What Methodologies are Needed to Study Group Communication?

A Bounded-Rationality Perspective

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The new millennium has seen several advances in the development of research methodologies and statistical techniques for the study of group communication (e.g., Hollingshead & Poole, 2005; Pilny & Poole, 2017). Among the most prominent research methods are computational methods and data analysis techniques that have advanced the field of group communication by tailoring research methods to the context of groups and group-specific questions. Innovations included the extension of new methods (e.g., text mining, Lambert, 2017; and annotated codings of group interactions; Brauner, Boos, & Kolbe, 2018) and the adoption of methods that have been used in other contexts (e.g., machine learning techniques, Bonito & Keyton, 2018). Notable advancements include new developments in network analysis (e.g., Su & Contractor, 2011), advances in multi-nominal analyses (e.g., Bonito & Keyton, 2019), and agent-based simulations (Luan, Katsikopoulos, & Reimer, 2012; Smith & Conrey, 2007; Reimer & Hoffrage, 2012). With the influx of new technologies, new techniques have been developed that aim to capture the dynamic nature of team interactions (e.g., Braun et al., 2020; Pilny et al., 2020) and bridge analyses of small interacting groups and larger systems of individuals, groups, and organizations (e.g., Poole, 2013; Foote & Contractor, 2018). Notable also are new methods used to study hybrid systems that include non-human agents and actors (e.g., Park, et al., 2006) and immersed, virtual environments (e.g., Blascovich & Bailenson, 2012) including virtual groups (Anderson et al., 2007).

Each of these advancements provides a unique tool that has been developed to test specific assumptions about group processes and communication. Equally important is their heuristic value in that each of these methods inspired the development of new theoretical questions. For example, Bonito and Keyton's (2019) advancement of multilevel analyses provides a tool to distinguish empirically between individual constructs on the group level and

the group-member level. The authors show that an experimental manipulation—to communicate efficiently or politely—accounted for differences in individual group members' reported satisfaction but did not account for the observed variation in group satisfaction. The distinction between constructs on the group and individual level can be extended to other group constructs and, thus, the developed method opens the door to new theoretical questions (e.g., which factors affect satisfaction on the member level and which factors affect satisfaction on the group level).

In this commentary, a proposal in favor of a meta-theoretical approach to the study of group communication is advanced, that has not received much attention in group communication scholarship: The study of the bounded rationality of groups and teams. The proposal is meant as an invitation to integrate and extend rather than replace existing methods. The notion of bounded rationality comes with an invitation to analyze group communication from the vantage point of an adaptation process that involves the communication processes that are employed by groups along with characteristics of the environments in which groups are situated.

In the remainder, the general concept of bounded rationality is introduced and some promises that this meta-theoretical lens offers to group communication scholarship are described. Three methodological signature characteristics are highlighted: The development and test of process models, the analysis and description of the ecological and social environments of groups, and the development of representative designs in the study of groups. The concept of bounded rationality has been most widely used in decision-making contexts. However, the general approach is not restricted to decision-making groups but can be extended and applied to other group tasks (such as problem solving and creative tasks) and include a variety of group concepts (such as leadership and learning in groups; e.g., see Simon, 1991).

Methodological implications of studying group communication from a bounded-rationality perspective

The concept of bounded rationality has originally been developed in cognitive psychology and behavioral economics to study individual decision making (for an overview of research on bounded rationality across various disciplines, see Viale, 2020; also see Hertwig, Hoffrage, & the ABC Research Group, 2012; Todd, Gigerenzer, & the ABC Research Group, 2012). The concept of bounded rationality is based on the insight that we live in a fundamentally uncertain world and must operate within the bounds of this uncertainty and our cognitive limitations and environmental constraints. Unlike classical models of rationality that are built on logical consistency, bounded rationality focuses on the match between the human mind and the environment in which it operates highlighting that human reasoning and behavior is the result from an adaptation of actors to their environment.

What does the concept of bounded rationality have to offer to group communication scholarship and what are the methodological prerequisites to conduct research on bounded rationality? Generally speaking, the concept of bounded rationality urges researchers to think in terms of the ecology of actors by trying to understand how strategies may have developed as an adaptation to specific information and social environments (e.g., see Gigerenzer, Todd, & the ABC Group, 1999). One specific area of group research for which this perspective holds promise refers to the evaluation of group performance. Historically, group research has often focused on group performance and productivity describing situations in which groups suffer from process losses. The vast majority of group studies measuring some type of group performance suggests that groups are forming irrational decisions and do not perform as well as they could. The concept of bounded rationality promises to broaden our view on process losses. The bounded-

rationality perspective suggests that at least some failures and process losses in groups that are described in the literature may be limited to information environments that have been used in laboratory experiments using atypical tasks. Some process losses observed in laboratory experiments may result from otherwise adaptive behaviors in information environments that groups typically encounter.

To explore if process losses prevail in groups when groups are exposed to environments to which they adapted, a study employing a bounded-rationality perspective would ideally try to answer the following three intertwined questions: 1) The environment question: What are the characteristics of the decision task and the social and non-social environments in which groups typically form these decisions? 2) The strategy question: Which strategies *should* groups use to form decisions in this environment (prescriptive part) and which strategies *do* groups use to form decisions (descriptive part)? 3) The adaptivity question: Do the decision strategies that groups select and use match the structure of their social and non-social environments?

Communication plays a central role in each of the three questions. For example, in terms of the information environment, the bounded rationality of groups depends on whether group members exchange information about a task before the group deliberation process and to what extent group members have shared mental models about the distribution of expertise, skills, and preferences in their group. In terms of the decision strategies, communication plays a central role as the choice of a decision strategy and the implementation of decision strategies are often based on group interaction and discussions. Similarly, addressing the adaptivity question typically requires a measurement of communication-related group constructs and group discussions. Answering the three questions can help evaluate process losses in groups as respective studies promise to provide insights about the underlying group processes and to identify tasks and

environments in which the processes that are used by groups are functional. The goal is not to attest that groups are always rational; rather, the goal consists in understanding if and when the strategies that groups use are adaptive in that they work well in environments that groups typically and frequently encounter.

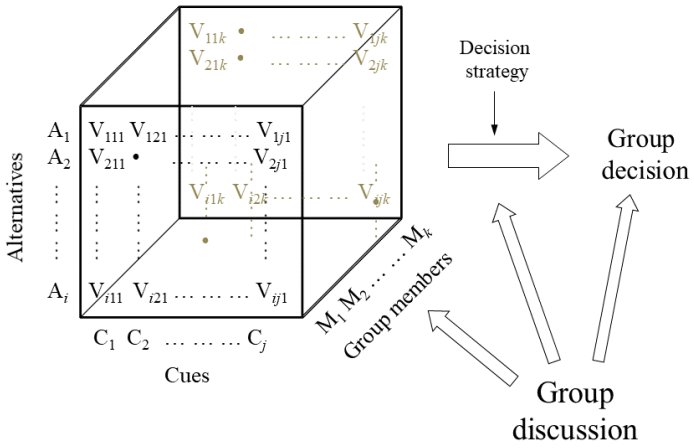
To be able to answer these questions, studies should embrace the development of viable models of information processing in groups and an analysis of environments that can inform the selection and specification of the used tasks. In the following, three signature characteristics are highlighted that should be embraced by research that subscribes to a bounded-rationality perspective: The development and test of process models; the analysis and description of the ecological and social environments of groups; and the development of representative designs in the study of groups.

Modeling individual groups: Process models vs. as-if models

The study of group communication and decision making from a bounded rationality perspective aims to understand group behavior as the result of an adaptation process. Group adaptivity refers to the match of the decision strategies that are employed by groups and the structure of information in the environment. Adaptiveness has been described as a relevant component of effective teamwork in group research before (e.g., see Kozlowski, 1998). The ability to select and change strategies based on information in the environment has been identified as an important skill in team decision making because team members must modify or replace routine strategies when they detect that the characteristics of the environment and task change (Reimer, Bornstein, & Opwis, 2005; Salas, Sims, & Burke, 2005). To be adaptive, teams have to be able to focus their attention on relevant information to accurately understand the situation and achieve a shared team situation model (Kaemmer et al., 2014; Kozlowski, 1998).

The notion of bounded rationality suggests that rather than an all-purpose tool, deciders have access to an adaptive toolbox of decision strategies. It is important to describe viable strategies as potential models of behavior and to study how deciders select the strategies they use and to what extent they are able to adapt their strategies to the requirements of their decision environment. Many group decision-tasks used in the literature can be represented in the form of the information-processing cube displayed in Figure 1 (also see Adamowicz et al., 2005; Reimer & Hoffrage, 2012).

Figure 1. The Information-Processing Cube



The information-processing cube has three dimensions: the members of the group, the choice alternatives, and the cues by which the alternatives are described. Consider a situation in which a group that is composed of *k* members has to choose among *i* alternatives that are described by *j* cues. The respective information-processing cube is composed of *k* x *i* x *j* smaller cubes. Each of these smaller cubes refers to the knowledge a certain member has about a certain

choice alternative on a certain cue. For example, group members may belong to a committee that has to choose a startup-company for investment on behalf of their company (see Banerji & Reimer, 2019). Each member has some knowledge about a set of startup companies. One group member may know that the founders of one startup company are well connected, whereas another group member may know which of the startup companies has the greatest experience in the respective market. In short, the cube represents information the group has on the decision task and how this information is distributed among its members. From a formal perspective, a group decision rule can be defined as a mathematical function that maps such an information cube into a single group decision (see Adamowicz et al., 2005; Reimer & Hoffrage, 2012). However, not every logically possible aggregation rule is psychologically plausible.

In the group literature, two types of group decision mechanisms have been distinguished that aggregate across the cube's dimensions in different orders. Social combination rules such as the majority rule assume that each group member first aggregates across the cues and alternatives to form an individual decision. In a second step, the group aggregates across the preferences or opinions of the individual members to form a group decision. Conversely, social communication rules capture the idea that the members of a group may pool their knowledge on the decision alternatives. For example, group members may first all aggregate their knowledge about each candidate and then collectively choose the one with the best overall evaluation. A group may also compare the alternatives cue-wise by first communicating to reach a consensus on which the most important cues are and choosing the alternative that scores highest on the most important cues (Reimer & Hoffrage, 2005). The representation of the cube acknowledges that group discussions may alter the choice set (the set of alternatives), the cues that are considered, and the

group members' knowledge about individual cue values as well as the decision strategies that are employed by groups.

What do we know about the decision strategies that groups employ? Group research has mainly studied social combination rules (such as the majority rule), but hardly any studies described a social communication rule. Group research provides extensive support for *as-if models* of group-decision making but only limited insight and support for potential *process models*. As-if models describe a rule that yields a certain outcome; however, as-if models do not claim to provide a viable description of an actual process. For example, the majority rule is mute about the actual process that would describe how a majority rule is implemented in a group. Conversely, process models describe a decision process. For example, voting would be an example of a process model.

Group research has a long tradition in describing as-if models of decision making. Most prominently, group researchers have developed, described, and tested several social decision schemes that describe how groups can form a joint decision. The social-decision scheme approach (Davis, 1973) proposes that a group's collective decision can be predicted in consideration of the distribution of members' pre-discussion preferences and a decision rule such as majority, truth-wins, proportionality, and equiprobability schemes. Some common social decision schemes include averaging members' estimations, voting for the majority's preferences, reaching consensus, and delegating an authority individual or subgroup (Hastie & Kameda, 2005).

Davis' approach has been applied in various contexts and has served as a basis for many group studies, which expanded the social decision schemes to, for example, expert-weighted

schemes (Bonner, Baumann, & Dalal, 2002), hidden-profile tasks (Stasser & Titus, 1985), and collective induction theory (Laughlin & Ellis, 1986).

Arguably, the majority rule is the most prominent decision scheme: It describes group decisions well in many situations, and it is also considered effective as it often yields accurate decisions (Hastie & Kameda, 2005). People often pick the alternative favored by most group members even if it is the wrong alternative (Ladbury & Hinsz, 2009). Typically, models that add aspects of group discussions as predictors are not better able to predict group decisions than models that are merely based on the distribution of preferences in a group and the use of a social combination rule, such as the majority scheme. However, a desideratum of group research consists in the lack of appropriate process models as the majority rule is almost exclusively studied as an as-if model. Specifically, it is not clear how groups implement the majority rule while deliberating. It is a promising working hypothesis to assume that group communication and group discussions play a central role in the implementation of the majority rule.

Many potential processes would allow groups to implement a majority rule and alternative rules that yield the same decisions. One possible process model would be *voting*. However, groups only rarely engage in formal voting unless they are explicitly asked to do so. In studies involving several hundreds of group decisions including hidden-profile tasks and other choice tasks that were conducted by the authors of this commentary, groups explicitly engaged in a voting process in less than one percent (Reimer et al., 2007; Reimer & Katsikopoulos, 2004; Reimer et al., 2010). Alternative process models for implementing a majority rule include a process by which individual group members express their preference for a specific choice early in the group deliberation. Nonverbal signals such as nodding, and the lack of disagreement can serve the function of communicating agreement. Another plausible mechanism consists in the

imitation of group members. Moreover, group members may discuss individual choice alternatives until they come to a consensus. Future research may describe and test specific process models used by groups to form a joint group decision.

When groups do not go with the majority, they follow at times the preference of one group member. This may, for example, be the most senior or experienced member. The truth-win principle is another decision scheme that can be implemented on the basis of several processes. Laughlin and his collaborators developed a research program that identified conditions under which groups select correct answers. Their research program identified the demonstrability of the correct solution as a key variable that affects whether groups form a correct decision in situations in which the majority prefers a wrong choice (see Laughlin & Ellis; 1986). It would be worthwhile to develop and test process models that build upon the concept of demonstrability. Developing process models of group decision-making that include a viable mechanism of how groups form a decision is important for several reasons: It is a prerequisite to evaluate the bounded rationality of groups as it provides insight into how groups form their decisions. Moreover, the formulation and test of process models is also important from a methodological perspective, as different decision schemes often yield identical decisions. For example, in situations in which the majority of a group prefers the correct answer in a multiple-choice situation, the majority and truth-wins rules yield identical choices. Specifying process models will provide opportunities to disentangle several possible decision strategies. In this context, it is important to see that models of bounded rationality provide models for individual groups. Models of decision making are ideally based on the observation of a series of many decisions (e.g., see Reimer & Katsikopoulos, 2004, as an example). In this sense, studies of bounded rationality

provide a methodology to conduct quantitative case studies of individual groups as well as comparisons of groups of groups once each group is described by a decision model (e.g., see Kaemmer et al., 2014, for an example).

Analysis and description of the environment

Beyond empirical models of decision making, studying the bounded rationality of groups also requires a systematic analysis of the environment. For Simon (1956), the environment includes all characteristics of the decision-making task and situation outside of a decider's cognition that are relevant for a decider. Common characteristics of environments that have been studied for individuals refer to the structure of information such as the similarity of choice alternatives and the similarity of the attributes that describe the choice alternatives (Gigerenzer & Gaissmaier, 2011). In the context of groups and teams, the environment also includes group characteristics, such as the distribution of knowledge about the choice alternatives (who knows what?) and the distribution of preferences (who prefers which alternative?). Describing the environment is important for methodological reasons: It is important as a systematic analysis of the environment enables researchers to develop a representative design by guiding the selection of decision tasks; and it is important to be able to evaluate the bounded rationality of the decision processes that are used by groups and to provide a prescriptive model of decision making within the bounds of a decider.

There is a long tradition in group communication scholarship to describe and reflect upon characteristics of the task that groups face, which is one important dimension of the environment (e.g., see McGrath's (1984) task circumplex). Analyses of environments in the spirit of bounded rationality go beyond a mere task analysis. Going back to the information-processing cube presented in Figure 1, to understand which decision strategies are useful in a given situation may

very much depend on the similarity of the members of the group, the choice alternatives, and the cues that are used to describe the alternatives. For example, in an environment in which cues are highly correlated, it does typically not pay off to discuss and integrate a large amount of cue information, but simple heuristics perform in such an environment just as well (see Reimer & Hoffrage, 2012; Todd et al., 2012). Are groups better off using a majority rule or should they follow their most experienced member?

The answer to this question depends on the structure of the environment. Reimer and Hoffrage (2012) described several formal similarities between strategies of individual deciders and social combination rules that allow extrapolating some of the lessons from the bounded rationality of decision strategies for individuals to the bounded rationality of social combination rules. For instance, in a situation in which group members vary greatly with respect to expertise, knowledge, or decision accuracy, adopting the choice of the *best* member pays off (also see Luan, Katsikopoulos, & Reimer, 2012). Conversely, in a situation in which members have by and large the same level of expertise, the majority rule may yield better decisions than the best member rule. Finally, in a situation in which all members have very high expertise, a group would easily reach unanimity, and accuracy would be high irrespective of which social combination rule the group uses. Therefore, it may be better to save resources and ask any individual to decide on this issue.

At this point, we do not have much empirical knowledge about the distribution of expertise and other important characteristics of groups outside of controlled laboratory studies. Thus, a methodological quest for group communication research consists in systematic descriptions of groups and their tasks in various environments. How many decisions do groups typically make? How large are groups? Among how many choice alternatives do they choose?

How is the expertise of members and other important individual characteristics distributed in groups? Having a broad empirical basis to answer these questions would facilitate analyses of group environments and contribute to the development of representative designs that preserve central properties of environments that groups typically encounter in empirical group research.

Representative design

The bounded-rationality perspective suggests that not only characteristics of the task (e.g., McGrath, 1984; Davis, 1973) but also characteristics of the information environment influence which decision strategies groups may use and how well the used strategies perform. Despite the insight that the study of a group's information and social environments is necessary to understand and evaluate group behavior, few studies have taken this quest seriously. Careful analyses of the decision tasks that have been used by researchers studying the heuristics and biases in individuals revealed that research on heuristics and biases itself is biased (Gigerenzer, 2018; Gigerenzer & Gaissmaier, 2011). It can be suspected that at least some studies on process losses in groups can be partially attributed to the use of atypical and biased decision tasks and environments. For example, an analysis of the information used in research on hidden profiles revealed that studies on hidden profiles utilized highly atypical information distributions that arguably prevent groups from using an effective strategy (Reimer, Barber, & Dolick, 2020; Reimer, Reimer, & Hinsz, 2010). To evaluate the hidden-profile effect, it would be worthwhile to understand how often groups face hidden-profile tasks. It is obvious that groups never encounter one of the environments used in research on hidden profiles as these environments do not allow groups to systematically compare choice alternatives on common characteristics (Reimer et al., 2020; for a hidden-profile task including common characteristics, see Fraidin, 2004; Reimer et al., 2010). We also know that the chance of the occurrence of a hidden profile

depends on the distribution of cue validities in an environment (Reimer & Hoffrage, 2012). However, we do not have systematic data and insights about the prevalence and characteristics of hidden profiles that groups face outside of laboratories. These data would help understand whether and how often natural groups encounter hidden profiles and how they could be solved. When provided information that can be used to compare alternatives, groups can solve hidden profile tasks under certain conditions in the laboratory (Reimer, Reimer, & Hinsz, 2010).

Studies that focus on bounded rationality have the goal to explore how simple mental mechanisms and group processes can exploit the structure of the environment to yield adaptive behavior. Box 1 displays typical steps of a study that subscribes to a bounded rationality approach. The development of representative designs began with Brunswik's (1956; see Dhami, Hertwig, & Hoffrage, 2004) ambition for an alternative to systematic design that can overcome the latter's weakness in external validity. Systematic designs aim to control extraneous variables to establish strong internal validity. Brunswik argued that generalizability is often limited in factorial design, a variant of systematic design, due to the artificial, unrealistic combinations of variables. Moreover, stripping tasks of the systematic relationship among variables can also impair the internal validity of studies.

Brunswik (1956) claimed that systematic design often yields results that distort the ecological functioning of the observed participants. Brunswik (1956) criticized the double standard in generalization practice in psychology and stressed the need to carefully consider the environment when conducting studies. The double standard is based on the fact that sampling is almost exclusively discussed in terms of the selection of participants but is hardly ever discussed in terms of the selection of stimuli and characteristics of the tasks that are used in research. This critique also applies to the study of groups.

Box 1.

Studying the Bounded Rationality of Decision-Making Groups: Research Steps

- **Choose Decision Tasks**
  Identify relevant decision tasks (e.g., decisions that groups face regularly; consequential decisions; decisions the studied groups care about; theoretically relevant decisions)
- **Analysis of Decision and Communication Environment**
  Analyze the structure of the decision environment including characteristics of the choice set (e.g., inter-cue correlation; similarity of choice alternatives; validities of cues), characteristics of the decision situation (e.g., time constraints, access to information), and the typical composition and structure of groups that face the described decision problems (e.g., group size, distribution of expertise)
- **Development of Process Models**
  Propose process models including simple heuristics and complex decision strategies (e.g., combination-based and communication-based strategies; strategies integrating cues that have been described as relevant in the literature; extensions of strategies that are used by individuals)
- **Simulation Studies**
  Use simulations to see if the strategies can work (e.g., systematically vary parameters such as the validities of cues and the length of group discussions; simulations should be based upon the identified characteristics of the decision environment)
- **Systematic Comparison of Results and Specification of Boundary Conditions**
  Use systematic analyses to find out under which conditions strategies provide accurate outcomes (e.g., systematically compare and classify the strategies based on their accuracy across various environmental characteristics; describe strategies in terms of their ecological rationality)
- **Empirical Study Using Interacting Groups: Representative Design**
  Set up studies with interacting groups to test experimentally/empirically for evidence that the strategies really are at work (e.g., select the decision characteristics that are most common in the environment; ask a number of groups to form a series of choices and model each individual group)

An alternative to systematic design is representative design. Representative design can be achieved, most preferably, by random sampling of stimuli from a specified reference class to a population, with each stimulus having an equal probability of being selected. As true random sampling is often difficult to achieve in practice, Brunswik (1956) recommended using mixed designs involving components of systematic and representative designs. Studies that subscribe to a bounded rationality perspective try to avoid using artificial, orthogonal designs that distort important characteristics of the decision environments (see Dhami et al. 2004). The concept of representative design is based on the conviction that human behavior can only be studied in situations that represent and retain key characteristics of the task and environment that deciders typically encounter. Behaviors may look irrational if actors are confronted with situations that are stripped of the characteristics of the environment to which strategies were adapted. The lack of representative designs in group research may have produced a skewed view and overrepresentation and overestimation of process losses in empirical group studies.

Outlook

The commentary outlined methodological considerations that follow from studying groups from a bounded-rationality perspective. The bounded rationality perspective offers a novel meta-theoretical lens to the study of group communication. More knowledge is needed about the information environments and social environments that groups encounter and more process models of group-decision making are needed. This perspective offers untapped resources.

The last twenty years have seen a number of significant advancements in group research methods. When furthering these models, it is worth considering a bounded-rationality perspective and asking the following three basic questions: (1) What are viable process models

that may describe the observed group behavior and how can groups be modeled? (2) What are the relevant characteristics of the decision and communication environment, including characteristics of the task and characteristics of groups that typically face the respective tasks? (3) Can group behavior be understood as an adaptation process?

As the bounded-rationality perspective teaches us, these questions are intertwined as adaptation can be best studied by looking at the match (or mismatch) of the strategies used and the specific characteristics of the environment. For example, is it wise for groups to follow the most experienced members in their group or use a communication-based decision strategy or use voting and go with a majority? The answer to this question depends on several characteristics of the environments in which groups form their decisions including the following characteristics: The validity and distribution of cue validities, the extent to which valid information is shared among group members, the accuracy of judgments of the most experienced member relative to the accuracies of less experienced members, and the shape of the distribution of expertise in a group (i.e., whether group members greatly vary in their level of expertise or not). At this point, we have very little descriptive empirical knowledge about the frequencies and distributions of these parameters in everyday groups and teams. The bounded-rationality perspective does not only provide guidance in the development of theories but may also inspire methodological innovations to explore and test assumptions about group communication.

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