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Temporal trajectories of enacted complexity in creative project teams

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ABSTRACT

With technologies to capture fine-grained measures of behavior now more ubiquitous, organizational researchers are now able to consider networks of actions performed by multiple actors as a unit of analysis. We apply the action network construct as a measure of enacted complexity. Because previous conceptualizations of complexity viewed the construct as a descriptive organizational property, capturing this property over time was a non-issue. But given the emergent nature of enacted complexity, questions about how complexity unfolds over time become meaningful. This paper thus examines how enacted complexity unfolds over time by investigating the temporal trajectory of actors and actions. We present our findings from an analysis of 11,023 task sequences of four videogame development projects with qualitative data collected over two years.

With technologies to capture fine-grained measures of behavior now more ubiquitous, organizational research are now able to consider actions as a unit of analysis. To the extent that individuals are embedded in social collectives such as groups and organizations, so too are individual actions embedded within networks of interdependent actions performed by multiple actors. A focus on the patterning of actions is crucial not only because actions are how things get done. Just as importantly, the patterning of actions reveals sequential relationships between actions, which in turn conveys insights about interdependencies between actions that frequency counts do not.

In this paper, we analyze the patterning of actions through the concept of action networks. An action network refers to the patterning of action represented as a directed graph where vertices represent categories of action and the edges represent sequential relations between those categories (Pentland, Recker, & Wyner, 2016). We apply the action network concept to emerging ideas about complexity (Poulis & Poulis, 2016). Specifically, we examine how complexity unfolds over time by examining trajectories of enacted complexity, which can provide new insights into the complexity of organizing compared to global measures that treat complexity as a phenomenon that occurs at a single moment in time.

Prevailing conceptions of organizational complexity view the configuration of organizational structures as an adaptive response to environmental stimuli. This perspective does not account for the agency of organizational actors in responding to complex environments. Organizational actors are portrayed as “effortless adaptive machines” (Poulis & Poulis, 2016: 505) that seek to internally match the complexity of internal configuration to the external environment for the goal of survival (e.g., Eisenhardt & Piezunka, 2011). Consequently, complexity has largely been theorized as an antecedent of organizational phenomena or a control variable, and rarely as a dependent variable or focal phenomena of interest for investigation (Hærem, Pentland, & Miller, 2015). This has led to claims that the complexity literature "routinely privileges the deterministic role of the environment in shaping choices and largely neglects equally influential individualistic concerns" (Poulis & Poulis, 2016:518).

Recent developments in the literature increasingly acknowledge the influence of agency in organizational responses to environmental complexity. In their study of 3M, Garud and colleagues (2011) found that interwoven complexity arrangements consisting of combinations of practices afforded organizational actors with multiple agentic orientations over the course of the innovation journey. Hærem and colleagues (2015) emphasize that in interdependent tasks performed by multiple actors, the processing of information cues and the performance of actions depend on the "expertise and individual differences of the perceiver/enactor". From this perspective, complexity is not simply an outcome of random variation and natural selection processes, but emerges from the interplay between interdependent actors, traits, and structures (Giddens, 1984; Hærem et al., 2015; Poulis & Poulis, 2016). This agentic perspective of complexity views it as more than just a static variable or "idealized description" (Hærem et al., 2015) of how the parts cohere, but as a dynamic phenomenon that emerges through the patterning of actions performed by multiple, interdependent agentic actors. Whereas earlier perspectives of complexity privileged random variation as its source, an agentic view of complexity emphasizes its emergent, intentional, and enacted aspect.

To capture the emergence of enacted complexity, we adopt a 'strong-process perspective' (Langley & Tsoukas, 2016:4) that views complexity as constituted through the actions of multiple actors. Actions are connected to one another in time, and it is this patterning of actions that constitutes complexity. The strong process perspective treats complexity as movement

(Chia, 1999) or flow (Hernes, 2014) that is revealed through its temporal trajectory – the "pattern, or patterning, of events that stretches back into time and extends into the future" (Hernes, 2017: 603).

Because previous conceptualizations of complexity captured global properties of complexity, time was a non-issue. However, when complexity is considered as enacted from a process perspective, the focus on the temporal flow of actors and actions brings time to the forefront. As Sorokin and Merton (1937: 615) argued, 'No concept of motion is possible without the category of time'. Consistent with a process perspective, this means seeing the patterning of actions as the ordering of time (Bergson, Whitehead), rather than actors and actions as mere events along a timeline. Time is also of critical importance from the perspective of practitioners and should also be a central concern for researchers. In organizations, projects take place over many months, so using theory that treats these projects as if they were a single moment in time risks overlooking "the temporality of the performative flow of living with its characteristics of emergence, unpredictability, and irreversibility" (Simpson & Lorino, 2016: 65).

This research thus examines how enacted complexity unfolds over time by investigating the temporal trajectory of actors and actions in the context of videogame development.

METHODS

We address this question by computing the enacted complexity of four videogame development project teams at different levels of temporal granularity and comparing these indices with qualitative data from ethnographic observations and interviews. The primary source of data was archival task schedules of videogame development project teams. This data was supplemented by real-time observations and interviews to establish a deeper contextual understanding around the primary archival data.

Research setting

The research context for our study is videogame development, which is a type of creative project (Obstfeld, 2012). Creative projects consist of an emergent trajectory of interdependent action initiated and orchestrated by multiple actors to introduce change into a social context. The nature of these departures could be in the form of new elements, or new linkages between familiar elements. Creative projects are an ideal setting for studying enacted complexity. These projects are a source of emergent actions enacted by actors who are "projecting a new end stage" (p. 1572). Since "repetition is not a guide on what to do next" (p. 1571), actors are less constrained by past routines and have a considerable degree of agency over their actions. Creative projects thus allow for more endogenous variation in enacted complexity independent of descriptive complexity.

The data was collected from project teams at an independent videogame development studio as part of a larger research study. Our findings are based on data from four project teams in this studio.

Data sources

Our primary data source for creating action networks came from task schedules that contained logs of tasks assigned to everyone. These documents were updated daily by the team and daily versions of these documents were downloaded by the researchers. Task sequences were extracted from these logs and categorized by four research assistants as either Administration, Experimenting, Building, Revision, Refinement, or Testing. A total of 11,023 task sequences from four projects were identified. These sequences were entered into Threadnet software (Pentland et al., 2016) which calculated scores for enacted complexity and visualized the task sequences as an affordance network (see Appendix A).

Secondary data sources consisted of 147 observations of team meetings and 9 formal semi-structured, and 24 informal interviews with team members and key informants. Ratings of project performance and descriptive complexity were obtained from producers and senior executives (CEO, COO) of the studio.

PRELIMINARY FINDINGS

For each project, we computed the overall level of enacted complexity (Table 1) and tracked complexity over time (Figures 1a and 1b). We will interpret these findings and develop insights in conjunction with an analysis of the qualitative data to elaborate on how the level of temporal granularity can provide insights into the complexity of organizing.

Table 1. Descriptive summary of project teams

Project	Project Description	Performance	Enacted Complexity	Descriptive Complexity
BQ	Action adventure game where mice banded together to save the world from evil. Sponsored by foundation with the goal of getting kids to make wise life choices.	3.28	18.12	4
MV	Programming robotic toys to battle one another. There is an online leaderboard and players can also earn or purchase "power-ups" online.	4.22	17.80	5
LB	Game is to use turtle-shaped controllers to guide a turtle through the Pacific Ocean. Game is an add-on attraction at Sea World's turtle exhibit.	4.28	7.24	3
REN	Basketball simulation game for NBA franchise. Non-interactive. Similar to Championship Manager where the match-up unfolds automatically.	3.33	6.92	4

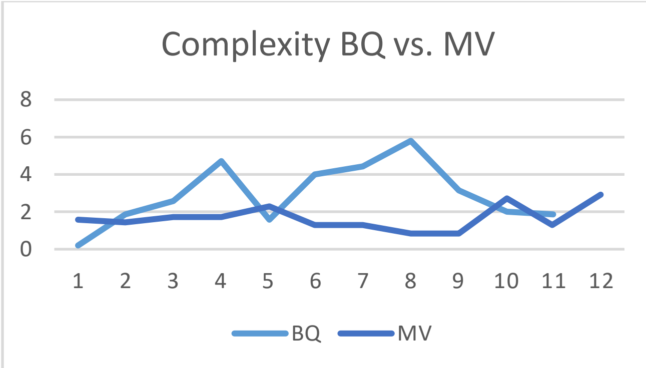


Figure 1a: Enacted complexity index over time for Projects BQ and MV

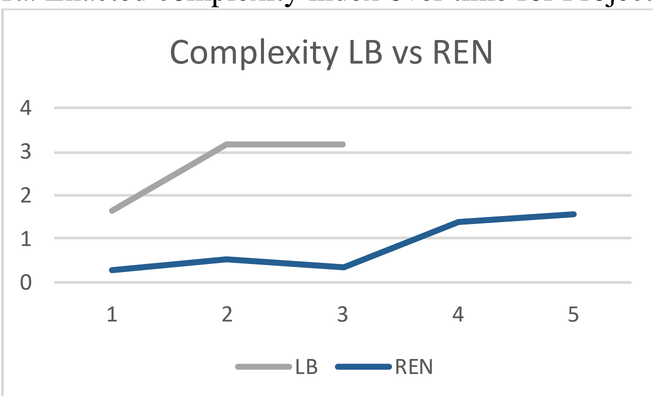
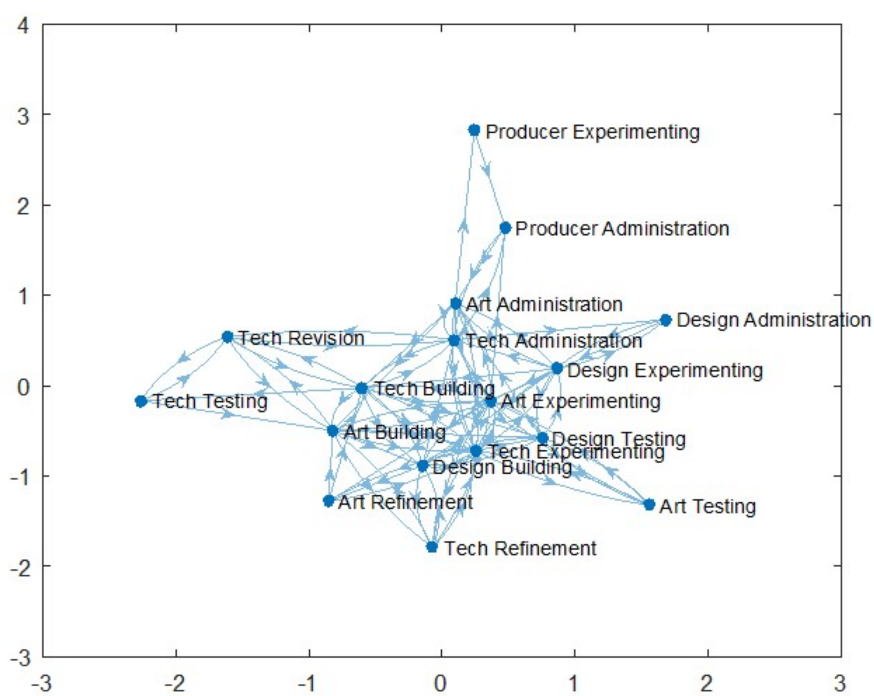


Figure 1b: Enacted complexity index over time for Projects LB and REN

APPENDIX A

Affordance network of task sequences for Project BQ



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