Eco-Leadership, Complexity Science, and 21st-Century Organizations: A Theoretical and Empirical Analysis

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Introduction

Throughout the 20th century, the traditional approach to leadership was based on "machine metaphors and machine-like assumptions" (Allen, Stelzner, & Wielkiewicz, 1999, p. 67; Rost, 1997). Leadership was seen as derived from position, vested in an individual, top-down in nature, and "driven by power for the purpose of control" (Allen et al., 1999, p. 67). The leader and his or her actions were viewed as "more critical than those of any other member of the group" (Wielkiewicz, 2000, p. 335). Those individuals within an organization who were "most competent and loyal" were appointed to leadership positions and assumed responsibility for the organization's overall success; they provided vision for the organization and direction to followers (Chemers, 1997, p. 11). The focus of leadership studies, then, became to make these individuals better leaders, and, indeed, "much of empirical research on leadership focuses on predicting outcomes that reside at the individual level of analysis" (DeChurch, Hiller, Murase, Doty, & Salas, 2010, p. 1069).

However, in today's rapidly changing, increasingly complex and interdependent world, our models of leadership simply have not yet fully caught up with the leadership dynamics of a 21st century, knowledge-driven society (Avolio, Walumbwa, & Weber, 2009). The traditional notion of leadership as "having a vision and aligning people with that vision is bankrupt…" (Heifetz & Laurie, 1997, p. 126). Relying on a few, elite positional leaders is "inadequate for dealing with the complexities of the modern world" (Wielkiewicz, 2000, p. 335). The romantic notion of a heroic individual leader may simply no longer be tenable (Avolio et al., 2009). Such approaches leave us ill-equipped to meet today's complex challenges because they fail to leverage the collective intelligence, energy, and creativity of all actors in a system. The complexity of new, adaptive challenges — along with the sheer speed of scientific, technological, and societal

change — is simply too much to depend entirely on a small, upper-echelon of positional leaders to provide "the leadership" for an organization (Allen et al, 1999; Western, 2013). It will take all of us. Wielkiewicz (2000) warns of an "urgent need" to radically rethink leadership in a way that "matches the complexity of the systems to which organizations must respond" (p. 335).

Western (2010, 2013) critically examined this shift in society's understanding of leadership through a meta-analysis of historical, socio-political, and economic perspectives, and identified four distinct discourses of leadership occurring in Europe and North America during the past century, which he has dubbed: (a) controller, (b) therapist, (c) messiah, and (d) the emerging eco-leader discourse. The most recent, eco-leader discourse emerged in the early 2000s and is characterized by collective decision-making, collaboration, shared leadership, and grassroots organization. This discourse reflects a 21st century society's attempt to adapt in face of increasingly complex and interconnected challenges that require the resources of whole organizations — to heed the warning that our mechanisms for enacting leadership are becoming outdated (Wielkiewicz & Stelzner, 2005).

As the eco-leader discourse evolves in society, scholars, too, are beginning to understand and study leadership as a complex social phenomenon — "an emergent property of a social system, in which 'leader' and 'follower' share in the process of enacting leadership" — rather than a simple set of traits, skills, or behaviors (Jackson & Parry, 2012, p. 105). The long-running, 20th century, mechanistic understanding seems to no longer be able to adequately explain leadership as the emergent phenomenon characteristic of the more contemporary, ecological worldview of today (Western, 2013). Therefore, just as scholars turned from mechanical to ecological metaphors for explaining the phenomenon of leadership, they have also sought out — and been influenced by — new scientific paradigms in which to ground their theories. One such

"new science" influencing worldviews is complexity science (Lichtenstein, Uhl-Bien, Seers, & Orton, 2006; Marion & Uhl-Bien, 2001; Regine & Lewin, 2000). Though a nascent science, Regine and Lewin (2000) write that complexity science represents a "Kuhnian shift" in the physical sciences, and is expected to have a similar impact in the social sciences. Scholars who have studied business, politics, trends in the stock market, the emergence of life on Earth, the fall of the Soviet Union, the rise of the Arab Spring, or even the movements of flocking birds have all co-opted complexity science when attempting to explain these complex interactions inside complex adaptive systems (Davis, 2004). This connectivity among actors within a system is one of the hallmarks of both the ecological forms of leadership and complexity science; it also directly applies to leadership studies (Allen et al., 1999; Western, 2013).

This chapter provides one example of how ecological approaches to leadership might be studied in an effort to empirically support the here-to-fore only conceptual claims that ecological forms of leadership are good for organizations. Indeed, there have been few, if any, empirical studies linking an ecological approach to leadership with organizational success (Lowhorn, 2011; Wielkiewicz, 2000, 2002). This is likely due to a preoccupation with individual leaders and their actions, as well as the difficulty associated with studying the environment in which leadership occurs from a complexity viewpoint. We will discuss the promise of complexity science in leadership studies, the 21st century organization as an ecological system, as well as just what an eco-leader might do to bring about change. Finally, we will offer findings to support the claim that an ecological approach to leadership just might lead to more adaptive organizations that have greater success over time.

The Promise of Complexity Science in Leadership Studies

At its core, complexity science is a repudiation of the reductionist approach to scientific inquiry. Richardson, Cilliers, and Lissack (2001) write: "Where we once focused on the parts of a system and how they functioned, we must now focus on the interactions between these parts, and how these relationships determine the identity, not only of the parts, but of the whole system" (p. 6). Complexity science is, therefore, typically applied to complex systems — social movements, flocking birds, the emergence of life on Earth — whose internal structure cannot easily be reduced to a mechanistic system (Allen, 2001). This is in contrast to the traditional approach to science (and the traditional study of leadership), which involves trading the complexity of the real world for a simpler, reduced representation (Allen, 2001). This reduction is based on the assumption that it is possible to: (a) establish a system's boundaries, excluding factors that are less relevant; (b) reduce the "full heterogeneity to a typology of elements"; (c) study individuals of average type; and (d) study processes that run at an average rate (Allen, 2001, p. 24). This process of reduction does take much of the "messiness" out of studying a complex phenomenon like leadership. However, as Finkelstein (2002) writes, "I understand that as researchers we need to simplify very complex processes to study them carefully, but what are we left with when we remove the messiness, the back-and-forth, the reality?" (p. 77).

There is a belief that the use of reductionist approaches has led leadership scholars to fixate on the individual leader's "symbolic, motivational, or charismatic" actions for too long —trading the messy reality of leadership for the clean incompleteness of individual variables (Lichtenstein et al., 2006, p. 2). However, through the lens of complexity science — just as through an ecological approach to leadership — leadership is no longer viewed as a simple, rational exchange between leader and followers. This view "won't fly in terms of explaining the full

dynamics of leadership" (Avolio, Walumbwa, & Weber, 2009, p. 430). Instead, leadership is viewed as an "interactive system of dynamic, unpredictable agents that interact with each other in complex feedback networks…" (Avolio, Walumbwa, & Weber, 2009, p. 430). These interactions foster learning, innovation, and the dissemination of knowledge (Uhl-Bien, Marion, McKelvey, 2007). Moreover, leadership is seen not necessarily as the *intentional* actions or effects of leaders. Instead, leadership "can be enacted through *any interaction* in an organization … leadership is an emergent phenomenon within complex systems" (Hazy, Goldstein, & Lichtenstein, 2007, p. 2). This means leadership, as conceived of by complexity science, is not just the product of, but, also, *is* the interactions of these unpredictable agents. When levels of leader-follower interaction "reach a critical mass, patterns begin to emerge and the group self-organizes…" giving rise to social movements, organizational initiatives, even governments (Gaustello, 2007, p. 606). This is a sea change in leadership studies.

As scholars begin to view leadership as an "an emergent property of a social system," the next step then is to explain *how* leadership emerges (Jackson & Parry, 2012, p. 105). Emergence is a central component of complexity science. Indeed, complexity science's purpose is largely to explain emergence. The study of emergence is not a new one. One of the first written explanations of this concept was by English philosopher G.H. Lewes (1875), who made the distinction between 'resultant' and a term he coined, 'emergent,' when writing on chemical reactions:

> Although each effect is the resultant of its components, we cannot always trace the steps of the process, so as to see in the product the mode of operation of each factor. In the latter case, I propose to call the effect an emergent. It arises out of the combined agencies, but in a form

> which does not display the agents in action… (Lewes, 1875, as cited in De Wolf & Holvoet, 2005, p. 2)

This emergence takes place in a complex adaptive system with a high degree of interactivity among agents; and the interactivity is nonlinear in nature and contains numerous feedback loops (Richardson et al., 2001). This makes establishing cause and effect nearly impossible — some would say irrelevant — leading Lewes to use the term emergent. Emergence, therefore, is best described as "a phenomenon where global behavior arises from the interactions between local parts of the system" (De Wolf & Holvoet, 2005, p. 2). To understand how these micro level interactions (e.g., the continued interactions between disenchanted workers) yield macro level structures (e.g., a strike or larger social movement) gives us insight into how leadership works and what roles so-called leaders may play in the process.

The basic processes used to explain emergence within a complex adaptive system is relatively simple. It is concerned with three factors: microdynamics, macrodynamics, and complex natural teleology. Microdynamics represents the bottom-up behavior that is created when individuals interact; these behaviors can be either coordinated or random. Small groups, dubbed "aggregates," or ensembles (groups of aggregates) begin to form through interaction. In the social sciences, the term aggregates typically describes "small groups of directly interacting actors who have a sense of common identity" (Marion & Uhl-Bien, 2001, p. 400). The effect of this interaction "imparts both a measure of stable order within and among ensembles and a collateral measure of unpredictability" (Marion & Uhl-Bien, 2001, p. 394).

Macrodynamics, on the other hand, is concerned with the resulting "structures and behaviors that emerge unbidden out of an interactive network of ensembles — behaviors that are self-generative, the products of interactive dynamics rather than external force" (Marion & Uhl-

Bien, 2001, p. 396). In other words, macrodynamics is concerned with what emerges from the micro-level interactions of individual agents. In the realm of leadership, "persistently interacting social networks create order, innovation, and fitness, but they ultimately elude control and prediction" because macro-level structures and behaviors arise in non-intuitive ways (Marion & Uhl-Bien, 2001, p. 396). However, uncertainty, unpredictability, and nonlinearity — while they may confound and conceal — are actually what afford complex systems the ability to be dynamic and adaptable. Order and stability in a complex system are necessary and good, but they do not allow for the variation that is crucial to the ongoing survival of the system. However, when you consider that these macro-level structures arise from the various interactions of multitudes of individual actors over time, that there is variety is not what is surprising. It is the emergence of order that is interesting and difficult to explain. Marion and Uhl-Bien (2001) have dubbed the collection of forces that enable this macro-level order "complex natural teleology."

Complex natural teleology is the mechanism that translates micro-level interactions into an order that is recognizable to us as macro-level structures and behaviors, such as leadership in its many forms: social movements, businesses, and governments. Complex natural teleology is comprised of: (a) autocatalysis, the automatic catalysts that foster interaction among actors, particularly "tags," which is any person or structure that speeds interaction; (b) need, the innate desires that drive the autocatalysis process, such as status, power, or resources; (c) physics, the demands or limitations either internal or external that shape the interaction; and (d) natural selection, "the selection of forms from among sets of possible forms (as restricted by physics)," (Marion & Uhl-Bien, 2001, p. 400). Together, these forces are the requisite conditions for micro-level interactions to emerge into an ordered macro-level behavior or structure (Marion & Uhl-Bien, 2001).

How Complexity Impacts Leadership Studies

Therefore, at its most basic level, and from a complexity lens, leadership as we know it arises in the following way: micro-level interactions among individual actors (i.e., so-called leaders and followers), dubbed autocatalytic interactions, occur. These micro-level interactions are driven by need, enabled by human and technological catalysts (or tags), limited by physics, and culled by natural selection. These autocatalytic interactions cause the emergence of macro-level structures and behaviors that yield order, innovation, and dissemination of information — things we would recognize as leadership and the products of leadership (i.e., organizations, movements, flocking birds, etc.) (Marion & Uhl-Bien, 2001). All of this occurs within the complex adaptive system.

The complex adaptive system (CAS), for its part, is the environment — nurturering or otherwise — in which the emergence of leadership occurs. In recent years, scholars searching for a model to "more accurately reflect the complex nature of leadership as it occurs in practice" have employed the CAS as the fundamental unit of analysis for leadership — a shift away from the individual leader (Uhl-Bien & Marion, 2009, p. 631). Complex Adaptive System theory is one of four major schools of thought in complexity science (De Wolf & Holvoet, 2005). Levy (1992, as cited in Uhl-Bien & Marion, 2009) describes complex adaptive systems this way:

> A complex (adaptive) system is one whose component parts interact with sufficient intricacy that they cannot be predicted by standard linear equations; so many variables are at work in the system that its over-all behavior can only be understood as an emergent consequence of the holistic sum of the myriad behaviors embedded within. Reductionism does not work with complex systems, and it is now clear that a purely reductionist approach cannot be applied; …in living systems the whole is more than the sum of its parts. This is the result of

> …complexity which allows certain behaviors and characteristics to emerge unbidden. (p. 631)

Complex adaptive systems can be found nearly everywhere: "ecosystems, the brain, ant colonies, stock markets, just to name a few" (Regine & Lewin, 2000, p. 7). It also provides a new paradigm for studying leadership in a way that "more easily explores issues that confound us from a traditional view — issues of shared, distributed, collective, relational, dynamic, emergent and adaptive leadership processes" — all approaches that fall within the emergent eco-leader discourse and ecological forms of leadership (Uhl-Bien & Marion, 2009, p. 631; Western, 2013). Regine and Lewin (2000) conclude, "the avenue most relevant to understanding organizational dynamics within companies … is the study of complex adaptive systems" (p. 6).

21st Century Organizations Are Ecological Systems

It is easy to see how complexity science supports eco-leadership's explanation of leadership as an emergent process co-created by both leaders and followers operating in fluid roles. Many organizations, which exist as macro-level manifestations of these interactions, could be described as complex adaptive systems that require: redundancy, diversity, interaction, and decentralization (Davis, 2004). However, the conventional understanding of leadership as emanating from individual positional leaders undermines these four requisite factors of complex systems. By relying on few positional leaders to provide leadership for an organization, redundancy is reduced, diversity is limited, interaction is lessened, and power is centralized, all of which reduce the capacity for the organization to learn and adapt as an organism in the changing environment.

Not every organization is an appropriate venue to apply an ecological approach to leadership, however. Organizations like banking or manufacturing, which require specific tasks to be

performed in an efficient manner, are predisposed to a more mechanistic approach (Western, 2013). Schools and hospitals, which, though they employ individuals in highly personal roles to provide the organizations' services, are often associated with a more mechanistic approach to leadership because of the rigid hierarchies within. An ecological approach, on the other hand, is well-suited to organizations that feature flattened hierarchies, a more educated workforce, and collaborative decision-making processes (Gockel & Worth, 2010). The ecological approach to leadership is also particularly suited to a knowledge-driven economy that requires rapid generation of new knowledge and innovation in order to be competitive; the flattened hierarchies and collaborative decision-making processes allow the eco-leader to harness the creativity, energy, and intelligence of the entire ecosystem to provide leadership for the organization rather than relying on a few positional leaders (Western, 2013). The ecological approach is also particularly well suited for organizations that purposefully seek out connections with other organizations and communities. Where the mechanistic paradigm conceived of an organization as a bounded system, ecological approaches view organizations as interconnected and interdependent ecosystems (Western, 2013).

One quintessential example of an organization functioning as a complex adaptive system — and the focus of this study — is the Florida Cooperative Extension Service. As a federal, state, and local partnership, Extension brings educational programming to diverse communities (Bonnen, 1998). Extension represents the interconnected, nested systems described by Western (2013). Among its programs is the 4-H Youth Development Program, which, in addition to existing at the federal, state, and local levels, also consists of innumerable connections with local communities, organizations, non-profits, businesses, schools, and families. The Florida 4-H program is led in each county by an Extension Agent (i.e., a positional leader), with the support

from a cross-section of the program's stakeholders, organized in the form of the county 4-H association (Diem & Cletzer, 2011). These 4-H associations maintain a roster of members with deep ties to the community in which they live. These associations exist to provide input and resources to the county 4-H program. They represent a collective leadership body. However, in Extension and 4-H, the focus is often heavily on the Extension agent as the leader of the county 4-H program.

This view of Extension Agents as traditional positional leaders, however, is problematic for aspects of the program — most noticeably turnover. The National Association of State Universities and Land-Grant Colleges identified retention of Extension agents as a "challenge area" (ECOP LAC, 2005). Turnover among county Extension faculty results in "disrupted educational programs, unmet citizen needs, low morale among remaining Extension professionals, and wasted financial and material resources dedicated to Extension agent on-boarding and in-service training" (Safrit & Owen, 2010, para 4). Efforts to reduce the effects of turnover on Extension programs have primarily focused on addressing issues related to the positional leader — burnout, salary and benefits, work-life balance, skills and competencies, or job satisfaction — rather than a more systemic approach. Unfortunately, each of these approaches to addressing turnover fails to acknowledge an emerging generational shift occurring in the workforce and its long-term effects on the retention of new agents and program resiliency. As Baby Boomers exit the workforce, organizations often replace them with Millennials. Where Baby Boomers sought employment stability, 74% of Millennials report expecting to have as many as five or more employers in their lifetime, and 38% of those currently employed are actively searching for a new position now (Price Waterhouse Coopers, 2011). Indeed, more than 60% of Millennials leave their positions in fewer than three years (Schawbel, 2013). Turnover is

both costly and damaging to program momentum, leaving employers facing an expensive revolving door (Schawbel, 2013).

Still, efforts to mitigate these effects focus on preparing the heroic positional leaders though skill and competency development, despite evidence that generational trends point to continued turnover among this generation so prevalent in the 4-H Extension agent positions. The effect is a leadership development approach focusing almost entirely on the positional leader when, in fact, the problem is systemic in nature. By taking a more ecological approach and distributing leadership, turnover among agents may be less disruptive and detrimental to the organization because responsibility for the program is not vested in a single person. Extension is failing to adapt to an external shift.

Adaptability Becomes the Chief Aim of 21st Century Organizations

Assuming an organization can carry out its mission successfully, it will usually turn its attention to longevity. It is the primary role of the members of an organization to structure and position the organization for continued relevance and success (Selznick, 1997). This necessitates the organizational capacity to continually interpret and react to external environmental factors. Barnard (1948) writes that the external environment is comprised of "physical, biological, and social materials, elements, and forces," and, further, is "at root the cause of instability and limited durability of organizations" (p. 6).

Though Barnard's (1948) description of an organization's need to contend with the external environment was appropriate for his time, how organizations seek to adapt has changed. During the time that Barnard wrote, organizations sought to find "equilibrium" with the external environment by enacting controlling internal policies governing employees' behavior. This model situated power and control in the hands of positional leaders and relegated employees to

worker status (Western, 2013). This model may have been effective when the purpose of an organization was efficient physical production, but in today's knowledge-driven economy, "knowledge is a core commodity and the rapid production of knowledge and innovation is critical to …survival" (Uhl-Bien, Marion, & McKelvey, 2007, p. 299).

An ecological perspective is concerned with the way in which an organization interrelates to other parts of its ecosystem (i.e., society, economy, the environment), as well as inflows of information and resources — all in an attempt to be adaptive (Western, 2013). To structure and position an organization for survival in a modern, knowledge-driven society, Wielkiewicz and Stelzner (2005, 2010) propose an ecological perspective that is characterized by four factors: (a) interdependence, (b) open systems and feedback loops, (c) cycling of resources, and (d) adaptation. This ecological model stresses the individual responsibility of actors in an ecosystem, developing the capacities of individuals within organizations, and a long-term perspective (Allan, Wielkiewicz, & Stelzner, 1999). Rather than chasing equilibrium, the goal becomes maximizing the *adaptability* of the organization to better contend with changing external factors. This ecological perspective posits that the long-term adaptability of an organization will be determined by the management of the tension between situating power and control in the hands of positional leaders, and having a "diverse sample of organization members influence the leadership process" (Wielkiewicz & Stelzner, 2005, p. 331). This is also described as the tension between the mechanistic, or industrial, paradigm, and the ecological paradigm. Western (2010) sums it up, writing that the environment "change[s] so quickly these days that the adaptive companies with capability for change are the winners" (p. 49).

In the case of county 4-H programs, their ability to adapt in the face of external threats to continue to meet community needs by providing youth programs will largely determine their

programmatic success. When properly employed, it is believed that the county 4-H associations — with their close ties to the community and collective leadership model — represented an ecological approach to leadership that has the capacity for ensuring success.

Results and Discussion of Findings

To empirically link an ecological approach to leadership with programmatic success, though, you must first define programmatic success. In this study, a researcher-developed index was used to score and rank county 4-H programs. The index drew on mandatory federal enrollment reporting data, along with United States Census Bureau data, to track per capita enrollment and five-year enrollment trends in county 4-H programs. We then rank county 4-H programs using *z*-scores. Based on these results, three of the highest performing counties, and three of the lowest performing counties, were invited to participate in qualitative focus groups. These focus groups encouraged participants to share in their own words their experience with leadership in their county 4-H programs. The focus groups centered on three primary questions: (a) What factors do you feel have contributed to the success of this group?; (b) How does this group approach decision-making?; and (c) How does this group ensure continued improvement?

As the high performing and low performing groups were compared and contrasted, we discovered that they diverged markedly on two of Wielkiewicz and Stelzner's (2005) four factors of eco-leadership: Open Systems & Feedback Loops, and Interdependence.

Low Scoring County 4-H Associations Are More Inwardly Focused and Connected

Low scoring county 4-H programs' associations differentiated themselves, in part, by exhibiting a greater tendency to be inwardly focused and connected. In an organization meant to connect the 4-H program to the community in order to gather input and resources, the composition of low scoring county 4-H associations' members was almost entirely from within

the program. For example, a 4-H club leader may represent her club's interests on the county association. Moreover, when association members were asked what they considered their primary role in 4-H, more than half of association members cited some other role, most often club leader.

Low scoring counties also tended to dwell exclusively on inwardly focused procedural matters — scholarship deadlines, banquet plaques, camp fees, etc. — rather than focusing outward on meeting community needs and identifying new challenges. One association member, who had just recently assumed the role of association secretary said, "I just went through a year's worth of meeting minutes and there's really not a whole lot in there other than what we've discussed as far as policies and procedures."

In contrast, high scoring county programs, while also tackling procedural matters, were the only associations to discuss vetting program-related issues, such as deciding which programs to offer, how they may meet community needs, and how to recruit new volunteers to carry them out. In a perfect example, one 4-H agent described a scene where she balked at the local association's guidance on how to build her new program. When they suggested she begin with school programs, rather than the community clubs favored by the state leaders, she said: "'Blasphemy! We can't do that.' I was almost defiant to them. We cannot go to the schools, we have to do community clubs, and they said, 'Listen, if you're going to be successful in *this county* with 4-H you have got to start in the schools, libraries, and churches.'" She went on to say that after six months of failure she acquiesced. She began to heed their advice and "Two years later, we have, I mean, *quadrupled* our numbers, and I have way more volunteers and community support. They were right."

In this same vein, high scoring county 4-H associations were also more likely to cite their external connections in terms of actual communities — “the west side of town,” “past the river,” minority communities, or businesses groups — rather than formalized, entity-to-entity connections, such as having a Farm Bureau or Cattlemen’s Association representative. Formalized connections were more common among low scoring counties.

These findings are consistent with Wielkiewicz and Stelzner’s (2005) ecological leadership principle of open systems and feedback loops, which states that an organization is dependent on inflows of information and other resources. Each organization is itself part of a larger, more complex open system (e.g., communities, economies, societies). Organizations that squelch feedback loops place the organization at risk by lessening its ability to adapt to the environment as it changes (Wielkiewicz & Stelzner, 2010). Low scoring associations that select members from within the 4-H program for the purpose of representing and connecting internal constituencies (e.g., sub advisory groups, or individual 4-H clubs), therefore, have a more inwardly focused, closed system with fewer feedback loops. This leaves the 4-H program with little inflows of new information, less feedback on programming, and fewer resources from the larger community. Having the organization structured in this way may contribute to increasingly ineffective county 4-H programming over time as the organization fails to adapt to external changes.

High Scoring County 4-H Programs Attribute Success to A Greater Number of Factors

County 4-H associations diverged on the question of, To which factors do you attribute the success of the county 4-H program? Low scoring county association members attributed success to only one factor: positional leaders. This usually meant the county 4-H agent. One participant remarked, “We’ve had other agents who didn't take the program to the level that

Rhonda has." However, it just as often meant the 4-H club leaders, which are adult volunteers who manage a 4-H club. Another participant commented, "I think it has to do with the leaders that we have in our clubs. We really have strong leaders, and that's where you're going to get your strong clubs..."

High scoring counties, in contrast, attributed success to a range of factors that did include positional leaders, such as the 4-H agent, but also other factors. A commonly cited factor was strong involvement from parents: "Parent involvement, I think, is number one. You have to have parent involvement for it to be successful." Another was a tight-knit community: "I guess it's the tight knit community. They're gonna make sure the kids get what they need…" The same associations often cited vested county commissioners, both in terms of budgetary support and a general understanding of the purpose of the 4-H program.

This is consistent with Wielkiewicz and Stelzner's (2005) ecological leadership principle of interdependence, which posits that any attempt to understand or direct an organization by focusing on its positional leaders is incomplete and bound to fail. Leadership must be understood in the complex context of the organization and its environment, and success can be attributed, in part, to a group's ability to see the connectedness of social systems and the way they influence one another. Therefore, the specific factors to which high scoring counties attribute success are not important in and of themselves. Rather, it is the number and variety of factors contributing to success identified by high scoring counties that makes it illustrative of this concept. High scoring counties' association members are more apt to see the myriad factors affecting their county 4-H program, rather than fixating on individual positional leaders.

The Eco-leader in the 21st Century Organization

If ecological approaches to leadership are, indeed, better for helping organizations be more adaptive in the knowledge economy, the next important question is: So what does an eco-leader do? With so-called leaders and followers serving in more fluid roles, and the potential for all actors to provide leadership at some point, the answer might not be immediately clear. However, there is surprising agreement in the literature. Positional leaders continue to play an essential role by: (a) influencing the structure of the ecological system, and (b) managing tension to create adaptive change.

First, rather than creating change through directives or selling their vision to followers, positional leaders act as organizational architects, creating the right conditions for leadership to flourish (Western, 2013). This is similar to the concept of physics with regard to complex natural teleology; physics refers to "external and internal demands and restrictions that limit or enable system behavior" (Marion & Uhl-Bien, 201, p. 399). Positional leaders who have control over distribution of an organization's resources have considerable ability to shape its human decision-making processes — such as a 4-H agent choosing to structure her 4-H association in a particular way. By apportioning resources and distributing power, positional leaders can influence the ecosystem in which they work by bringing together people and ideas.

Second, positional leaders play a critical role in what Wielkiewicz and Stelzner (2010) call "optimiz[ing] the tension between the 'Old School'/industrial perspective and the 'New School'/ecological perspective" (p. 23). The tension is between structure and process, efficiency and adaptability, order and chaos. This need for balance has long been understood on some level in leadership studies; examples of the yin and yang of this industrial/ecological tension abound: transactional versus transformational leadership (Pearce & Sims, 2002); organic versus

mechanistic (Courtright, Fairhurst, & Rogers, 1989); democratic versus autocratic leadership (Gastil, 1994), the individual versus relationship orientation (Rost, 1997); etc.

The difficulty for the positional leader is in achieving a balance over time. Recall that Barnard (1948), writing from a mechanistic perspective, believed the purpose of leadership in an organization was to help achieve an equilibrium with the external environment through creating complementary internal structures. Structure can create order, efficiency, and high productivity, but too much structure can also leave an organization unable to adapt quickly to a changing environment. Conversely, an ecological model, with its focus on process, can lead to disintegration if carried too far; should all structure and hierarchy be eschewed, the ecosystem becomes too chaotic (Wielkiewicz & Stelzner, 2010). To demonstrate the successful navigation of the tension between these two paradigms, Regine and Lewin (2000) provide the example of Andy Grove, then CEO of Intel. Facing adaptive challenges, he chose not to deliberately restructure the hierarchy of the organization in a top-down, mechanistic manner. Instead, he "pushed [the organization] into a degree of chaos by creating uncertainty and ambiguity" in order to free all the actors within the Intel ecosystem to generate their own order in response to the external adaptive challenge (Regine & Lewin, 2000, p. 11).

The benefits of nurturing an ecosystem and balancing the tension between structure and process is clear. Complexity science and the ecological approach it supports "dramatically expands the potential for creativity, influence, and positive change in an organization" (Lichtenstein et al., 2006, p. 8). Further, it provides a clear set of procedures for distributing leadership, fostering self-organization, and overall making an organization more adaptive.

Conclusions and Future Research

By continuing the work of empirically connecting an ecological approach to leadership with long-term organizational success, we might provide credence to this here-to-fore only conceptual phenomenon. The basic premises of this study could be replicated in a wide variety of contexts: business, rural communities, agricultural organizations, civic groups, etc. Empirical studies of leadership approaches' effects on organizations, communities, or programs are rare. By using the structure provided — complexity science as a theoretical framework and mechanistic-to-ecological continuum indicators as a measure — replication would only then require the creation of an index of success in the complex adaptive systems under study.

There is more work to be done, though, to better study this phenomenon. A measure of ecological leadership practices occurring in an organization should be developed. While there are instruments like the Leadership Attitudes and Beliefs Scale III (LABS-III) that provide a useful proxy for measuring individuals' attitudes and beliefs on the mechanistic-ecological continua, they often do not assess the reality of leadership within the organization, as long-running institutional practices and structures may trump even the association members' individual attitudes and beliefs about leadership (Wielkiewicz, 2000, 2002). This would be accomplished by reviewing the literature on leadership in mechanistic and ecological organizations, and then identifying indicators of where an organization may fall on a continuum between mechanistic and ecological. This would likely be further broken down into sub-scales based on Wielkiewicz and Stelzner's (2005) four factors of ecological leadership: interdependence, open systems and feedback loops, cycling of resources, and adaption.

After identifying superlative ecological organizations through quantitative means, more qualitative work also needs to be done to describe best practices for the eco-leader. How does the

eco-leader best structure his or her organization to encourage leadership to flourish in unexpected places? What are the exemplary cases of optimizing the tension between mechanistic and ecological processes over time?

By studying the ecological approach to leadership in action, we expand our understanding of leadership from "the isolated, role-based actions of individuals to the innovative, contextual interactions that occur across an entire social system" (Lichtenstein et al., 2006, p. 2). We also "increase the relevance and accuracy of leadership theory by exploring how leadership outcomes are based on complex interactions, rather than 'independent' variables" (Lichtenstein et al., 2006, p. 2). Complexity science, for its part, provides a framework for exploring the phenomenon of leadership more deeply and could be utilized more often as a theoretical framework for leadership studies. The notion that leadership is a linear process affecting few variables in isolation is at odds with what we know both scientifically and intuitively about leadership. Focusing only on roles and actions of specific leaders is just the tip of the iceberg.

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