Chapter 28
New Leadership Paradigms in the Complexity Science

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Leadership is a term that has long attracted interest. The word 'leader' evokes images of influential and dynamic individuals who achieve superiority. Leadership reminds many questions: Why and how do certain leaders inspire such commitment? Why and how do certain leaders achieve such attention? And why do certain successful leaders then just fall out of favour? Such questions surrounding leadership have long been a topic of speculation.

Hunt (1999) states that existing leadership theory neglects the complexities of the leadership role because most definitions reflect the assumption that it is a process whereby intentional influence is exerted by one person over another (Yukl 2006).

Besides new models of leadership continue to develop, including a model of leadership for the new organizational form, where leadership relies less upon managerial authority and a new set of ideas that transcends the physical, biological, and social sciences, referred to as Complexity Theory (Schneider 2002).

Organizations are dynamic and so should their leaders be. Dynamic leaders are behaviorally complex, so effective leaders apply appropriate behavior to the demands of the situation. In order to cope with the problems of reductionism and determinism, Marion and Uhl-Bien (2001) recommend exploring leadership from the perspective of Complexity Theory. Complexity Theory is the study of complex and chaotic systems and how order, pattern, and structure can arise from them (Marion and Uhl-Bien 2001). In the natural sciences Complexity Theory has

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evolved for many years but has only recently realized as a metaphor for studying leadership and organizations within the social sciences. This research investigates empirically leadership and organizations through the lens of Complexity Theory by exploring the complex and chaotic contextual factors that leaders experience. This research contributes to the evolving process of the study of Complexity in the arena of leadership by contextualizing the literature.

The study of leadership from the perspective of Complexity Theory is about adaptation in response to uncertainty. Lawrence et al. (2009) maintain leaders with a large behavioral repertoire are more adaptable than those with a limited repertoire of behavior. Behavioral Complexity is operationalised using Lawrence et al. (2009) Competing Values Framework. The Competing Values Framework is a measure that captures the extent to which leaders demonstrate four behaviors on four quadrants: Control, Compete, Collaborate and Create, which are argued to be critical to all types of organizational leadership. Leadership effectiveness is defined in terms a leader's level of "Overall Performance", their "Ability to Lead Change" and their capability to "Influence".

Schneider and Somers (2006) contribute to the linkage of Complexity Theory (CT) and leadership by suggesting how leadership within a Complex Adaptive System (CAS), one type of dynamic system under CT, might influence or shape the CAS. They attempt to fill a critical step in developing linkage of the existing literature on Complexity Theory and leadership with the ambitious objective of development and testing of a CT-based leadership model. This effort is aligned with the broader quest to move from generalizations about dynamic systems to tools and processes for understanding these systems (Sterman 2000).

28.1 General Systems Theory

In the General Systems Theory, some systems phenomena were thought to be of universal significance for all disciplines (Boulding 1956). These phenomena involve populations of individuals in interdependent relationships and the interaction of these individuals with their environment, governed by the principle of equilibrium or homeostasis. Systems were categorized into a hierarchy based upon their complexity. Greater levels of complexity were thought to be regulated by the principle of self-maintenance. Social organizations were considered to be complex (Boulding 1956). Katz and Kahn (1978) captured GST's application to organization theory in describing its emphasis on relationships, structure, and inter-dependence, and delineated ten characteristics of Open Systems (Table 28.1) (Schneider and Somers 2006).

General Systems Theory has had a large influence on leadership research, creating a lens of systems thinking with a framework, such as Hunt's (1991) theory of leadership, Jaques' (1976) general theory of bureaucratic organizations, and Fiedler's (1967) Contingency Model (Schneider 2002).

Table 28.1 Comparison of properties of open and complex systems

Properties of open systems		Properties of complex systems	
(1) Importation of energy	Energy is imported from the environment	(1) Importation of energy	Energy is imported from the environment
(2) Throughput	Inputs are converted through the use of energy	(2) Throughput	Inputs are converted through the use of energy
(3) Output	Produced output is exported into the environment	(3) Output	Produced output is exported into the environment
(4) Cyclicality	System events are structured by cycles	(4) Chaos	CAS are poised systems that function at the edge of chaos for optimal buffering and adaptability
(5) Negative entropy	The transformation cycle is a cycle of entropy, leading to disorganization or death. To survive, negative entropy is acquired by storing energy from the environment	(5) Emergence	Some activity occurs that is not induced by the environment, but instead, results from the interdependence of system components
(6) Information input, negative feedback, and the coding process	Inputs consist of information and signals about the environment and system functioning, as well as materials that are transformed. Negative feedback allows for necessary correction. Information must be coded appropriately to be meaningful	(6) Information input, negative feedback, and the coding process	The interactions of system agents or elements with one another are need-based, bottom–up, and emergent, and are associated with the presence of catalysts and feedback mechanisms
(7) Steady-state and dynamic homeostasis	The basic principle is the preservation of the character of the system. In countering entropy, systems move toward growth and expansion, as they tend to import more energy than is necessary	(7) Adaptation	The basic principles are preservation and adaptation of the character of the system
(8) Differentiation	There is movement toward greater differentiation, specialization, and elaboration	(8) Differentiation	N (the number of sub-units) blends with the intra-system variables K and P and the intersystem variable C to achieve a poised system
(9) Integration and coordination	Greater integration and coordination are necessary to counter the tendency toward greater differentiation	(9) Integration and coordination	The intra-system variables K and P blend with N and the inter-system variable C to achieve a poised system
(10) Equifinality	The same final state can be reached from differing conditions and a variety of paths	(10) Path dependence	Unique final states may be reached due to sensitivity to initial conditions

Schneider and Somers (2006), adapted from Katz and Kahn (1978)

28.2 Chaos and Complexity Theories: New Factors in Leadership Discourse

Complexity brings new principles into existence about a type of system, named as Complex Adaptive Systems. Having ideas deep in historical roots, the theory gained ground in the 1980s with formation of the Santa Fe Institute (Schneider and Somers 2006). This new theory is named as a paradigm shift from previous science (Wheatley 1994) and moreover some explained that it is a new paradigm by associating previous science with Modernism and Complexity Theory with Post-Modernism (Schneider and Somers 2006). Organizational complexity had been defined as the number of activities or sub-systems within an organization, with the dimensions of vertical or number of levels; horizontal or number of units, departments or divisions; and spatial, the number of geographic locations (Daft 1992). Schneider and Somers (2006) explain Complexity Theory as that there are three inter-related building blocks of Complexity Theory – non-linear dynamics, chaos theory, and adaptation and evolution. Complex systems are non-linear, meaning events within complex systems do not follow direct sequences. Neither are the effects proportionate to the cause; big effects can have small consequences and small effects can have big consequences, this phenomenon is referred to as the butterfly effect. Chaotic systems and complex systems are different, for complex ones are less mechanical and more stable and predictable, Chaos Theory does inform Complexity Theory, as both concern non-linearity (Marion 1999). Chaos is critical to the process of adaptation and evolution. Not all systems have equal capacity to evolve; this capacity reflects the system's mix of chaos and anti-chaos, or order (Kauffman 1995).

While Complexity Theory has promoted a re-examination of leadership, it has been suggested that leadership may be crucial to the process of self-organization (Knowles 2001) and leaders might serve as context setters and designers of learning experiences (Schneider and Somers 2006). In complexity theory the leadership process is different, for in complex systems leadership does not rely on formal authority structures, moreover it is contrary to the authority structure as it may well influence the process of emergence or self-organization. The difference in process implies that the leader is also qualitatively different. Leaders influence other persons and processes (Marion and Uhl-Bien 2001). They do not rely on authority and might consciously initiate their leadership role, or might accept the role that has been given at them.

28.3 Conclusion

Complex systems perspective introduces new leadership logic to leadership theory by explaining leadership in terms of an emergent event rather than a person. It suggests a form of distributed leadership in an interactive dynamic, within which

any particular person will participate as leader or a follower at different times and for different purposes (Lichtenstein et al. 2006). It is not limited to a formal managerial role, but rather emerges in the systemic interactions between heterogeneous agents (Marion and Uhl-Bien 2001).

Leadership emerging endogenously within interactions, leaders is not assumed to be directing collective action. There is no linear cause-effect relationship to discover. Indeed, leadership might a term that is descriptive of certain social forces among actors, which may include a formal leader. Complexity leadership theory also reflects a new approach to understanding dynamic organizational capabilities, including innovation (Lichtenstein et al. 2006).

To conclude, leadership is the emergent result of interacting individuals such that behavior and resource elements of the organization come together in useful ways. We can state a frame that can be formalized in terms of dynamic organizational capabilities and routines. Adopting complexity thinking does not throw away existing practices, but it does change our attitude to their likely success. Complexity thinking addresses the balance between assuming predictability and stability, and handling uncertainty, novelty and change. As such, it reflects the complexity of the real world, increases the relevance of our leadership theories, and provides new insights for students, researchers, and managers in the complex world of leadership.

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