Introduction to the Special Issue: "Cognitive Perspectives on Group Decision and Negotiation"

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Many organizations today rely heavily on their knowledge assets and engage in collaboration to leverage those assets. Managers and decision makers increasingly are forced to forge strategy, negotiate, and make decisions based on a vast amount of complex and dynamic information and expertise. Furthermore, the implementation of planned courses of action increasingly requires consensus and commitment among diverse stakeholders. In sum, all facets of the problem solving process including problem identification, idea generation, convergence, and implementation, as well as harmonization among stakeholders, increases the demand for smart and effective group support.

To design such support we believe the research on Group Decision and Negotiation would benefit from an increased understanding of the cognitive load and the cognitive processes that go on in the minds of decision makers and negotiators. Historically, the cognitive activities included in collaboration research have tended to be embedded and theorized about in the context of larger input-process-output (IPO) models. Such models often focus more on the interactions between individual team members than the cognitive mechanisms of the individuals themselves. Some of the more seminal IPO research models stress the social or organizational context of the work including individual and task characteristics (e.g., Nunamaker et al. 1991; Rao and Jarvenpaa 1991; Zigurs and Buckland 1998) or facilitation techniques and approaches (e.g., Miranda and Bostrom 1999; Wheeler and Valacich 1996). Grand models, however useful, tend to offer limited insight into the cognitive mechanisms involved in collaboration

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because they are simultaneously tackling so many dimensions of collaboration such as group characteristics, technological features, task-related characteristics, and the organizational environment (e.g., DeSanctis and Poole 1994; Gopal et al. 1993; Markus and Robey 1988). More recent research has focused on patterns of collaboration (Vreede et al. 2009) and design patterns for effective collaboration such as thinkLets (Vreede et al. 2006). These patterns are based on best practices and offer insight in the mechanisms that make collaborative activities more or less effective. However, they are based on practical know how, not on a more detailed theoretical understanding of why these techniques and methods work. To understand this, we need to understand the conditions for synergy; effective aggregation of individual contributions into a group result. Part of this puzzle, we believe lies in understanding the cognitive perspective on group decision and negotiation activities.

In this special issue, we seek to advance the same goals of making organizations and teams more efficient and more productive but do so by focusing first and foremost on the individual cognitive activities involved in collaboration activity. Understanding cognitive load and cognitive activities involved in collaboration offers various design principles to efficiently and effectively use cognitive capacity. Cognitive research has mainly focused on individual tasks. In order to design interventions that improve cognitive efficiency in collaborative tasks we seek to understand individual cognition in the context of collaborative tasks. This special issue therefore intends to spark a rather new perspective, or at least an increased emphasis, in research on group work and collaboration; the cognitive perspective. We will present you five interesting papers that each discusses one or more cognitive aspects of group decision and negotiation. The papers show that the cognitive perspective can help us to identify new and promising design directions for collaboration, decision, and negotiation support. Further, the papers demonstrate that this perspective presents methodological challenges that will need to be addressed as researchers pursue new and innovative research approaches. In this introduction we will first summarize the papers in the special issue. Next we will discuss the key research challenges and potential of the cognitive perspective. Based on this we will sketch a research agenda to further explore this line of thinking and inquiry.

1 The Cognitive Perspective: Five Papers on Cognitive Phenomena in Group Decision and Negotiation

In *Macrocognition in Collaboration: Analyzing Processes of Team Knowledge Building with CoPrA* the authors; Seeber, Maier, and Weber present a new research method to analyze knowledge building processes from a cognitive perspective. Inspired on traditional qualitative methods, they present CoPrA; a COllaboration PRocess Analysis technique to analyze macro cognitive patterns in transcripts of team collaboration. Using groupware they obtained transcripts of team knowledge building processes. These transcripts are then analyzed using a coding scheme based on literature to derive macro cognitive patterns such as; clarifying information, sharing knowledge, posing critique, etc. Analysis at this level of abstraction shows patterns in the order in which cognitive tasks are performed. Some groups did complex tasks in parallel, while others worked in more sequential steps; which are likely to have an impact on cognitive load, group dynamics and performance of the team. Using CoPra, future

research can give more detailed insight in the patterns of group interaction that lead to effective team collaboration and decision making.

In *The Sound of Trust: Voice as a Measurement of Trust During Interactions with Embodied Conversational Agents* the authors Elkins and Derrick present an experiment that explores how vocalic and nonverbal behavior can be used to predict an individual's perceptions of trust. The authors used a form of Artificial Intelligence (AI) called an Embodied Conversational Agent (ECA) to interact with human participants in a simulated checkpoint interview. They demonstrate that trust is temporarily variant and that vocalic pitch and duration of response to questioning are both negative predictors of trust. ECAs that smiled were trusted more than ECAs that did not smile and that college educated participants exhibited more trust toward the ECA than participants without college educations. The results point towards systems that could be developed to automatically monitor trust levels and recommend facilitator interventions in response to low trust situations. More pragmatically, the results suggest concrete actions that leaders can take to induce feelings of trust among their group members. The authors make a compelling case for using AI to reduce variation within treatments as well as the precise measurement of vocalic behavior to provide insight to perceptions of trust.

In *Individual Priming in Virtual Team Decision Making* the authors Bartelt, Dennis, Yuan and Barlow present the results of an experiment that uses priming in an attempt to improve group performance on a decision making task. Priming is intended to activate concepts and associations in the working memory of participants that, under certain circumstances, can lead to improved performance. The authors explored the effects of achievement and regret priming and although regret priming increased information sharing among participants neither treatment led to improved decision quality. The authors provide an important framework for understanding priming research that contrasts a dichotomy of individual vs. group against task goals of brainstorming vs. decision making. This illustration gives insight to researchers attempting to take interventions from cognitive psychology and implement them in the collaborative settings. The authors make a convincing argument as to why summative tasks are more likely to be successful than consensus based tasks.

In *Cognitive load in Convergence* the authors Kolfschoten and Brazier present an overview of individual cognitive activities involved in a group process during convergence. Convergence is a phase in decision making and negotiation where the group after sharing and eliciting many alternative explanations and alternatives for a problem, goes through a process of reduction, creating shared understanding and organizing or structuring the information that they share to prepare for a choice or decision. This converging phase is likely to pose high cognitive load, as participants need to understand and integrate multiple perspectives to a problem and its solution. In the paper the authors use literature, an expert panel and an introspective survey to create an overview of the cognitive activities that can occur in this process. Based on this overview, guidelines to support convergence by reducing or balancing the cognitive load involved are derived. The paper shows that analysis of group work at this cognitive level of analysis helps to further understand why techniques and methods for collaboration and decision support are effective, and how they can further be 'fine-tuned' to improve group productivity during this complex phase of group work.

In *Putting Quality First in Ideation Research* the authors Reinig and Briggs examine the theoretical causes that give rise to good ideas when groups engage in ideation and brainstorming as well as the methodological issues for demonstrating improved ideation. They review Bounded Ideation Theory and its propositions relating idea quality to cognitive factors such as scarcity of attention resources, mental and physical exhaustion, understanding of the problem, and goal congruence. They review recent research to determine which of the factors are actively addressed in the literature and which are producing gains in terms of generating more high-quality ideas. They also review the five different approaches that researchers are using to evaluate ideation techniques and evaluate them in terms of their biases and relevance to practitioners. The paper ties together some theoretical shapes of the ideation function, which plots idea quality as a function of idea quantity, to the ideation metrics used in the literature by reporting on the results of a Monte Carlo simulation. They conclude with some practical suggestions for refocusing ideation research on producing high quality ideas by manipulating the cognitive factors that give rise to good ideas.

2 Discussion

We see challenge and opportunity for research that takes the cognitive perspective on group decision and negotiation. The challenge is the need for new theories and methodologies to study and analyze patterns of individual cognition in the group context. The opportunity lies in the insight that such patterns offer in opening the black box that surrounds many of the phenomena that have been identified for enhancing group productivity such as trust building, creating shared understanding, and consensus and group commitment. We briefly address these to derive an initial research agenda for the cognitive perspective on group work.

2.1 The Methodological Challenge of the Cognitive Perspective

Research in Cognition, Artificial Intelligence, Neuro-psychology and cognitive psychology is rapidly growing and provides us with an increased understanding of how the mind works, the function of different parts of the brain, and how cognitive focus and performance can be stimulated and supported. In these lines of research cognitive performance on tasks is linked to brain activity or stimuli that are known to trigger a specific cognitive process. However, in a group context, several challenges make it difficult to directly adopt these research methodologies.

1. It is difficult to attribute the outcomes and performance of a group effort to specific individuals. The objective of group work is often to produce synergy among participants that ultimately results in some form of shared understanding and consensus. This requires the integration and meshing of individual perspectives and mental models and it can be challenging to trace a direct link between an individual's cognitive effort and his or her contribution to the end group product.
2. Group work by nature triggers multiple cognitive activities. Although individual work can be highly focused on a single cognitive task, this is often not the case in a

group context. Due to the need for coordination of effort, a collaborative task will often show traces of two cognitive processes; the processing of the content of the task (problem solving or decision making) and the processing of the interaction about the task to support coordination of effort. Furthermore, often a third cognitive process is involved with managing individual goals in the process and prediction about the goals and intentions of others. Participants might need to hold on to both their own perspective as well as that of one or more others in the group to compare them and understand differences. It will therefore be difficult to attribute performance to a specific cognitive activity.

3. Cognitive stimuli to support group work are likely to have different effects on participants in a group process, especially in heterogeneous groups. People hold different values and goals, sometimes associated with differences in culture and personality, and this can lead to differences in how they react to group situations that may involve cooperation or conflict. Further, differences in knowledge level can directly influence cognitive activities and associated stress levels with those activities. We recognize that all minds are not alike and that context still has an important role in research on cognition.

These and no doubt many other challenges lead to a set of methodological challenges including the ones covered in this special issue:

- Capturing the cognitive activities in sufficient detail for analysis. CoPrA is an example of how to capture such activities, as well as the combined methods used to create the framework on cognitive activities in convergence.
- Mapping effective interventions from cognitive psychology to group decision and negotiation. Some interventions that have shown to be effective in improving the work of individuals may not be suitable for certain group tasks. The paper on virtual priming provides an example of this and discusses why certain interventions may be more effective than others depending on the objects of the group.
- The need for experimental control when testing manipulations on cognition in interactive settings. Elkins and Derrick use an ECA to provide a reliable and consistent manipulation of non-verbal behavior, such as smiling. It would be difficult for even a well-trained actor to present himself or herself in precisely the same posture and tone over multiple experimental interactions. The use of ECAs could provide a promising mechanism for reducing extraneous noise in experimental manipulations of cognitive constructs.
- Linking cognitive activities directly to the real world outcomes sought by organizational decision makers. Reinig and Briggs demonstrate that only one of the five common metrics used in ideation research is in alignment with the real world goals of ideation.

3 The Research Opportunity of the Cognitive Perspective

Besides these challenges, the papers in this issue also shows the potential of the cognitive perspective in revealing new patterns that help us to understand the cognitive impact of group work. These understandings offer us new ways to facilitate cognitive

load reduction and to focus cognitive attention to stimulate performance and otherwise more effectively manage cognitive effort.

For example we saw in the papers on CoPrA and cognitive load in convergence, that the order in which cognitive tasks are performed or even combined, have a substantial impact on group performance, and can help us to further understand phenomena in group dynamics (e.g., group think) and patterns in group performance such as creating shared understanding. This creates a situation of exploding complexity as researchers examine the role of order and cognitive activity.

4 Conclusion

With this special issue we call for researchers to increase the attention they give to the cognitive foundations of group decision and negotiation. Technology and organizational structures are rapidly evolving and research grounded in today's technology is in risk of losing its relevancy as the technology it is built upon becomes outdated. Human cognition and all its complex mental activity is stable and any insight that we draw is likely to serve group decision and negotiation researchers through generations of technological and organizational development. We present this special issue of GDN with hopes and aspiration that we can help to stimulate additional research in the cognitive foundation of collaboration.

References

de Vreede GJ, Briggs RO, Kolfschoten GL (2006) ThinkLets: a pattern language for facilitated and practitioner-guided collaboration processes. Int J Comput Appl Technol 25(2/3):140–154

de Vreede GJ, Briggs RO, Massey AP (2009) Collaboration engineering: foundations and opportunities: editorial to the special issue on the journal of the association of information systems. J Assoc Inf Syst 10(3):7

DeSanctis G, Poole MS (1994) Capturing the complexity in advanced technology use: adaptive structuration theory. Organ Sci 5(2):121–147

Gopal A, Bostrom RP, Chin WW (1992–1993) Applying adaptive structuration theory to investigate the process of group support systems use. J Manag Inf Syst 9(3):45–69

Markus ML, Robey D (1988) Information technology and organizational change: causal structure in theory and research. Manag Sci 34(5):583–598

Miranda SM, Bostrom RP, (1999) Meeting facilitation: process versus content interventions. J Manag Inf Syst 15(4):89–114

Nunamaker JF Jr, Dennis AR, Valacich JS, Vogel DR, George JF (1991) Electronic meeting systems to support group work. Commun ACM 34(7):40–61

Rao VS, Jarvenpaa SL (1991) Computer support of groups: theory-based models for GSS research. Manag Sci 37(10):1347–1362

Wheeler B, Valacich J (1996) Facilitation, GSS, and training as sources of process restrictiveness and guidance for structured group decision making: an empirical assessment. Inf Syst Res 7(4):429–450

Zigurs I, Buckland BK (1998) A theory of task/technology fit and group support systems effectiveness. MIS Q 22(3):313–334