

Modeling Human Stability and Change in Organizations

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Abstract—This extended abstract describes current work in progress on so-called micro-foundations of organizational routines. These are individual-level human processes assumed responsible for the emergence of routines. Recent agent-based models in organization science focus on psychological mechanisms operationalizing the stability of human behavior. As similar concepts exist in creativity research, the aim of this project is to facilitate a dialogue between organization scientists and creativity researchers in order gain insight on these processes. The latter will subsequently be implemented in agent-based models of generic as well as applied routines to test and compare models of these micro-foundations.

I. INTRODUCTION

Considered “the building blocks of organizations” [2, p. 3], organizational routines are elementary processes by which employees accomplish their work. Routines can be described as encompassing two parts, their representation and their enactment [26]. A routine's representation refers to its “abstract or generalized pattern” [29, p. 796], sometimes called its *ostensive* part [29]. It can be envisioned as people's accounts of how something is or should be done. Such accounts can be conceived as internalized representations, as in individuals' mental models [37], and they can be indicated by externalized collective representations such as written standards [9]. A routine's enactment refers to “actual performances by specific people at specific times in specific places” [30, p. 286], sometimes called its *performative* part [29]. The interplay between the representation and enactment of a routine is constitutive and generative to a certain extent depending on the context. For example, a hospital may have a rule stating staff meetings are to be held at every change of shifts. Given the rule is indisputable, this collective representation of the routine “staff meeting” will not change based on its enactments even if some unofficial variations in start and end times occur. On the other hand, a small start-up may, as an initial act of professionalism, decide to hold staff meetings every Monday morning at 9 o'clock sharp. After a while, the staff realizes it needs to hold meetings more often and spontaneously whenever it needs them. So by enacting their representation of a staff meeting, over time they change its representation in terms of frequency and purpose.

Although researchers agree that routines represent an organization's basic behavioral unit, understanding their explicit role in forming organizational behavior is still a matter

of scientific debate [7]. Recently, *micro-foundations* are in tight focus [6], [21], [33], i.e., human mechanisms thought to influence the stability and change of routines. The underlying idea is that if one wants to manage or modify organizational routines, e.g., to enhance an organization's resilience, one needs to start by understanding and changing the behavior of the humans carrying them out. However, routines are difficult to empirically investigate, as their operationalization and measurement have many degrees of freedom [28], [30]. Moreover, reaching empirical consistency is an obstacle, because the “same” routine can vary starkly depending on the organization, observer-dependence, and gaps in what employees do and report they do [16]. Furthermore, there is disagreement regarding which constructs or mechanisms significantly describe and drive the micro-foundations of routines, e.g., human memory (procedural, declarative, transactive; [24]), cognitive frameworks [3], individual habits [26].

Recently, organization scientists have started to use agent-based modeling to conceive more formal models of routines [4], [12], [19], [24], [25], [31]. As agent-based models can be used to show how simple rules of micro-level interaction can lead to macro-level phenomena [13], the method corresponds well to the interplay between a routine's representations and enactments. Nevertheless, many agent-based models to date focus on teams or managers as the lowest system level. They thereby disregard the essential role the actual actors of routines play in generating these emerging processes [19], [20].

Stability and change of individual behavior is a concept inherent in creativity research in psychology [10], [17], [27], [32], [35], [39]. Creativity researchers have established diverse models describing how humans differ in the stability of their behavior and how variability in behavior can be modeled [5], [8], [18], [23], [34], [36]. They address personality, cognitive, behavioral and social aspects of human creativity, i.e., behavioral stability and change. Moreover, work designing agent-based models of human creativity in a social context has been successfully completed [15], [16]. Models of individual creativity are not present whatsoever in current models of micro-foundations of organizational routines, although the latter implies the construction of individual and social mechanisms for behavioral stability and change within a larger social context. Although both sciences – that of organizational routines and that of creativity research – attempt

to model human behavior as something varying in stability, they do so from very different perspectives. Furthermore, modeling human behavior is not just about which model to choose, but how to connect several interdependent models to one complex view of human behavior. By transferring concepts from creativity research to organization science, a current gap in work on organizational routines will be addressed in this project. Agent-based modeling will function as a methodological bridge between both disciplines, allowing for an original approach to understanding the micro-foundations of organizational routines.

II. RESEARCH GOALS AND QUESTIONS

Table I summarizes the research goals and questions in this project.

III. METHOD

The three research goals stated in Table I will be operationalized as three separate subprojects. The questions corresponding to each research goal will be addressed by the methods described per subproject in the following.

A. Subproject 1

Exploring individual and social mechanisms creativity researchers and organizational scientists assume to be responsible for behavioral stability and change will be achieved with the Delphi method [11]. This is technique used to structure group communication on developing solutions to complex problems. The group usually consists of experts from

different domains, each able to contribute specific knowledge to solving the problem. In its original form, it is carried out as disparate rounds of questionnaires. A facilitator analyzes the questionnaires before each new round starts to give experts feedback on others' solutions and group tendencies to solving the problem. In each new round, experts can change their answers. Participants remain fully anonymous, and their expertise is seen as potential to optimize solutions. The Delphi method will be implemented to professionally consult selected creativity researchers and organization scientists on the following issues: mechanisms (micro-foundations) of human stability and change (e.g., habits, cognitive frameworks, memory, social influence), ideas on what may currently be lacking to define such mechanisms, how different mechanisms can be connected, how individual creativity can be linked to organizational routines. The goal of this subproject is to conceive a framework to describe how both disciplines construct behavioral stability and change particularly with respect to the formation of routines.

B. Subproject 2

The results from Subproject 1 serve as precursory quality assurance for this subproject. Only mechanisms considered having the greatest impact on behavioral stability and change, according to the experts in Subproject 1, will be chosen for modeling. The method of agent-based modeling will be used to design and test agent prototypes in a generic model of organizational routines. The agent prototypes will be constructed in NetLogo [38], a modeling environment

TABLE I.
RESEARCH GOALS AND QUESTIONS

No.	Goals / Questions
1	Explore individual and social mechanisms for behavioral stability and change
1.1	Which constructs do creativity researchers & organization scientists use to describe/explain behavioral stability and change on individual and social levels? In which <i>targets</i> , i.e., real-world task scenarios, are the constructs applied?
1.2	What similarities & differences exist between the constructs used by these scientists? Can a mutual framework be derived to describe how behavioral stability and change is constructed in both disciplines?
2	Model individual and social mechanisms for behavioral stability and change
2.1	Which constructs determined in Goal 1 are most suitable for modeling individual and social mechanisms particularly in organizational routines?
2.2	What would these constructs look like operationalized as programmed prototypes (agents)?
2.3	How would these agents' behavior/performance compare on a generic routine (task)?
3	Apply individual and social mechanisms for behavioral stability and change
3.1	Which targets are suitable for testing the agents' behavior within a more complex organizational environment?
3.2	How do the agents' behavior/performance compare on these tasks?
3.3	How can the validity and feasibility of using these agents for modeling organizational routines be evaluated? What value do they contribute to modeling routines?

suitable for this subproject's goals and for demonstration to non-modeling audiences. The generic model of organizational routines will be designed after recent computer models [24], [25], [31]. In these models, an organizational routine is operationalized as repeating sequences of n disparate actions (enactments) and an $n*n$ matrix saving the conditional probabilities between all possible actions (representation). Specifically, previous enactments affect upcoming ones in terms of "action pairs", i.e., the next action to be taken in a sequence depends on the conditional probabilities between the current action and all other possible actions. To agents on the micro-level, the routine is a first-order Markov process. These models, however, only use one type of agent. The performance of the agent prototypes in this setting will be characterized by output measures describing qualities such as the recognizability, repetition, formation, adaptation and stability (change) of their collective behavior [16]. Currently, these qualities are commonly used to describe routines [1], but they are not linked to specific or standardized measures. An auxiliary goal of this subproject is to define specific ways to measure these attributes. This will allow a concrete and quantitative comparison of their behavior, therewith facilitating the assessment of how similar the proposed mechanisms for behavioral stability and change are.

C. Subproject 3

In this subproject, companies our research team already collaborates with will be asked to "donate" example routines to retest the agent prototypes in more realistic and applied scenarios. The same agents and output measures will be used as in Subproject 2. The overall goal at the end of this subproject is to evaluate the insight gained with all three subprojects and to compose a comprehensive framework on which micro-foundations (individual and social mechanisms for behavioral stability and change) are constitutive for describing, explaining and implementing organizational change in terms of routines.

IV. Conclusion

This project started in April, 2014, and its current focus is Subproject 1. The sampling procedure as well as the interview questions are momentarily being developed for the Delphi technique. Moreover, initial preparations are being made for Subprojects 2 & 3. A preliminary prototype agent-based model is being built, and informal discussions about exemplary routines from practice are being conducted with collaboration partners.

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