

The dynamics of micro-conflicts and uncertainty in successful and unsuccessful design teams



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What differentiates successful from unsuccessful design teams? Building on new research on design innovation that emphasizes interactions between social and cognitive processes, we investigated a potential distinguishing feature:

Successful design teams may harness interpersonal conflicts (a social design process) to mitigate uncertainty (a cognitive design process). We analyzed temporal relationships between brief, expressed interpersonal disagreements and subsequent spoken individual uncertainty in 30 h of conversations of 10 successful and 11 unsuccessful engineering product design teams. We discovered that micro-conflicts were followed by a relative reduction in uncertainty in successful design teams, whereas uncertainty rose after micro-conflicts in unsuccessful design teams, suggesting that interactions between conflict and uncertainty may be a differentiating factor for design team success.

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What differentiates successful from unsuccessful design teams? After decades of research on this question, design studies researchers have learned much about the nature of successful design teams. For example, successful design teams make heavy use of mental simulations and analogies (Ball & Christensen, 2009; Christensen & Schunn, 2009); use design tools and media that are appropriate to the phase of the design process (e.g., sketching early on, prototypes later on; Jang & Schunn, 2012); and work through consensus to build a robust shared understanding of the design problem (Agogino, Song, & Hey, 2006; Dong, 2005; Yang, 2010). Yet, much remains to be understood about the complex factors that lead to team design success (Dinar et al., 2015). For instance, while critical inquiry—which may include conflict—is a foundational part of design education and practice (Dym, Agogino, Eris, Frey, & Leifer, 2005; Oh, Ishizaki, Gross, & Yi-Luen Do, 2013; Schön, 1983), theoretical and empirical work on team cognition suggests that conflict still needs to be appropriately harnessed such that

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relationship conflict is minimized, open-minded discussion is maximized, and the benefits of disagreement can occur (Jehn, 1997; Tjosvold, Wong, & Chen, 2014). Yet, we know little about the preconditions, attendant processes, and mechanisms that make these desirable outcomes possible.

An emerging research area in design team innovation emphasizes interactions between social and cognitive processes (Paletz & Schunn, 2010). The key assertion of this perspective is that understanding how social and cognitive processes are intertwined could help improve our understanding of how design innovation truly occurs, and thus improve interventions designed to improve design team performance (e.g., because social dynamics might alter how cognitive interventions are perceived, or vice versa). This perspective also has the potential to yield fresh insights into pathways to design team success. This social-cognitive perspective is motivated by numerous prior findings of complex interactions between social and cognitive processes in teams. For example, simple social phenomena like turn-taking can shape individual memory retrieval dynamics (Nijstad & Stroebe, 2006). In addition, dissent from a minority opinion holder can trigger a broader information search in other team members, whereas dissent from a majority of team members biases information search in favor of the dissenting opinion (Nemeth & Rogers, 1996).

In this paper, we investigate how the interplay between disagreement (a social process) and individual team members' uncertainty (a cognitive process) could help differentiate successful and unsuccessful design teams. Specifically, we discover that, in successful teams, open expression of disagreements helps to reduce individual uncertainty (a desirable effect in the design process), whereas in unsuccessful teams, similar expressions of disagreement *elevate* uncertainty levels. Although both disagreement and uncertainty are natural to design teams, harnessing disagreement to resolve uncertainty may be advantageous, if not necessary.

1 Background

1.1 Intra-team conflict and micro-conflicts in design

Conflict has been studied at intra-personal, intrateam, interteam, and national levels, in design teams and between countries (e.g., De Dreu & Gelfand, 2008; Ozkaramanli, Desmet, & Ozcan, 2016). We focus on intrateam conflict as between individuals within the same design team. For this study, we define conflict to be when one team member explicitly opposes or contradicts statements or plans proposed by another team member. Thus, we focus on conflict as disagreement, which is inherent to problem-solving conversations, regardless of its negative affect, intensity, or directness (Paletz, Schunn, & Kim, 2011; Weingart, Behfar, Bendersky, Todorova, & Jehn, 2015). Such disagreements within a team can arise from differences in values, needs, interests, opinions, goals, or

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