Fluid participation can solve social dilemmas in organizations: An agent-based simulation

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Introduction

Recent trends in modern firms have revealed the increase of organizational fluidity in organizations. Current organizations become to blur their boundaries to adopt rapidly changing environments (cf., Mortensen & Haas, 2018), where tasks are generally completed by project-based teams which will be dissolved once their missions are completed (Schmidt & Rosenberg, 2014). Such fluidity has been captured in the classic concept of "fluid participation," an organizational property in which "participants vary in the amount of time and effort they devote to different domains; involvement varies from one time to another" (Cohen, March & Olsen, 1972: 1). However, our knowledge is still limited on how organizational fluidity affects individual behaviors and how the affected behaviors can lead to organizational success / failure.

In this study, we investigated the dynamic influence of fluid participation on organizational success by focusing on social dilemmas within organizations. Researchers have argued that achieving stable cooperation in social dilemmas, where individual and organizational payoffs conflict, is a key for organizational success (Rockmann & Northcraft, 2018). While cooperation in social dilemma is hard to achieve without sanctioning system (e.g., Yamagishi, 1986), we instead considered the organizational fluidity as a driving factor for cooperation (cf. Boyd & Mathew, 2007).

Models and Simulations

We conducted an agent-based simulation using Public Goods Game (PGG) and evolutionary dynamics (cf. Bowles & Gintis, 2011). We incorporated individual heterogeneities in capability, or vertical difference in per-cost contributable amount, into our model while past studies on social dilemmas have assumed that individuals are homogeneous in their capabilities.

This study followed the basic settings that are generally applied in the field of cooperation studies (cf., Sigmund et al., 2010). We assume a finite population consisting of N individuals. From the population of an organization, n members for the interaction group are randomly selected to participate in one round of the PGG, which represents a situation whereby many work groups are formed in an organization. After one round of the PGG, the group is dismissed. Then, another interaction group is formed with new n members to play another round of the PGG. We assume that there are only perfect cooperators who are always willing to contribute and perfect non-cooperators who are not willing to do so at all.

At the end of each generation of the sequential 500 rounds, the updating process is performed based on the evolutionary dynamics, or more specifically, *replicator* *dynamics*, through which the change in frequency of an individual type is proportional to the difference between the fitness of that type and the average fitness of the population (Hofbauer & Sigmund, 1998).

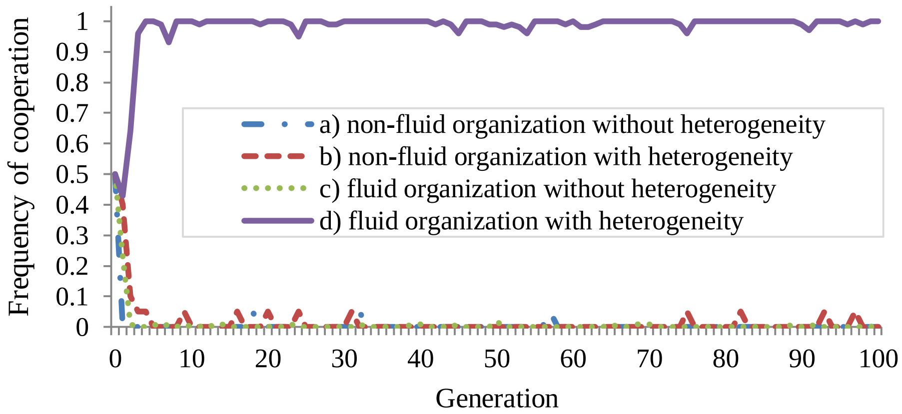
We obtained the long-run frequencies of a certain number of generations with the four treatments as a 2 (non-fluid or fluid organization) x 2 (without or with individual heterogeneities in per-cost contribution amount) design: a) *non-fluid organization without heterogeneity*, b) *non-fluid organization with heterogeneity*, c) *fluid organization without heterogeneity*, and d) *fluid organization with heterogeneity*. As to organizational fluidity, or the degree to which team members for the PGG game vary in time (Cohen et al., 1972), was operationalized as the population or organization size (N) with a fixed interaction group size, $n = 5$. In *fluid organizations,* when N is relatively larger than n, participation in the interaction groups varies over time. In contrast, in *non-fluid organizations,* when N is small and close to n, participation in the interaction groups does not vary over time. We assume $N = 100$ for *fluid organizations* and $N = 20$ for *non-fluid organizations* in the simulation. Separate simulations checked the robustness of results with longer generations and a reasonable range of parameters.

Results and Discussion

Observations from simulations revealed that only fluid organization with individual heterogeneities could achieve stable cooperation, as shown in Figure 1. Other treatments replicated findings from previous studies in that cooperation failed as interaction repeated. These results implied that fluid participation could play a critical role in successful organizations by combining individual heterogeneity in capabilities.

FIGURE 1

Level of Cooperation Obtained Through Generations



As to theoretical contributions, this study sheds new light on the classic concept, “fluid participation,” in management literature by revisiting it as an underlying mechanism to solve social dilemmas within organizations. Further, this study expands our understandings on current organizations of which fluidity is one of the distinctive features (Mortensen & Haas, 2018). Fluid participation should be essential for such organizations to maintain individual contribution, where it is practically difficult for managers to drive them through supervision (Schmidt, & Rosenberg, 2014). Our model is minimalistic; therefore, it has limitations in considering organizational dynamism and individual diversity. Nevertheless, we hope our work can serve as a foundation for future research.

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