

D Network Organization Paradigm

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Introduction

Fervent communication on social networking sites provides opportunities for potential issues to trigger individuals into individual action as well as the attraction and mobilization of like-minded individuals into an organization that is both physically and virtually emergent. Examples are the rapid pace of Arab Spring and the diffusion rate of the Occupy Movement. We intend to view this as a complex adaptive system where diverse agents perform various actions without adherence to a predefined structure. The achievement of joint actions will be a result of continual interactions between them that shape a dynamic network. Agents may form an ad hoc organization based on a dynamic network of interactions for the purpose of achieving a long-term objective, which we termed as a *Network Organization* (NO).

An NO is introduced to present large, semi-autonomous, ad-hoc networked individual entities that aim to automate command and control of distributed complex objectives. We introduced a paradigm that serves as a reference model for organizations of networked individuals. This paradigm suggests modular components capturing essential units that define an ad hoc NO when they are modularly combined. We touch on how this model accounts for external change in an environment through internal adjustment. Furthermore, due to the predominant influences of the network substrate in an NO, multiple effects of it have an impact on the NO behaviors and directions. We envisioned several dimensions of such effects to include synergy, social capital, externality, influence, etc. A special focus is on measuring *synergy* and *social capital* as two prevalent network effects.

An NO Paradigm

Given volatility of networks, an NO paradigm allows for rapid depiction and analysis of an

emerging and evolving NO witnessed in our connected world. It encapsulates representational power of a more ubiquitous perspective over its modifier by providing guidelines, a reference model, and a set of principles. In short, the paradigm is structured along five profiles:

- *Network Profile*: The dynamic network will provide an NO with a set of existing agents and available resources along with initial protocols.
- *Agent Profile*: Every agent has a profile that consists of her allegiance to an NO, skills to perform tasks, relationships with others (inside or outside an NO), a set of preferences as well as autonomy-levels toward different activities.
- *Problem Profile*: Agents are expected to perform different actions that in part satisfy their organizational charter. Those actions are specified through different problem profiles. Each problem should determine a goal to be achieved and the strategy of controlling and coordinating different parts of it. The precedence and independence of this problem from others should also be considered.
- *Governance Profile*: This profile defines control for an NO. It includes the organizational charter that generates multiple problems and the different patterns of connecting them. Also, the current performance and the autonomy-level of an NO will be updated continuously in this profile.
- *Institution Profile*: An NO receives some regulations and classifications from multiple institutions it belongs to in order to satisfy their global charter that is much bigger than the organizational charter.

Figure 1 depicts an overview of an NO when connecting the components of the proposed paradigm together. The f s represent different functions to transfer from one state to another. Network effects, considered in the next section, play important roles in the state " f_4 " to increase performance, and in state " f_7 " to help an NO to plastically transform adopting to outside or inside requirements.

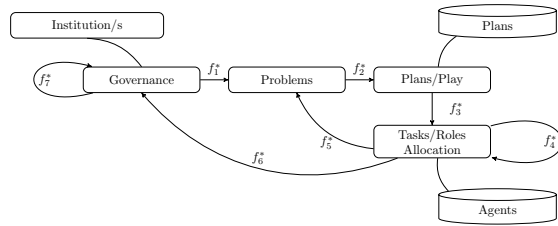


Figure 1: Architecture of an NO paradigm

Network effects in an NO

An NO replicates many properties and features of virtual working groups. A specific salient phenomenon is how working together in a network affects their individual as well as collective productivities. Network effects can be found at various levels of mutually beneficial groups of work because they are responsible for enhanced collaborative outcomes in an NO. Thus, we consider two different types of network effects featured in an NO that are synergy and social capital.

Synergy describes different modalities of compatibilities from one agent to another when performing a set of coherent and correspondingly different actions towards their organizational objectives. Agents of an open multi-agent system, such as an NO, are self-governed by their own belief system and they have a free will to contribute. When agents are under no structural obligation to contribute, synergy is quantified through multiple forms of the serendipitous agent's chosen benevolence. The approach is to measure some natural types of benevolence and the pursuant synergies from them stemming from agent interactions.

Social Capital observes the accumulation of positive values of social flow and trust plus abundance of communications over the common topic of an NO. By the time the social capital grows inside an NO, it will gain structural, relational and cognitive benefits. It allows for major changes within an NO (e.g., launch of new strategic plans) by improving trust, ties, norms, cultural, and acquisitions; however, the lack of it may affect the outcome of an NO. An assessment model was proposed to measure this effect on relations between agents operating in a large-scale open service-oriented organization, such as an NO. Similar mechanisms can estimate the future behavior of

agents and agents' peers in order to simplify the interaction process with those peers.

We modeled both effects from agents interactions. Measurements of finding such effects are applicable to real world as well as artificial NOs. We examined those two effects on two different case studies that best illustrate the main tenets of our conceptualization. The first case is of a multiplayer online role playing game that helped us mimic an actual NO and measure different values of synergy. The second case is based on a real world NO of a terrorist organization, called *Aum Shinrikyo*, that allowed us to exemplify the paradigm and measure social capital.

Conclusion

The salient properties that set NOs apart from other organizational paradigms are: a. Openness, b. Evolving structure, c. Selfish allegiances and community social power, and d. Impromptu network topology. An NO can be a small team of two or more agents working on a common, quick goal that is possibly faster than human perceptual threshold (e.g., aerial coordination at high speeds) or a large collection of agents made up of thousands of people (i.e., possibly swarms) working on long term objectives that are possibly beyond a single human's cognitive capacity (e.g., detecting climate change).



Saad Alqithami obtained his Ph. D. and masters from the department of computer science at Southern Illinois University in 2016 and 2012 respectively. He holds a faculty position at Albaha University, Saudi Arabia since 2009. His research interests include issues

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