. Even though he didn’t have films he is always available for students so even if they are having trouble they can just go to him

13 A Yeah because he is there

14 B The only reason I didn’t choose Smith was because like I said I was writing them out I was like oh wait but I guess the only reason I didn’t was because of the easy A and then also that he didn’t have any outside speakers. I thought that would be bad too.

15 D That he was always late to class

16 B Is that what it said?

17 A Oh I didn’t know that.

18 C I didn’t see that.

19 A Mine didn’t say that.
20 B Yeah mine didn’t either. It said that Martin was always on time but Smith could talk to people after class.

21 A: I know we weren’t supposed to be personal but it seemed like Martin was only interested in what he was studying and he had no outside knowledge or he didn’t use communication outside in the world and I think that is important.

Although this extract reveals some of the same characteristics of information exchange as the previous one (e.g., topic and valence), there are two features here that are of potential interest. The first is that there is a structural parallelism in the contributions by A (line 8) and C (line 12). A begins by providing negatively valenced information regarding her preference, but then continues by listing all of the candidate's positive attributes (including a deft rendering of a putatively negative item, “easy A,” into a positive one by saying Smith's attendance policy might be the cause of it). This strategy is reminiscent of the refute-then-support variant of a two-sided message (O'Keefe, 1990). C (line 12) follows the same structure, first by repeating an item initially mentioned by A (“didn't have films”) then continuing with a positively valenced, unique information unit (“he is always available for students”). The correspondence in argument structure influenced the types of information presented in it. Again, the fact that the last item is unique is incidental; the structure of the argument made that item relevant. It is also worth noting that A presented seven of the eight items she was to memorize about Smith, five of which were shared among the group. C repeated one of these shared items, but not the other four. In these data, it appears that participants tend not to be redundant; they do not repeat just mentioned information (McCabe & Brannon, 2004). If there is a constraint on redundancy, then C's remark at line 12 makes sense—she contributed
information that was not contained in A’s contribution.

The second observation to make concerns how unique information might make itself known as such. Recall that knowledge distributions are based on inter-member connections, and that there is no meta-knowledge that identifies any given item as shared and unique. Participants discover these qualities through interaction (Hinsz et al., 1997; cf. Wittenbaum et al., 1999). B, who initially preferred Martin, begins to list information in line 14 that is negatively-valenced toward Smith. Participant D (line 15) responds with a unique item that continues in that vein. The other three participants follow this remark by noting that, in effect, they did not receive that item (“late to class”) to memorize. B (line 20) then lists information concerning Martin and Smith, that happens to be unique in both instances. The item pertaining to Smith (“could talk to people after class”) was previously mentioned, although with somewhat different wording, whereas the other item “Martin was always on time” was introduced for the first time. The redundancy constraint described above might be operating here, as evidenced by the different wording of the previously mentioned item, as well as the inclusion of an item not yet discussed. This does not, however, explain why a host of other information items were not mentioned. Recall that they were still focused on Smith and that most of the information pertaining to him was already provided. This interlude seems to end quickly and has little effect on subsequent discourse. A, a Smith advocate, turns attention to Martin (line 21), and casts the two unique pieces of information to follow in terms of “being personal” (although, as she observes, the instructions given by the researcher cautioned against that), noting that Martin seems to immersed in his research and that he “doesn't use communication in the outside world” (which hearkens to the knowledge item “Has no experience practicing communication in the real world”). It is perhaps important
to note that subsequent contributions make no mention of the fact these items were
unshared. Participants might have accepted this as a feature of the task in which they were
engaged, and elected not to address the distribution of items.

In sum, information contributed during discussion is connected in one of several
ways, and in some cases more than one way. Importantly, although one may describe
information in terms of its shared or unique character (as a function of experimental
manipulations or other factors), interaction, especially the way in which information is
exchanged, is virtually unaffected by it. Shared or unique information is contributed not
because it is shared or unique, but because it happens to have to have one or more
substantive connections to other information.

A Local Model of Information Sharing in Small Groups

In this section, I outline a model of information sharing in which information is
both an outcome and an influence on the activation of knowledge units. In addition, the
model does not assume global availability of knowledge; instead, it is a local model in
which only a subset of knowledge units is available at any given time. Furthermore,
activation deteriorates, such that activated knowledge units return to “resting” levels until
and if reactivated later during discussion (Nijstad et al., 2003b). Finally, the extent to
which shared or unique knowledge is contributed to information depends on the inter-unit
connections among knowledge, and the connections among information contributed to
discussion. In short, information exchange is a by-product of the relation between
knowledge and information.

It is important to remember that the problem facing information-sharing
researchers is to describe the conditions that facilitate or inhibit information exchange, as
well as to develop interventions that will improve it. As was noted above, the unique or
shared character of knowledge has little bearing on how such information is contributed to discussion. Thus, designing interventions (e.g., discussion protocols) to facilitate information exchange without considering the process by which information is contributed to discussion conflates inter-member with inter-item distributions of information, which, in turn, provides an inaccurate assessment relation between antecedents and discussion.

The model developed in this section derives from O’Keefe and Lambert’s (1995) discussion of message production during interaction. Briefly, they argued that message production is a function of conditions of relevance associated with interaction. These conditions, referred to as “focus,” are responsible for, in part, the activation of the thoughts on which contributions to interaction are based. O’Keefe and Lambert contend that the most critical aspect of focus is how “antecedent and projected contributions shape what is relevant to say at any particular juncture” (p. 75). In general, contributions are fashioned in some way to be responsive to what is said, as well as to anticipate what others might say in response (Sanders, 1987). For example, if participants are discussing politics, then characteristics of politicians and their policies are likely to be activated and available for expression. It is then up to the participant to determine how such information should be used at that moment, for example, as a rebuttal or as a way to anticipate and diffuse an interlocutor’s argument.
Figure 1

In short, a local approach is concerned with the relation between information units contributed to discussion and knowledge units stored in long-term memory. The model depicted in Figure 1 provides a useful starting point. Information contributed to discussion activates, in both self and others, knowledge from long-term memory (O'Keefe & Lambert, 1995). The recall of knowledge may lead to additional activation in which other related (at some level) knowledge is available for expression in short-term memory (Nijstad et al., 2003b). Not all active knowledge is contributed to discussion, however; participants often choose from among a set of knowledge units to contribute, or contribute in ways that synthesize that knowledge into a shorter, inference-laden contribution (O'Keefe, 1997). Participants may choose not to contribute at all, and defer to their colleagues for a variety of reasons, for example, perceived differences in status (Knottnerus, 1997) or ability (Gouran, 2003).

The model does not have an obvious starting point by design, although one cannot, in principle, start with “choice to contribute” (see below). It can account for contributions that induce discussion via the relation between activation and knowledge. Typically, a member starts by verbalizing a salient thought or set of thoughts. Fraidin's (2004) study provides an example. He argued that knowledge is interdependent in the sense that two or more items, when considered in tandem rather than separately, provide a more meaningful interpretation for a given issue or point. As an example, he referred to two data items from a “murder mystery” task used by Stasser and Stewart (1992). The
two items, that the suspect (E) heard another suspect's car at the scene of a crime, and that E is deaf, have different implications based on their distribution among members. If one member has both items, then he or she should be able to draw the connection that E was lying; if the items are uniquely distributed across members, one cannot independently draw the conclusion regarding E's credibility. Importantly, Fraidin posited that the ability to draw connections between items increases the items' salience, which, in turn, makes it more likely that participants will mention them during discussion.

The model also accounts for innovation of the type described by Nijstad and De Dreu (2002). Active knowledge, regardless of the source of activation (i.e., actor, partner), has the potential to lead to searches through long-term memory for relevant knowledge at various levels of abstraction. Should additional knowledge be retrieved and become active, it can then serve as additional input into the retrieval process (see Greene, 1997). Eventually, the process ends, and leaves the participant with a set of active knowledge units, which can provide the basis for a contribution to discussion.

The most important feature of the model, however, is to assume that the connections among information units contributed to discussion mirror those among knowledge-units. For example, as noted above, information might be connected because it has similar (or dissimilar) valence. Knowledge might also be characterized in that way (among many possible others). In addition, because researchers are interested in inter-member distributions of knowledge (e.g., shared and unique), one should be able to describe knowledge and information along two dimensions (i.e., inter-unit and inter-member). Thus, a positively valenced piece of information might be uniquely distributed within a group.

The likelihood that a shared or unique piece of information is contributed to
discussion depends on the type of coherence in place at that time. Thus, for example, if valence is operating at a particular moment during a group discussion, and members are focusing on positive characteristics of a set of decision alternatives, then a unique piece of information that is positively valenced is more likely to be contributed than one that is negatively valenced. The same applies to other levels of connections or similarities.

Proposition 1: The contribution of a unique or shared information item is a function of inter-item connections made salient during moments in discussion.

The “choice problem” (Bonito, 2004), as suggested above, cannot be a starting point for the process. Members can choose to withhold or present information if they have a corresponding knowledge unit available in short-term memory. Without active knowledge, members cannot in principle contribute substantively (i.e., provide task-relevant information). Other types of contributions, however, those related to floor management or decision processes (e.g., “Do we have consensus?”) and the like can be produced by individuals without active relevant knowledge (Weiner & Goodenough, 1977). In short, members cannot participate substantively at a particular point if they do not have relevant knowledge on which to base a contribution to discussion.

Antecedents to discussion become relevant during the choice stage of the process. Members with relevant active knowledge may choose to present or withhold it for a variety of reasons. For example, discussion that is based on positively valenced characteristics of a particular choice might activate positive and negative information regarding that choice. Exogenous factors (e.g., status, ability, and factions within the group), however, might compel members to withhold that information. It is important to note that exogenous factors cannot explain the choice to contribute substantively when
members have no active, relevant information in short-term memory. Thus, the preference-consistency and social comparison explanations for information exchange, discussed above, can only operate on substantive comments at the choice stage. It should be noted, however, that such explanations can account for other, non-information based contributions, regardless of the activation status of one's information.

Proposition 2: Exogenous factors are associated with information exchange only at the choice stage in the process.

Proposition 3: Exogenous factors are responsible for the production of nonsubstantive (i.e., non-informational) comments.

Conclusion

The purpose of this paper was to demonstrate the vital role played by communication in the process of information exchange in small groups and to develop a model that describes how this process functions. This is not a model of decision-making per se, as it does not trace the relation between the process and outcomes. In that sense, it falls short of Hewes' (1986, 1996) quite stringent criterion for showing that communication unambiguously affects group outcomes. Many putative communication effects on outcomes, Hewes has argued, can be attributed wholly or in part to factors exogenous to discussion (e.g., group composition), which reduces communication to nothing more than a conduit through which preexisting preferences, arguments, tactics, and the like, are made manifest (Corman & Kuhn, 2005). Going a step farther, Hewes proposed a socio-egocentric model of discussion, in which the baseline assumption is that contributions to discussion are largely unconnected, in the sense that any given message occurs largely without regard to what precedes and follows it. This baseline is meant to be evaluated against actual discussion, which, one would hope, does not exhibit such
egocentric characteristics. Several scholars (Corman & Kuhn, 2005; Pavitt & Johnson, 1999) have taken up this challenge by evaluating the extent to which group interaction is coherent, under the assumption that coherence is the characteristic of discussion that keeps contributions “connected.” This paper continues that line of work, in applying the notion of coherence to information sharing in groups, and focusing primarily on how information is related to the process.

Following Pavitt, (1993) this paper offers a softer, or perhaps more encompassing, role for communication in group discussion, in eschewing “prediction” for “mattering.” Pavitt showed how communication matters in a variety of ways to discussion, including increasing shared awareness, establishment and modification of procedures, and the assignment of weights to decision alternatives, all of which are potentially consequential for group outcomes. Thus, models and descriptions of group communication processes might legitimately focus on consequences that are not directly related to group outcomes, but nonetheless play a role in how a group, whose members likely vary in terms of knowledge, ability, and preferences, progresses from the beginning stages of discussion to an output that more or less reflects the collective will of the group.

My claim, in keeping with the spirit of “mattering” as described above, is that the process of information pooling, and thus the quality of the collective information database itself, is a “local” phenomenon, in the sense that a contribution containing a bit of information has some consequences for the contributions that follow. Because participants typically do not make incoherent or random contributions to discussion (Pavitt & Johnson, 1999), it is logical to assume that the information contained in a given utterance influences subsequent contributions, including the type, if any, of information
presented in them. Because there are several different options for maintaining coherence in subsequent contributions (i.e., several different bits of information might be coherently presented), it is not always knowable before the fact how participants will orient and respond to substantive comments in discussion. But such orientations and responses are consequential for the collective database.

This perspective also serves as a useful counterargument to the rather invidious upshot to the mediated view that communication is responsible for process loss. Imagine that each group member brings unique and useful information to a discussion, but that not all of that information is presented during it. In fact, this is an all too common finding in most research involving information pooling, at least for tasks in which prediscussion distributions of knowledge are manipulated by or known to the researcher (Stasser & Titus, 2003; Stasser & Vaughan, 1996). Because the amount of information contributed to discussion falls short of the summed information resources across the individual members, researchers assume that the process of communicating somehow constrained or otherwise prevented members from contributing all of what they know to discussion.

It is hard to imagine how members come to contribute and assess information without a constitutive role for communication. Because one might designate information as shared or unique does not mean that such designations play a role in the process. In fact, they play little, if any role, in the informativeness of any given discussion. Instead, the process described above suggest that unique and shared information “hitch a ride” on the bases (e.g., semantic, function, and structure) for coherence. Without such processes, and in the absence of any type of telepathy, coherence provides the means by which information is contributed to discussion. Without it, information would exist as knowledge units within members, without the possibility of being communicated to and
acted upon by other members.
Endnotes

1 It's not entirely clear how the item “Hartford is the capital of Connecticut” would be stored. Greene (1997), drawing on connectionist models, argues for a modular system with storage at different levels of abstraction, whereas Nijstad and associates (2003c) describe a system based on images. Whatever the actual stored from, it is still quite likely that the form in which the item is contributed to discussion differs from it.

2 The task is written so that the gender of the three candidates is ambiguous. The use of the male pronoun is for convenience.

3 We have seen many such statements in our data, and we suspect other researchers have as well. See also transcription extract 2005-2-28-5 below for an example.

4 Something akin to CIS might work for the first contribution to discussion—someone has to start by saying something constructive. After that, however, discussion is affected by what precedes it. One can imagine a lull in the conversation, where folks have exhausted a topic or issue. What is addressed subsequently might be associated with chance, but those probabilities have changed as a function of what was already discussed. Folks tend not to be redundant during discussion.

5 The information was presented in columns, one column per candidate. The first three lines of this extract show participants identifying the candidates' names by the column in which each appeared.
Figure Captions

Figure 1. Local model of information sharing in groups.


Knottnerus, J. D. (1997). Social structural analysis and status generalization: The


