



Flock Leadership: Understanding and influencing emergent collective behavior

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ABSTRACT

This study introduces Flock Leadership, a framework for understanding and influencing emergent collective behavior in the context of human organizing. Collective capacities emerge when interactions between individuals enact divergent and convergent ways of perceiving and responding to reality. An agent-based flocking model is employed to represent these interactive dynamics and emergent processes. This study explicates the model's constructs, translating its algorithms into behavioral norms at the individual level and its outcomes into collective behaviors at the group level. Phenomena-based simulation modeling links two collective states—technical capacity and adaptive capacity—to the specific underlying norm configurations from which they emerge. Flock Leadership provides a unique theoretical framing of emergent collective behavior in organizational settings, a new methodology for analyzing relationships between those emergent behavioral patterns and the interaction norms underlying them, and a useful means for identifying leadership opportunities.

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“The hallmark of a great leader is that when he is gone, people say ‘we did it ourselves’.”—Lao Tsu.

Austrian-born conductor Herbert von Karajan (1908–1989) led the Berlin Philharmonic Orchestra with restraint. Uncomfortable with von Karajan's limited and imprecise gestures, a trumpet player once asked, “Maestro, with all due respect, when should I start playing my tune?” Von Karajan responded, simply and pointedly, “when you feel it's the time.” A journalist, similarly mystified, questioned the conductor, “Maestro, why don't you give precise indications to your orchestra?” Von Karajan's answer revealed the basis of his leadership approach: “Because,” he explained, “that's the worst damage I could do to them: the musicians would not listen to each other” (Cousin, 2012, para. 7). Von Karajan underscored the *listen to each other* norm during rehearsals. He would simply point his baton at a single player, a gesture intended to tell the other players ‘listen to him’, explains von Karajan biographer Richard Osborne. “When the playing of the rest of the orchestra complemented that of the solo”, continues Osborne, “von Karajan would give a thumbs up and move on” (Tyner, 2001, para. 1). Israeli conductor Itay Talgam describes the influence of von Karajan's restraint on the orchestral collective: “They look at Karajan. And then they look at each other. ‘Do you understand what this guy wants?’ And after doing that, they really look at each other, and the first players of the orchestra lead the whole ensemble in playing together” (Talgam, 2009, para. 17).

Von Karajan could have commanded his orchestra to look to him; he was the conductor, after all. Why, then, did he encourage them to look and listen to one another? Von Karajan understood the potential for interacting parts to self-organize into a coordinated, energized whole. He saw his leadership role as creating space for the parts to interact while guiding and ingraining the norms of interaction. The resulting harmony was an emergent property of the orchestral collective, meaning that it arose as a

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result of the interaction of the players and that it was not a property of any of the players individually. Emergent collective behaviors have varying degrees of predictability (Marx & McAdam, 1994). The collective behavior guided by von Karajan was relatively predictable; when his Berlin Philharmonic played Mozart's symphony no. 31, for example, concert-goers familiar with the score could anticipate the essential content of the production. Von Karajan expected that honing the norms of listening and interaction would generate better emergent harmony, not novel content.

Managers and leaders in other contexts have very different expectations of the collective behaviors they oversee. Some organizations look to emergent collective behavior not to navigate the known and refine the present but to discover the unknown and create the future. One such organization is Pixar Animation Studios, whose president, Ed Catmull, underscores the importance of interaction when he describes the consequences of changing the site of creative meetings from a long skinny table to a smaller square table: "Sitting around that [smaller square] table, the interplay was better, the exchange of ideas more free-flowing, the eye contact automatic. Every person there, no matter their job title, felt free to speak up" (Catmull, 2014, p. 3). Like von Karajan, Catmull wants members of his team looking and listening to each other. At the Berlin Philharmonic, interaction drove emergent collective harmony; at Pixar, interaction drives emergent collective creativity.

The von Karajan and Catmull insights establish several themes and suggest several questions central to analysis of emergent collective behavior in organizational contexts. There are different types of emergent collective properties and behaviors. What, then, are the principal types and how do those types relate to the challenges organizations face? In particular, how does the collective capacity necessary for incremental improvement at familiar tasks differ from that necessary for discovery and transformation? By definition, emergent collective behavior cannot be commanded and controlled. It is nonlinearly related to interactions between numerous individuals, not the direct result of authoritarian dictate. What, then, constitutes leadership in the context of emergent collective behavior? How might one exercise influence without invoking and exerting formal authority? If emergent collective behavior is a function of interactions between individuals, then what can we learn about *how* different interaction norms on a team, in a department, or throughout an organization generate different collective behaviors?

These questions motivate this study, which introduces a framework for understanding and influencing emergent collective behavior that I call *Flock Leadership*. To develop insights into Flock Leadership, I employ an agent-based flocking model to represent the process by which human collective capacity emerges. As numerous scholars discuss (e.g., Davis, Eisenhardt, & Bingham, 2007; Dinh, Lord, Gardner, Meuser, Liden & Hu, 2014; Harrison, Lin, Carroll, & Carley 2007; Uhl-Bien, Marion, & McKelvey, 2007), agent-based computational modeling is well-suited to analysis of emergent behavior in complex systems because it accommodates the interactivity, nonlinearity, and multi-level processes characteristic of emergence. Inspired by the emergent collective behavior found in schools of fish, herds of land animals, and flocks of birds, agent-based flocking models consist of algorithms reflecting the simple movement rules underlying complex aggregate motion (Goldstone & Gureckis, 2009). A defining property of flocking models is that component individuals base their movement decisions on the behaviors of their peers. Thus, collective movement patterns emerge from localized interactions between neighboring individuals, not from the orchestrated design of a leader or central authority.

In the sections below, I situate Flock Leadership in relation to existing analyses of emergent collective behavior in the leadership literature, explain why agent-based simulations are useful tools for analyzing emergence, and introduce the flocking model that serves as the basis of this study. Next, I explain how I interpret the flocking model to represent organizational dynamics. This entails translating the model's algorithms into behavioral norms at the individual level and translating the model's outcomes into collective behaviors at the group level. I then conduct phenomena-based simulation modeling for the purpose of analyzing relationships between interaction norms and patterns of collective behavior. What configuration of behavioral norms generates collective capacity for incremental improvement at familiar tasks, which I call *technical capacity*? What configuration of behavioral norms generates collective capacity for discovery and transformation, which I call *adaptive capacity*? I close with a discussion of the implications of Flock Leadership for theory, research, and practice. Flock Leadership provides a novel theoretical framing of emergent collective behavior in organizational settings, a new methodology for analyzing relationships between those emergent behavioral patterns and the interaction norms underlying them, and a useful means for identifying leadership opportunities.

Emergent collective behavior and leadership

This study defines collectives as McGrath, Arrow, and Berdahl (2000, p. 95) define groups: as "bounded, structured entities that emerge from the purposive, interdependent actions of individuals." The behavior of a collective is said to be emergent when it arises from interactions among a set of individuals, when it assumes distinct patterns, and when it cannot be understood simply as the sum of its constituent parts (Pais, 2012). A set of individuals that exhibits emergent collective behavior is known as a complex adaptive system. It has become increasingly popular in the past two decades to view groups of people (McGrath et al., 2000) and, more broadly, organizations as complex adaptive systems, or "dynamic systems of adaptation and evolution that contain multiple parts which interact with one another and the environment" (Morel & Ramanujam, 1999, p. 278). It makes sense, in part, to approach groups of people as complex adaptive systems because of the pivotal role that *interaction* plays in influencing behavior in both contexts. "The central feature," writes Joseph McGrath (1984, p. 13), "the 'essence,' of a group lies in the interaction of its members—the *behaving together*, in some recognized relation to one another, of two or more people who also have some past and/or future relation to each other." In complex systems, even though interactions between elements may follow relatively simple rules, feedback loops generate nonlinear outcomes in the form of patterned emergent behaviors at the collective level (Anderson, 1999). The study of such systems has acquired the name complexity theory, though it is less a single theory than an interdisciplinary ensemble of approaches modeling how microstate events self-organize into emergent

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