Maastricht University

Making the invisible visible

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Summary

Although team meetings are a crucial aspect of organizational life, research indicates that a significant percentage of meetings are unproductive, with managers often citing low engagement and poor communication as reasons for the lack of productivity. This can be detrimental to workers in knowledge-intensive fields, where job performance depends heavily on communication during collaborative problem-solving activities. This thesis investigates the relationship between team communication and team performance in the context of collaborative problem-solving (CPS) by utilizing social network analysis metrics for social signal modeling. Furthermore, by integrating insights into team cognition from psychology, this thesis overcomes the limitations of existing studies, many of which have struggled to identify significant social signals in their analyses of combinations of problem-solving activities.

Thus, adopting an interdisciplinary approach, this research explores the composition of modalities for different CPS tasks (Chapters 2 & 3), investigates the impact of these modalities on performance (Chapter 4), and examines how researchers and designers can benefit from these insights when researching CPS or designing support tools for teams working on CPS (Chapter 5). The outcomes of this thesis have the potential to inform the design of human–computer interaction systems and contribute to knowledge across multiple fields, including social and computer sciences. The interdisciplinary nature of this research should promote the flow of ideas between these fields and provide a holistic understanding of the relationship between team communication and team performance in the CPS context.

Chapter 2 provides evidence that types of problem-solving activities differ in terms of the social signals that can be collected, demanding separate analysis. Together with my co-authors, I demonstrate that

modeling the collected signals reveals significant pattern differences between different problem-solving activities. In doing so, we reveal what we term the sociometric DNA of an interaction. This notion describes how specific interactions have specific properties of social signals that differ distinctly from other interactions.

Chapter 3 builds on these findings. By capturing and analyzing social signals of rotation in team dynamics, my co-authors and I demonstrate how understanding the sociometric DNA of a problem-solving activity can enable context detection. These findings have value for researchers and practitioners working on building systems that provide more relevant recommendations to teams.

Chapter 4 concludes this thesis' first research strand, providing evidence that social signals relate to team performance and that this relationship varies between problem-solving activities. Certain social signals contribute positively to one activity but less positively to others, a finding that is important for building context-aware systems that can improve team performance.

Chapter 5 utilizes the results of the previous studies to test the impact of a custom-built, real-time visual support system on the performance of teams working on a particular problem-solving activity. My co-authors and I provided teams working on divergent-thinking tasks with a visual support system designed to encourage equal participation by visualizing participation contributions. The findings show that the system positively impacts team performance.