Promoting learning and innovation in organizations
through complexity leadership theory
Introduction

21st century organizations deal with the pressure to be innovative and ingenious in an environment where competition and globalization foster change and unpredictability (Cao and McHugh, 2005). Hence, it is increasingly important to understand how to promote adaptive responses (e.g. learning and innovation; Jiménez-Jiménez and Sanz-Valle, 2011) under such circumstances.

According to Anderson (1999), organizations are built upon complex dynamic systems where agents freely interact under simply structured rules to promote novelty and efficiency across the organizational system. Arrow, McGrath and Berdahl (2000) have further supported this notion, by acknowledging that small groups (e.g. teams; departments) act as complex dynamics systems, given that these can perform effectively in challenging work environments by applying simple rules of behavior. However, such approach to organizational functioning is not prevalent in most theories of leadership. In fact, most leadership theories describe it as a process where one specific person or group have direct, unidirectional influence on others (Avolio Walumbwa and Weber, 2009). Leadership is often regarded either as a psychological trait (e.g. charismatic), a one on one relationship (e.g. leader-member exchange theory), or as being self-oriented or collective-oriented (e.g. self-leadership and shared leadership; Avolio et al., 2009).

Grounded in the work of Anderson (1999) and others (e.g. Guastello, 2007; Lichtenstein et al., 2006), and despite the abundance of empirical evidence suggesting a positive relationship between such conceptualizations of leadership, and both learning and innovation (e.g. García-Morales, Jiménez-Barrionuevo and Gutiérrez-Gutiérrez, 2012; Hoch, 2013), we believe that adopting a leader-centric perspective on learning and innovation offers a limited comprehension of the dynamics of leadership in organizational settings (Avolio et al., 2009; Guastello, 2007). Alternatively, complexity
leadership theory regards leadership as a shared emergent process where individuals and teams interact and learn from each other to produce novelty and adaptive capacity (Avolio et al., 2009; Lichtenstein et al., 2006; Hazy & Uhl-Bien, 2014). In complexity leadership theory, leadership functions are not considered to be restricted to one specific person (e.g. CEO) or group (e.g. Top management team). Instead, complexity leadership theory emphasizes creating organizational conditions that enable effective, but largely unspecified, future adaptive states. This means that formal leaders per se are not in full control of organizational dynamics, and co-workers are empowered to collectively learn and implement new solutions (Lichtenstein et al., 2006; Marion and Uhl-Bien, 2001).

Under complexity leadership theory, this paper advances two propositions describing how learning and innovation can be leveraged through complexity leadership.

**Complexity leadership theory**

In complexity leadership theory, leadership is achieved through the interaction of three functions: administrative, adaptive and enabling. The first one entails managerial and formal activities of an organization, such as coordinating and planning tasks. It is a top-down function embedded in authority and status. At the opposite end, the adaptive function is informal, emergent, complex and dynamic. It emerges from: (1) interactions between agents over conflicts, ideas or preferences, and (2) adaptive, creative and learning actions that emerge from the interactions within complex adaptive systems (CAS) as they all strive to adjust to tensions (Uhl-Bien, Marion and McKelvey, 2007). Finally, the enabling function acts in between the other two; its goal is to create the conditions for complex interactive dynamics of adaptive leadership to emerge, and to manage and integrate the administrative-adaptive interface (Uhl-Bien and Marion, 2009). The enabling function has the incumbency to ameliorate, catalyze, coordinate
and entangle the “flow” among the bureaucratic and adaptive functions. In fact, there are times in which a more formal and bureaucratic structure is needed in subunits, and others which require an innovative and “out of the box” kind of response (Uhl-Bien et al., 2007).

Evidence of how complexity leadership theory might work can be found in research by Carte, Chidambaram and Becker (2006), and Fitzgerald, Ferlie, McGiven and Buchanan (2013). Particularly, Carte and colleagues (2006) tested how the emergence of leadership behaviors in self-managed virtual teams contributes to team performance. Their results indicated that teams had a better performance when emergent leaders were allowed to act upon team needs. Fitzgerald and colleagues (2013) added to previous research by testing if adopting a leadership system that promoted self-organized behavior led to higher efficiency. The authors found that when change-oriented leadership roles were encouraged (which, under complexity leadership theory, means that there is an entanglement between the administrative and adaptive leadership functions) improvements in service outcomes emerged.

Using CAS as its basic unit of analysis, complexity leadership theory purpose is to recognize strategies and behaviors that generate the onset of creative ideas that will drive the innovative process, learning and adaptability among individuals (Uhl-Bien et al., 2007). In essence, a CAS “cannot be predicted by standard linear equations because 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 (…) 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” (Levy, 1992, p.413). In fact, the concept of emergence refers to behaviors that originated as a result of the interactions between simpler elements of the system
(i.e. individuals). For instance, Schneider and Somers (2006) argue that leadership development emerges from a nonlinear and discontinuous pattern of interactions between organizational agents. Moreover, certain conditions will affect the capacity of leadership to emerge and function effectively in social systems. Namely, agents must be interdependently related, meaning that the productive well-being of one agent or aggregate is dependent on the productive well-being of others. In addition, they must experience adaptive tension to elaborate (e.g. administrative leader pressure, conflicting constraints, and environment). Without such pressure, there is no initiative to change (Uhl-Bien et al., 2007). These arguments help to complement and extend previous theoretical work by Giddens (1986) which had outlined the Theory of Structuration where he proposed a duality of structure. According to Giddens (1986) organizational structuring is changeable by human agency and therefore cannot evidence invariant properties. This duality assumes that agents and their actions come into existence only within a structured environment in which agents have simple rules of behavior inside which they are given the necessary autonomy for self-organization. Furthermore, Farjoun (2010) proposed that to better understand a complex environment there is the need for duality in organizational mechanisms and processes that support and promote both stability and change, i.e. in order to survive organizations must manage the balance between periods of stability where the organization exploits the environment, and periods of change where the organization explores the environment.

Lichtenstein and Plowman (2009) further added to this discussion, by arguing that there are four sequential conditions that are necessary to explain the emergence of leadership: disequilibrium, amplifying actions, recombination/ self-organization, and stabilizing feedback. More specifically, in complex systems, agents interact and exchange information between them. Every exchange is presented as a new possibility
to learn and innovate. As individuals interact, share and learn from each other, they push the system towards newer dynamic states (Anderson, 1999), and adjust their response within the system (Lichtenstein and Plowman, 2009). This phenomenon then contributes to the emergence of higher order adaptive states in the complex system (e.g. team; department; organizations) that often manifest as innovation (Uhl-Bien et al., 2007).

Complexity Leadership Theory and Learning

Learning is a process through which knowledge is obtained and used, providing opportunities for improvement (Edmonson, 1999). Considering that complexity leadership theory emphasizes that learning occurs throughout the interaction among agents and their functions (Uhl-Bien et al., 2007, Uhl-Bien and Marion, 2009), learning can be regarded as a collective process of “reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing error or unexpected outcomes of actions” (Edmondson, 1999b, p.354). As such, it can be said that, CAS are organizational systems adept at learning. Hence, learning, describes a process by which knowledge is created, adopted, and/or dismissed in a system (Carley and Hill, 2001). Furthermore, it is only when individuals make sense of situations that learning occurs and the knowledge created allows individuals to adapt to complex situations (Weick, 2007). Recognizing information in turbulent environments allows for the survival and effectiveness required to maintain the balance between flexibility and stability in any system (Brown and Eisenhardt, 1997; Farjoun, 2010). In short, complexity leadership emphasizes learning for adaptation (Uhl-Bien et al., 2007).

Anecdotic evidence of CAS learning in complexity leadership theory can be found in the mine collapse in Chile. On August 5th 2010 a gold and copper mine near Copiapó caved in and, 33 miners where trapped in a chamber 2,300 feet below the
surface. The rescue team had to openly acquire, share, and combine knowledge through the testing of assumptions, the discussion of differences, the forming of new routines, and the adjustment of strategies in response to possible errors (Edmondson, 1999; Edmondson, Bohmer and Pisano, 2001). Leadership emerged across the miners, as each individual was recognized as being particularly competent at setting tasks and responsibilities (bureaucratic leadership), solving complicated situations (adaptive leadership), and managing group boundaries and relations (enabling leadership). While this case study provides evidence for the benefits of applying complexity leadership theory, other events provide the opposite framing. Namely, the work of Weick (1993, 2007) regarding the Mann Gulch disaster in which 13 men died because of interactive disintegration of role structure and sense making in a minimal organization. In his reflection Weick points out that one key reason why this disaster took place was because communication between group members (i.e. adaptive agents) was not enabled. Each member failed to share relevant information that was necessary to build learning through sense making. If the men implied in the Mann Gulch incident had shared relevant information (i.e. entanglement) this process would had been adequately managed by the team leader (i.e. administrative agent) and, the group would have been able to adapt to the incident successfully.

The human interactions described in the episodes above and their connection with complexity leadership theory can also be matched with current theories of adaptability in complex work environments (e.g. Burke et al., 2006a, 2006b; Weick, 1993, 2007). These theories argue that under conditions of uncertainty or change, team learning, facilitates the development of knowledge and contributes to the ability of members to improve their collective understanding of a given situation (Burke et al.,
2006a). Such theories (e.g. Burke et al., 2006b) help to reinforce and emphasize the importance of complexity leadership behaviors as triggers to learning.

In short, considering the above mentioned arguments, we argue that learning will occur based on the interaction and adaptive tension between complexity leadership theory’s administrative, adaptive and enabling functions.

**Complexity Leadership Theory and Innovation**

Innovation refers to the intentional application and introduction of new and better ways of doing things (West, 1997; West and Rickards, 1999). Following this, innovation can be understood as a process that includes the generation of new ideas (creativity) and behaviours directed towards implementing these new ideas within the work setting (e.g. Rank, Pace and Frese, 2004; West, 2002). Many times individuals and groups carry out innovative activities with the intention to benefit from them, since they often arise in response to the uncertainty and demands of the context (West, 2002).

In complexity leadership theory innovation emerges, not from the vision of the leader but rather when members themselves work through the issues they have to solve (Marion and Uhl-Bien, 2001), being more or less innovative considering the degree of use and reuse of the information and the exploration of new knowledge that is made (Katila and Ahuja, 2002). In CAS innovative behaviors can emerge from the interaction of groups of agents when they have to solve a problem, seemingly, without the necessity of a centralized leadership form of control (Boal and Schlutz, 2007). These arguments find support on previous work on the factors that promote and hinder innovation. Specifically, Damanpour (1991) performed a meta-analysis regarding the organizational factors that contributed to innovation. His findings indicate that while open communication across organizational levels positively contributes to innovation, centralizing and formalizing decision making negatively relates to innovation. In line
with this findings, Dougherty and Hardy (1996) pointed out that formal hierarchical leadership structures tended to impede the dissemination of knowledge that is helpful for (1) innovation to occur and (2) the sharing of innovative ideas and outcomes throughout the organization.

As an example of the relation between complexity leadership and innovation let us return to the mine collapse in Chile. In the mine collapse, opposed to the Mann Gulch incident, members of the rescue team engaged in interactive communications among themselves in order to solve the problem they were facing (e.g. adaptive function). Evidence supporting the link between complexity leadership theory and innovation can also be found in a study by Edmonson, Bohmer and Pisano (2001), where the authors found striking differences in the extent to which Hospitals were able to implement a new technology that required substantial changes in the operating-room-team work routine. Through qualitative analysis, Edmonson and colleagues (2001) found that successful hospitals were the ones creating enrollment conditions, designed preparatory practice sessions and early trials to create psychological safety and encourage new behaviors (i.e. administrative function), and promoted shared meaning and process improvement through reflective practices (i.e. adaptive function). As in such examples and, in order to be successful all members of a system must be able to manage conflicts, overcome resistance to change, and persist in implementing their innovative proposals (West, 1997). In essence, and as pointed by De Dreu, Nijstad, and Van Knippenberg (2008), innovation is a fundamental reason to work together, because members seek a collective gain, instead of some personnel gain.

Based on these arguments, we propose that innovation will occur based on the interaction and adaptive tension between CLT’s administrative, adaptive and enabling functions.
General Discussion

In this paper, we proposed that learning and innovation at work can be better understood through complexity leadership theory. In complexity leadership theory, leadership can occur anywhere within a social system (Uhl-Bien et al., 2007). As the situation changes, different individuals may act and contribute for the emergence of the leadership phenomenon. Learning and innovation happen when the open space between members is filled by events that lead to the creation of new knowledge. Ideas emerge from the clash of the member preferences (Uhl-Bien et al., 2007). Namely, this is in line with theoretical arguments that support that new and unexpected events allow for the creation of new knowledge (Burke et al., 2006a; Kozlowski & Bell, 2008) and, innovation is considered to occur throughout the interaction phenomenon among agents (Boal and Schultz, 2007).

Theoretical and empirical research regarding the frequent interactions among agents would be valuable to better understand learning and innovation in complex environments. Further, one problem found in today’s organizations is that mainly bureaucratic forms of organization prevail and the adaptive function is suppressed (Uhl-Bien and Marion, 2009). In this sense, the enabling function of complexity leadership theory can ameliorate this situation by helping the implementation of ideas produced by the adaptive function and the creation of new knowledge throughout learning. Consequently, from a practical perspective, it allows administrative leaders to acknowledge and validate these ideas (Uhl-Bien and Marion, 2009).

Rapid changes in the competitive context of firms make it more evident that the new “organizational reality” is guided by nonlinearity, tension and instability (Anderson, 1999). This paper aimed to shed new understanding on the learning and innovation phenomena’s. Namely, this paper proposed that framing leadership as a
complex phenomenon can offer additional insight regarding learning and innovation in the workplace. It was argued that how learning and innovation emerge, as a result of adaptive tensions between organizational agents and the environment, is dependent on the design of complexity leadership functions across the organization.

Although literature on the topic is growing (e.g. Brown and Eisenhardt, 1997; Lichtenstein and Plowman, 2009; Marion and Uhl-Bien, 2001; Uhl-Bien and Marion, 2009), there is still substantial lack of theoretical and empirical knowledge to guide our understanding of how complexity leadership functions shape learning and innovation. One way through which this could be achieved is through computational modeling, which is a method to perceive reality through the creation of possible representations of it in a virtual simulated environment (Myung, 2003). Although computational modeling is not a usual method in the analysis of organizational behavior, it has increasingly been considered as a legitimate and disciplined approach with the potential to cause significant contributions to the field (Harrison, Lin, Carroll & Carley, 2007). The use of computational modeling offers a variety of benefits. It can examine the consequences of the arguments and theoretical assumptions, explanations and alternative hypotheses, and test the validity of these explanations (Harrison et al., 2007; Weinhardt & Vancouver, 2012).

Therefore, we encourage scholars and practitioners to extend knowledge regarding complexity leadership’s emergent nature that is essential for learning and innovation to occur in modern organizations.
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