Complexity-thinking and social science: Self-organization involving human consciousness

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ARTICLE INFO
Article history:
Received 6 February 2016
Received in revised form 1 January 2017
Accepted 16 March 2017

Keywords:
Self-organization
Complexity-thinking
Self-cultivating self-organization
Self-presenting self-organization

Abstract
Complexity-thinking refers to a cluster of concepts popularized in several branches of science, primarily in the physical sciences but increasingly in the social sciences. There is reason to be cautious regarding how the concepts are used across disciplines and branches of science. This paper discusses self-organization in dynamic systems, tracing its roots in social science and critiquing current usage of the term with regard to systems involving consciousness - humans and groups of humans. A brief sketch of the levels of complexity sets the groundwork for understanding the critique of self-organization to follow. I argue that consciousness fundamentally changes the terms of discussion in self-organization by adding a self/selves that is not equivalent to the system as a whole, but which directly influences what is organized, how, and toward what end. Self-organization in complex adaptive systems involving consciousness should be distinguished as self-cultivating self-organization and self-presenting self-organization.

1. Introduction
Several books appeared in the 1980s and 1990s that popularized a group of concepts in science: specifically the concepts complexity (Holland, 1995; Waldrop, 1992), chaos (Gleick, 1987), self-organization, emergence (Nowak & Vallacher, 1998; Prigogine & Stengers, 1984) and dynamic systems (Capra, 1996; Thelen & Smith, 1994). While these concepts have different disciplinary histories, they are frequently grouped together, often under the rubric complexity thinking (Capra, 1996). These complexity concepts are now widely used in many branches of science, and increasing are being applied in psychology, education, nursing, and other social sciences. There is reason to be cautious regarding how these concepts are used, however, especially across the levels of complexity that separate material science and social science. On the other hand, insights of complexity science may hold great promise for a more adequate social scientific perspective if we can avoid the dangers of uncritically using concepts developed in material science to conceptualize living systems such as persons and groups of people.

This paper begins by grappling with some of the terminology of complexity thinking, noting that some terms, and ‘systems thinking’ in general, have long been used in social science. A brief sketch of the levels of complexity sets the groundwork for understanding the critique of self-organization to follow. The critique, in short, is that there is a vital difference between self-organization in systems that involve consciousness (those of interest to psychologists, educators, and social scientists generally) and self-organization in systems that are not conscious. If this is the case, several implications follow, including changing the way we speak about self-organization in the social sciences to reflect the role of consciousness in that self-organization.

1.1. The complexity cluster

Some of the terms in the complexity cluster can be found historically in both social science and material science (including physics), while others, such as chaos and complexity were developed and are used almost exclusively in material science. I will focus on dynamic systems and self-organization – each of which grew at least partly out of studies in nonlinear change in the organization and growth of living things - living systems. Accounts of the development of complexity thinking as a whole suggest that this perspective has coalesced since the 1930s through insights in a variety of fields including physics, biology, psychology, ecology, and material science (Capra, 1996; Gleick, 1987). As noted in the following brief review, these terms have been active in social science discussion for longer than that, and hence, the full story of

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social scientists’ contribution to dynamic systems has yet to be told.

The scientists who formulated the science (Bertalanffy, 1968; Boulding, 1956; Holland, 1995; Prigogine & Stengers, 1984); the writers who popularized the ideas (Capra, 1996; Gleick, 1987; Waldrop, 1992); and those in the social sciences who have taken up aspects of this approach (Thelen & Smith, 1994; van Geert, 2012) all speak of complexity thinking as a universalizable approach to non-linear change. It is useful, they argue, for describing certain types of complex systems wherever they are found. This includes non-linear behavior in micro-particles, in cells, in organisms, including humans, in ecologies and societies, and in the universe of planets and stars (Capra, 1996; Waldrop, 1992). While I am not challenging that claim of universal relevance, I do argue that self-organization is sufficiently different as a process when dealing with human consciousness that some way of designating that distinction is intellectually necessary in psychology and social science more broadly.

2. Dynamic systems, complex systems, and systems thinking

Of all the concepts in the complexity thinking cluster, systems thinking and dynamic systems terminology are perhaps the most accessible to social scientists, having a long history in psychology. Capra (1996) reports that “the main characteristics of systems thinking emerged simultaneously in several disciplines” (p.17) during the first half of the 20th century, especially biology which “emphasized the view of living organisms as integrated wholes,” Gestalt psychology, and ecology (p. 17–18). Byrne and Callaghan (2014) argue that what makes complexity thinking a universalizable explanatory frame is that it speaks in terms of complex systems, and systems that can be described as complex exist in many scientific disciplines. “When we talk about complexity we are talking about systems. Complexity is a property of systems” Byrne and Callaghan note (2014 p. 3). Morin (2008) argues that:

The scope of system theory is… quasi-universal, because, in a certain sense, all known reality, from the molecule to the cell to an organism to a society, can be conceived of as systems. That is to say, they can be conceived as the interaction of different elements” (Morin, 2008 p. 9 p. 9)

Murphy (1997) notes that systems thinking emphasizes process:

One has to give up the traditional Western philosophical bias in favor of things, with their intrinsic properties, for an appreciation of processes and relations; the components of systems are not things, but processes. (p. 32 emphasis added)

In their book Dynamical Social Psychology (1998), Nowak and Vallacher argue that dynamic systems thinking is congruent with many important traditions in social science:

The subject matter of social psychology is inherently dynamic. It is hard to conceive of action without movement, judgment without a flow of thoughts, emotion without volatility, social interaction without an ebb and flow of gestures and words, or social relation without ongoing evolution of roles and sentiment. (Nowak & Vallacher, 1998 p. vii)

Further, they note that “the nature of human dynamism provided a focal point in the earliest attempts to characterize experience in interpersonal contexts, as reflected in the seminal work of such figures as James, Mead, Cooley, Lewin, and Asch” (Nowak & Vallacher, 1998 p. vii).

Byrne and Callaghan (2014) trace systems thinking back to a wide array of intellectuals, including Darwin, Marx, Parsons, Durkheim, and Weber, illustrating something of the role social science has played already in the development of this aspect of complexity thinking. They note: “systems theories [and] explanations with an evolutionary character have emerged alongside, rather than deriving from, natural science and they continue to play an important role in much social theory to the present day” (Byrne & Callaghan, 2014, p. 88).

In A dynamic systems approach to the development of cognition and action, (1994) Thelen and Smith argue that dynamic systems and related concepts are the appropriate way to think about and describe the complexities of human development.

In our approach to fundamental questions of mental life, we invoke principles of great generality. These are principles of nonlinear dynamic systems, and they concern problems of emergent order and complexity: how structure and patterns arise from the cooperation of many individual parts. (Thelen & Smith, 1994, p. xiii)

The authors argue that this approach allows us to ask questions we have not previously been equipped to address, such as: “What are the organic and environmental factors that engender change?” and “How can we begin to untangle the complex web of causality when real infants live and develop in a world filled with people, things, and events in continuous interaction?” (p. xiii).

Like other systems that have been studied, such as the development of weather patterns or growth patterns of species in a geographic region, the development of cognition and action are not preprogrammed, Thelen and Smith note (1994). Rather, cognition and action emerge from a complex interaction in development, and in interaction with the environment, itself best conceptualized as a complex system. Thelen and Smith say in summary: “It is a science for systems with a history, systems that change over time, where novelty can be created, where the end-state is not coded anywhere, and where behavior at the macrolevel can, in principle, be reconciled with behavior at the microlevel” (1994, p. 49). The developing systems Thelen and Smith described include aspects of learning to walk, and learning to think.

Additionally, Nowak and Vallacher (1998) argue that a systems perspective will help synthesize the atomized social psychology of the past hundred years:

For the better part of the 20th century, social psychological research has attempted to isolate causal mechanisms with respect to distinct aspects of interpersonal experience. The methods spawned within this approach have been quite successful in identifying the key features of human thought and behavior. With the advent of the dynamical approach, it is now possible for investigators to assemble sets of such mechanisms into coherent systems. (p. viii)

Waldrop (1992) discusses similarities across complex systems as diverse as: the political entity the Soviet Union, the New York Stock Exchange, ecosystems, birth rates among rural poor families, the creation of living cells from ‘chemical soup’, natural selection and evolution, and the human mind. He argues that every one of these systems...

...is complex in the sense that a great many independent agents are interacting with each other in a great many ways. Think of the quadrillions of chemically reacting proteins, lipids, and nucleic acids that make up a living cell, or the billions of interconnected neurons that make up the brain, or the millions of
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