Towards Leading *Diverse, Smarter* and More *Adaptable* Organizations that *Learn*

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> *If change is inevitable but unpredictable, then the best tactic for survival is to act in ways that retain the most diversity; then, when circumstances do change, there will be a chance that a new set of genes, a species or a society will be able to continue under the new conditions. Diversity confers resilience, adaptability and the capacity for regeneration* (Suzuki &McConnell, 1997, p. 162).

Abstract

Leadership is in crisis. Technology has enabled our complex and interconnected world where it is much easier for organizations and entire ecosystems to collaborate – quickly – while older mindsets based on the organization as a machine model are proving to be grossly inadequate. Simultaneously, we have failed to predict and to understand, for example the cascading financial system failures that threaten lives, institutions and nations. This paper takes a complexity thinking perspective to carefully examine *specialization*, *diversity* and *organizational change* in new ways so that we can extend our leadership thinking about the *adaptability of our organizations*. Because diversity is a critical condition for complex organizational change, we explore diversity from two disciplinary perspectives. First, we take a learning science (education) perspective to find that leaders should consider organizations as emergent collectives that are able to learn and to become capable of "learning ahead" in turbulent contexts. We then explore, from an organizational science perspective, how diversity exists as an essential condition for identifying differences and novelties as seeds for innovations (changes) made possible only by collective work attracted to these novelties. Finally, the author presents a framework for understanding and leading and knowing the *potentials* of diverse, smarter, more adaptive complex organizational ecosystems.

1.0 A Crisis in Leadership

In 1996 Peter Drucker crystallized his life's research in *The Leader of the Future* to predict an emerging "knowledge era" where organization leaders and followers need to be *smarter* and much more *nimble* to lead knowledge era work. History is proving Drucker right. By 2011, leaders everywhere are facing pressure to "know better" and to "better guide" our more technologically interconnected and constantly changing organizations in the knowledge era (Fullan, 2002). But leading ***smarter*** (more intelligent) and ***adaptable*** organizations well in persistently unsteady-state conditions is a task beyond the grasp of many leader-practitioners and researchers. In 2011 the world witnessed The Arab Spring, civil unrest across Greece, the global 'Occupy Movement' and profound new tremors across the European Union (2011). These are macroexamples of both rational and irrational, and yet highly interconnected economic, political and cultural systems coexisting as an undeniable backdrop for public leadership thought today. It is nearly impossible to reduce such a complex backdrop to merely "leadership" or "management" objects anymore, yet many leaders try to make those pieces "manageable" by attempting to reduce organizations to working "pieces". That is a serious delimitation for today's leadership thinkers while the public once again wonders why leaders and scholars cannot avoid all manner of repeating and cascading system failures impacting millions of lives (Marion and Uhl-Bein, 2001; Goldstein, 2010). The day of the Great Lone Leader is gone. In this technological age leaders can no longer simply parse our work to generate organization structure, to set values or to focus on human relations organizations, for example. Leaders need to learn *with and across our* organizations to generate the very possibility for our organizations to adapt in a new age (Schlechty, 2009).

Leaders struggle to understand the "whole system" perspectives. We also struggled to understand and react to cascading economic system growth from 2001 to 2008 in both the developed and developing world (OECD, 2010). For example, we failed to predict the cascade of North American banking failures and subsequent European sovereign debt crises. History teaches us that these patterns of growth and collapses have happened many times before (Reinhart & Rogoff, 2009) but in the 21st century we have clearly been unable to develop ways to predict these major events. Our perceptual narrowing occurs when we reduce the concept of leadership into structural functionalism – this is akin to planning this year's annual picnic just as we did last year but without accessing current weather information, food preference changes or changes in the picnickers themselves. Most academics and public sector and government leaders, particularly education system leaders - have similarly failed rather miserably to predict or to learn in concert with our emerging, unstable, connected worlds of economics, cultures, finances, politics and ideals since the economic crisis of 2008. We seem overwhelmed. Complexity theorists warn us that

prediction may, in fact be impossible when we realize that everything is always in flux – so the ability to adapt and to learn (the subject of this chapter) may be much more important to leaders of technologically-engaged, changing organizations (Cilliers, 1998; Capra, 2002). Perhaps our collective ability to adapt and to learn as leaders in unsteady states is too constrained by a proliferation of specializations among us while our individual ideas, approaches and tactics lack a certain degree of diversity or "difference" that is so necessary for people to co-create or to learn in many of these situations (Rorty, 1989). Does this sound familiar to you? Are we overspecialized for the times? Are we underspecialized? Leadership scholars today all gesture to important "change" features and to what complexity theorists see as "preconditions" for organizational adaptability in complex systems. Changing organizations in general are told to embody a necessary degree of tension, difference and heterogeneity that will allow us, as Einstein warned, to think differently than the ways that got us to where we are today. In this Chapter we focus on two such features of organizations (1) ***leader and follower abilities to learn*** about the changing context of the organization (Schlechty, 2009; Marion & Uhl-Bein, 2001; Davis, Sumara & Kapler, 2008) and (2) the ***capability of leaders and followers to adapt*** (Bertalanffy, 1969; Goldstein, Hazy & Lichtenstein, 2010; Kowch, 2007). If, as leaders we accept that things are in constant flux and that things are all interconnected to each other, we must also consider that the very *possibility* for some sort of purposeful adaptability at the organization level will depend on a concept that includes the ironies and tensions found between difference, specialization, redundancy and other features of the modern organization.

Meanwhile, billions of lives in many nations are pushed and pulled to and fro every day by global leaders doing their best to respond to many change forces with the aid of modern communications and digital learning technologies that allow people to connect quickly and powerfully over space and time. Too familiar with bureaucratic and hierarchical realities in organization life that were common before such ubiquitous connective technologies, leaders today feel pressure from the new, incredible connectivities offered and they must learn to lead within these complex systems, not just to "manage" parts of the organization (Oblensky, 2010). Tied together both tightly and loosely by communication networks the leaders of today's organizations have responded to a public and employee demands for less rigid organization models. One response is to connect to "fads" of the day, thereby clinging to convenient metaphors and models like "distributed leadership" most recently indicating once again that we are indeed aware of the new relational context of our organizations (Forno & Merlone, 2007). Sadly, as we explore in the brief history of leadership thought summarized in the next section, the "network metaphor" is widely used as a descriptor of what "could be" but when we review organization change data showing what most organization networks actually do, we find that almost no one actually studies networks and relation patterns in education (or any) organizations (Kowch, 2009) beyond simplistic 'social' network

study. Convenient metaphors are not enough. As leaders in these technology-involved ecosystems we are, indeed, failing to "walk the talk" reflected by our new language about agility, transformation and change particularly in the public sector where organizations still exist as very bureaucratic organizations (Mclellan, 2010), and this author's 20 years of research and experience leading large organizations is testament to an emerging language about change creating a vast shadow over the important work to realize organization change:

> *The financial industry had always been intended to be something of an unseen backroom support for the broader economy…yet in the years leading up to the crisis the financial sector itself became the front room (Sorkin, 2009, p. 538).*

Embedded in this quote is subtle evidence of a predominant old-world view of organizing as a set of stable structures divided by partitions where we sort and promote different and specialized functions or work done by people. The idea that industry or any organization can be sorted into "back rooms and front rooms" within structures (houses) is indicative of this *piecemeal* mindset problem where we sort and partition complex industries and entire sectors in our minds. Worse, within that "building" we imagine sub-structures where very specific visible and hidden specialized activities occur as separate from the rest of the world. Fixated on "the building", we lose sight of the neighbors, who comes and goes from our building, and indeed the fact that we share parts of it, lose parts of it and exist in a neighborhood, city, region and nation. This causes tremendous oversimplification.

Leaders know that there is a lot more to an organization than structure, nested structures or even a set of cultures, just as we know that there is a lot more to organizing than mere human relations, culture or shared values often studied in a piecemeal fashion as completely separate "models" describing how people get things done. Piecemeal thinking and overspecialization is prohibiting a comprehensive understanding of our complex, constantly changing organizations today. So it is easy to see why *we face an imperative to blend information and educational technology disciplines for new leadership thinking* (Kowch, 2009) as we unpack the implicit, uncritical ideas and metaphors for 'structure' to understand the very potentials of our new organizations to adapt as mixes of diverse, specialized (but not too specialized) ideas, people, contexts and issues. For nearly 15 years this author's research has found that these implicit, uncritical ways of knowing organizations guide everything we do as leaders – and we need to face that limitation to move forward. We can begin by exploring a few of the very features that empower complex systems (not fixed structures) to adapt via a mixture of *diversity*, *specialization* and *redundancy*, as we do later in this chapter. As leaders we must accept these newer approaches to *discovering adaptability*

because earlier structural models incorrectly assume machine-like connections between people and "functions" existing within implicitly steady states among those heavily partitioned structures of the mind (you cannot actually "see" a department, for example). We cling to these mindsets so uncritically but in reality, every atom of every artifact in all the structures are in states of flux ranging from static (dead) to wildly (surprisingly) chaotic (Cilliers, 1998).

It is imperative that new scholars and leaders build up our interdisciplinary knowledge of leading to better learn and to lead better in the knowledge era (Thompson-Klien, 2010). We *can* understand organizations less intuitively, and more as a context for patterns of work that occur as a bricolage of both *learning* and *adapting* efforts done between and among people in "near chaotic" relational networks. Information-age work framed by a new information technology design mindset is no longer work done by specialized labor from partitions or cubicles – it is the work done by co-creators who emerge from across "organizations" seeking innovation, change and new mental models for a new era (Miller & Page, 2007). Leadership literature, especially in the public education sector stacks high with commentary on *distributed* leading and *transformation* while in the next second a writer or reader can gaze across any office situation to find powerful, entrenched bureaucracies that *look, act and feel nothing like what is read or written.* These tensions must be better understood. Are we becoming too similar to one another as leaders or scholars in this field? Are idea fads and consulting 'gold rushes' sapping the potential of our organizations to adapt and respond to our changing challenges head-on? Are we losing our own scholarly diversity to wave of popular, metaphor-laden overspecialization within our ranks as 'fads' make our ways of knowing leadership seem (wrongly) homogenous "Fall of the Faculty (Ginsberg, 2011)? To understand diversity today, we need to understand our *academic and practice contexts better*.

More robust concepts are emerging from new research to help us understand leading complex change in the knowledge era organizational ecosystems. Today, leaders and followers are re-imagining the ubiquitous "cubicle" metaphor more as a leaf in a forest that is part of the interdependent work we do with each other in more open, connected "space". We also need to know more about the entire organization ecosystem to really understand the qualities, contexts and common patterns work (not just social contacts) that comprise such complex (eco)systems (Castells, 2004; Fisher, 2009). In the future, your job as a leader will no longer be limited to care for the leaf, the tree or for the forest in pieces – your job will be to learn, to change and recognize special work done within and around that diverse forest as both process and product, as both means and ends in states of constant flux (Rorty, 1989). Similarly, we will need to expand the space of the possible in our leadership thinking domains and to ***diversify our very perceptions of the "organization"*** well beyond a set of nested structures where specialized work occurs

in linear box or "organization flow-chart" patterns. Far too much research is showing that the constant explosion of jargon underpinning convenient industries selling "transformational leadership" mantra is being understood as temporary 'trends' and as 'means' to ends (Kowch, 2007;2008).

Old ideas die hard. We often notice new students to our advanced leadership classes that can quickly recognize and critique the latest technology and leadership 'fads' or *'trends'* with precision and acuity. However because they most often understand *organizations* mostly as structures in steady conditions, these future leaders interpret 'fads' or diverse change features, especially *technological* change as one big set of constant change pieces. They often write of these as pieces in a steady "change rhetoric" happening 'outside' the organization – almost like cloudy weather - until we, as (great) leaders 'adopt' them or close our windows.

This author recently waited in a traffic jam across from a beautifully renovated large two-story home (circa 1890) in metropolitan Calgary. I noticed a plethora of new, high-tech windows, roof skylights and top-quality landscaping additions enhancing this completely renovated architecture. Since the renovation was done around 2000, a group of five twenty-story plus condo towers emerged on *all* sides of this home. This is a perfect example of what happens when change leaders (at the home) engage the kind of thinking we explored in the previous section. That thinking leads precisely to a "successful" home renovation project (change) by change leaders not ignoring, but rather 'compartmentalizing' the possibility of unconventional building (and zoning) changes in the environment. If the change leaders had been old-style leadership specialists, it is easy to imagine what their language would have been at the post-renovation house-warming party:

> By the end of the renovation, our "blue-sky" planning considered internal and external features to the property, some which we adopted and some we did not. Some, like what happens beyond the structure property line are beyond our control anyway, for we hear that some building may occur in the area. This too may pass - people are *always* building. Looking at the changes to the house we imagined, our renovation was: "*distributed*", *planned, designed and built collaboratively* among highly *effective and efficient*, *specialized* architects and contractors; *community* focused and open; maintaining craftsmen architecture and the *architectural diversity* of the neighborhood; *cost* effective; *customer centred*; *sustainable*; *value-driven* and *evidence-based.* The transformation is *green* and *ecosystem-friendly* too, for the house and garden will be bathed with *natural* light.

In 2012, sunlight never lands on this property. The front porch light burns brightly at noon. There are indications of large tree and plant removals. One of the neighboring towers just changed ownership while a weathered Realtor sign rises from the home's front lawn. If we could hear the voice of the specialists and condo builders we would likely hear different prose describing the impact of this house

transformation, reflecting differently upon "change leader" abilities to lead and to adapt. In 2012, leaders of our large, indebted public systems can no longer afford such less complex, closed-system thinking. Neither can private corporations, cities, governments, nations or our natural ecologies stand the pressure of piecemeal systems thinking where everyone does their specialty on a closed set. We are simply *far* more interconnected than we think we are in a diverse, technological age (Barabasi, 2003; Baker, 2008).

We must re-conceptualize change, leadership and organizations to become better leaders now by evolving our leadership knowledge for a new context (Levin & Fullan, 2008).

> *A company is not a living machine…its people get better by learning, evolution and flexible adaptation* (Capra, 2002, p. 114).

Other chapters in this book offer more specific explorations of specific kinds of diversity including social, psychological and cultural diversity that leaders must consider better to lead in a technological age. In this chapter we consider rather that the presence of (many kinds) of diversity is an important precondition to leading any kind of systemic or complex (organization wide) change, and we explore the conditions under which a varying mix of diversity and redundancy allow us to achieve the start-point for change, as leaders.

This kind of thinking has existed for years in business (Goldstein et al.; 2010) and information technology sectors (Miller & Page, 2007) while and very little of it is going on in education but for in curriculum study (Davis & Sumara, 2008). By contrast, almost no complexity-thinking research is published in the education subfields such as technology or education leadership. Yet the discipline of education is the academic "home" of this author who studies relational structures for learning and leading in any organization context.

First, we need to understand the context of leadership and organization thinking that got us only so far, as we do in the next section of this chapter. Then we can explore what complex organizations are and how important diversity is to the ecosystem's very potentials for change (real change and adaptation is very unlikely without a mix of *diversity* and *redundancy* in ecosystems).

2.0 Shifts in Leadership Thought – An Evolution from Closed to "Whole System" Thinking

> *Only leaders who are equipped to handle a complex, rapidly changing environment can implement the reforms that lead to sustained improvement* (Fullan, 2002; Levin & Fullan, 2008).

Complexity thinking often prompts researchers to think with "a *trans-disciplinary* research attitude" (Sumara, Davis & Kapler, 2008, p. 111). This interdisciplinary work shares leadership perspectives on diversity from two sister-disciplines across the humanities; (1) ***organization science*** (business/economics and organization theory and practice) and (2) the ***learning sciences*** (education leadership and learning theory and practice). Together these lenses offer rare and penetrating glimpses into complex system organization and leadership conditions and qualities such as diversity, specialization and redundancy. Before we outline how important specialization and diversity are for leading the networked organization of the future, we should first examine the constantly shifting terrain of leadership theory (or thought).

Next, A quick examination of sweeping changes in leadership thinking over the last century offers readers an important backdrop for leaders who need to evolve a space for 21st century thinking about: (1) varying degrees of ***specialization***, inclusive of; (2) a mix of ***diversity***, duplication (***redundancy***) with; (3) the ***ability of people networks*** to (4) organize their interests and ***work together*** as critical foundations for leading change across complex organizations.

2.1 The Evolution of Leadership Thinking – from Scientific Management to Complexity Theory

A brief account of leadership theory over time allows us to better understand two important points before we delve into leading diversity in an organization that 'learns' to adapt: (1) *complexity thinking* may be a 'tipping point' in the development of leadership theory and that (2) *diversity*, as a feature of specialization is critical to new understandings about leading complex and emerging (transforming) systems. For most of our historical leadership theory, we have modeled or theorized the organization as existing in "steady state" or stable realities, not as "far-from-equilibrium" states that characterize today's technologically engaged organizations- where ***technology can be the single largest disruptive change catalyst*** **in complex organizations** (Goldstein, Hazy & Lichtenstein, 2010; Christensen, Horn & Jonhson, 2008).

A problem of incoherence*:* Leadership models have evolved over time as scholars and practitioners responses to the inadequacies found in the preceding models (Hallinger, 2002; Willower & Forsythe, 1999). Today, stakeholders and leaders alike complain that our current leadership models still fail to describe true leadership in our world and that there is little connection between leadership rhetoric and the leadership needs in organizations. This has been going on for too long, but there are good reasons for it.

Contemporary thinking about *leadership*, which is a term that is somewhat ironically impossible to define from the literature (Hargreaves, 2010), has evolved from centuries of reductionist, cause-effect, linear explanations of physical and social phenomena about people and organizations. More recently we have shifted to thinking *in toto* about organizations, work, partnering and people engaged via technology as a more organic, nonlinear way of knowing where uncertainty and unpredictability can be accounted (Goldstein, 2010; Schlechty, 2009; Marion & Uhl-Bein, 2001). This overall movement has been possible because faster computers, large datasets, analytics and evidence-based decision making allow us to witness more of a whole-system gaze and an ecological mindset – a mindset that we could not possibly have attempted in earlier sort-and-study time periods (Schwandt & Szabla, 2007; Kowch, 2009), though not all leaders are sufficiently technologically oriented to make use of such tools and ideas (Cuban, 2011). The following brief review of leadership thought over the last few decades offers solid grounds for this author's subsequent argument that leadership theory has transformed to a point where we must can consider complex organizational change as completely dependent upon the existence of two important features of specialization – diversity and redundancy.

1900 to 1950: Organizational theorists Schwandt & Szabla (2007) point out that scientific management in the early 20th century tried to accurately portray work-life cause-effect relations between workers and efficiency by assuming that all organizations exist in a state of equilibrium. By 1945 leaders began to think about system and human relationships as features that could be "managed" to maintain equilibrium through a mix social choices and problem-solving interventions. To use an ant-hill metaphor, in this period we studied the contingent behaviors of the ants amidst the interventions of the (great) ant-leader.

***1950-1960*:** At the dawn of the information processing age, educational administration scholars understood leaders as top-down actors in hierarchies. We focused on specialized, highly trained people with roles performing specific functions within relatively isolated bureaucratic institutions (Griffiths, 1964). Leaders set out goals and provided interventions to achieve specially prescribed outcomes in times when people counted as parts in a set of *work **transactions** within machine-like organizing processes*. As a response to interventions that had not worked, open and closed systems thinking arrived, shifting us toward a slightly subjective or 'it depends' stance, and systems thinkers emerged to ponder the functions and variations in information processes. Leaders focused on internal organization processes before the 1970s, where leader behavior and models of internal and external system transactions emerged. Alas, leader *results* often didn't match their intentions in the transactions era and since. Using our ant hill metaphor again, in this era we studied the inputs and outputs and what ants did to each another, as well as the structure of the hill as it may have shaped their work.

1960-1970*:** The ***social systems *approach* followed in the 1960s to focus on leader *transactions* based on general systems theory. Here, the focus of the leader was remained on the inputs, outputs, work flows and rules for doing things (actions) according to (work) functions while also considering the importance of socialization processes (Evers & Lakomski, 1996). Still mechanistic in nature, leading work was thought about as an activity not done alone but within social system processes as well (Schwandt & Szabla, 2007). Thinking about values began to emerge as socialization over older structural ideas caused tensions for 'more social' leaders. Revisiting the ant hill metaphor, here we studied the causes and effects of social discourse among teams of ants and individuals, with leadership focusing on developing power and shared norms among as part of ant leadership socialization. The diversity inherent to socializing differing people and units led to unexpected outcomes and a strong critique of the social systems approach, particularly as television and mass communication connected diverse people and settings. Tending the ant society in all its complexity was found to consume infeasible amounts of leader time, requiring further leader specialization.

1970 – 1990*:* By the 1980s, North American populations objected to leaders that were found spending far too much time on ever-changing "machine maintenance" management activities resulting from the social systems approach. Cries for "***critical social theory***" rose where leaders aimed to integrate socialization and more value based principles for leading organization socialization (Bates, 1982; Greenfield, 1984). Simultaneously, the introduction of values as post –rational ways of knowing emerged so that individual and social norms without "ends" in mind framed a fresh approach to leading organizations. Leadership theory exploded, but overall student learning achievement in education systems was not found to improve, despite these more holistic trends in leading. During the 1970s, 80s and 90s most contemporary research then shifted again from social transaction studies to ***instructional leadership and school effectiveness*** movements (Blasé & Blasé, 1996). These approaches slowed when evidence of bureaucratic leader "management" duties were found to conflict too often with more broad "leadership" goals that, overall resulted again in very little system performance improvement (in education, student achievement) gains (Hargreaves & Fink, 2006). Here we studied what ant leader's value and how ant leaders offered followers a shared sense of emancipation at work. In the education discipline we studied the effectiveness of ant leader policy and organization (especially planning) to improve system outputs (learning). We studied the ant social machine, values and student learning as the 'customer' moved to the center of the organization in terms of interest (actual results were mixed).

1990-2000*:* In the 1990s, *more* ***holistic, transformational*** *models* emerged describing leaders who aroused human potential, satisfied higher needs and elevated communal work aimed at higher

commitments and performances (Leithwood et al., 2005; Sergiovanni, 1989). This led to a predominantly, leader-centered egoist ideology among *effective practitioners*, a problem that is oddly reminiscent to the "great man" (sic) trait theory limitations of the 1940s. When we realized this shortcoming, we extended social and structural thinking to imagine and study decentralized and distributing leadership work as a more inclusive, shared concept (Gronn, 2002). At the same time, the more traditional power-based cause/effect models for structuring human relations were found to fall well short as descriptive models for most 21st century era schools and global education systems (Mitchell & Sackney, 2011). In this era we studied the queen ant types in the context of dominant social, political and change "forces" acting on organizations to explain and craft interventions. We modeled and designed operational and social systems to harmonize better so that the ant (worker) society could transform its own systems (even perhaps to move to a new hill) through the simultaneous empowerment of leaders, followers and public pressure. The "gold rush" of organizational transformation consulting and rhetoric proliferated - but research showed little evidence of the ideas impacting education system learning achievements (Leithwood & Jantzi, 2005; Kowch, 2009).

2000+: In the 21st century, ***distributed leadership*** models emerged, bearing more *relational* system features to focus more the best practices of leaders and followers who share the work of guiding large, bureaucratic systems with the overarching ethos of 'letting go' of their power within far more integrated, intuitive decision making collectives (Gronn, 2002; Harris, 2008), yet very few leadership scholars actually studied the networks, preferring to use the convenient metaphors instead. By 2012, distributed leadership has yet to gain empirical or research evidence base proving the ideas. A nagging problem, so far, is that these theorists *seldom explore the structural and dynamic features* of 'distributed organizations' specifically, so they don't help leaders to understand the idea beyond a general understanding of it as another form of delegation (Harris, 2008). By 2011 the distributed leadership is losing popularity among scholars and practitioners because even this holistic, more integrated organization approaches still appears to be "piecemeal" in terms of really integrating and designing *total* systemic change inclusive of most dynamics within changing institutions (Reigeluth & Duffy, 2008; Gronn, 2002). Somewhere in between distributed leadership thought and complexity thinking are the many micro and meso level ***communities of practice*** theories and other professional development leadership models that promoting social interaction within the profession (DuFour & Eaker, 2005), but these models also fall short of reality as "…easy concepts that were seldom realized in terms of [actual] leadership communities" (Levin & Fullan, 2008; Kowch 2007).

So today in leadership theory we espouse that the "ants": (1) really do share their work; (2) communicate with technology and data continuously; (3) are heavily connected to the collective work they do and to one another; (4) share values and that (5) (cultural) diversity among the ant hill population is absolutely necessary for socialization. In this era, ants seem to talk a lot about socialization and culture mainly to please leaders who tend to share or express sharing more of the work during more collective transformation efforts.

2.2 A shift to complexity thinking?

Organizations are complex systems (Uhl-Bein et al., 2007). How do we understand a complex system (organization) as something with the potential for adaptation/change? With new knowledge that complex systems can be understood as patterns of relations organized according to certain rules applying to unsteady state conditions, leadership researchers are thinking about complexity approaches to understanding organization at the same time as learning system researchers focused on engaging learners in completely new ways (Uhl-Bein et al, 2007; Davis, 2005). Complexity thinking works to understand *learning* systems (Doll, 2010; Davis, Sumara & Kapler, 2008) and organizations (Goldstein et al., 2010), and that's important because *learning* and *adaptability* are connected ideas here, when and if the right amount of diversity exists in the system. Connected here is the concept of ***diversity*** in the natural world as it informs our way of knowing organizations of people when we lead systemic change (Hargreaves & Fink, 2006). As complexity thinkers, we respect advice from Darwin that "*groups of the best need not be the best groups*" (Page, 2007, p. 671), and that diversity matters in complex systems, ecosystems and organizations. This idea will be evolved in the next sections of this chapter.

It is a parallel 'ant hill' perspective of agents (people), actions and conditions for collaborative work that is informing this newer perception of diversity for organization leaders. Today, more interdisciplinary research from business, IT and organization theory fields informs the Humanities so we can see new patterns, features and principles for collective work (Thompson-Klien, 2010). Combined with policy and social network relation mapping, we understand much more about actual networks of people and organizations working together, turning complex system analytics into much less of a metaphor to offer deeper understanding about of collective work potentials, individual and institutional dynamics, relation types, patterns and ideology in constantly changing environments (Kowch, 2003; 2007; 2009). Here we study how ants learn by understanding what's happening around the ant hill and inside of it in concert with knowledge about influence and social relations, patterns of relations, degrees of specialization and degrees of specialization and diversity among ants. We see as well the supra-systems

or weather (politics, history, economics) in the ecosystem by remembering that the hill is always changing with these interdependent features. This marks a ***definitive change*** in the way education system scholars and most scholars conceptualize change leadership (also known as emergence) when entire organizations are concerned.

> *The real voyage of discovery consists not in seeking new lands but seeing with new eyes* (Proust, 1899).

2.3 Shifts in The Way Leaders Think About Change:

It is important to realize that *technology is the single largest amplifier or feature in accelerating change across complex organizations*. Reigeluth (1991) merged technology and learning design thinking with systemic change theory to suggest a necessary paradigm shift as a pre-condition for systemic change in education systems of any scale by noting the **critical importance of technology for learning** in the modern context. In 1995, change theorist Everett Rogers offered a view of organization change as dependent upon an S-curve innovation adoption process in business. The idea evolved to incorporate the concept of constant change in *Disrupting Class* (Christensen, Horn & Johnson 2008). Christensen used education as an example where technology-led education system replacements will likely be enacted by new governance and learner choices for better education via distance learning. His work supports the ideas of education change theorists who also claim that when most participants in an ecosystem find a better alternative or product than what is offered by failing (public) systems, alternative organizations emerge that can totally change the competition overnight (Fullan, 2002; Hargreaves and Fink, 2006). These shifts mark a change from classical functionalist thinking to post structural, complex perspectives about change in organizations.

Ecosystems are more open to change than we have thought, and they are inherently unstable. More recent research includes the idea that organizations are not in steady, rather they are in constant flux with an incredible number of relational factors influencing one another – just like in every living ecosystem (Davis & Sumara, 2006; Oblensky, 2010; Fullan, 2002; Hargreaves and Fink, 2006). In the 1980s-1990s, systems theorists Bertalanffy and Simon translated information system logic to social systems. Systemic change and complexity (emergence) theorists work today with network theory to understand "the expanding space of the possible" (Hazy, 2008), and they consider too how educational technology and leadership thinking must combine to prepare leaders for these new contexts (Kowch, 2009).

Next, we explore how organizations are complex, emerging (changing) ecosystems that are very, very dependent on a mix of diversity, redundancy and interest organization capabilities to change (emerge) and adapt (learn).

3.0 Framing Organizations as Emergent Complex Ecosystems

> *Business schools have treated organizations as if they were machines that could be analyzed, dissected, and broken into parts. According to that myth, if you fix the parts, then reassemble and lubricate, you'll get the whole system up and running. But this exactly the wrong way to approach a complex problem… it misses the fact that under the right conditions a complex system can adapt, whereas a piece of machinery cannot... an aircraft cannot reconfigure itself but an organization can* (Goldstein et al, 2010, p. 3).

3.1 Emergence:

In social contexts, invention and innovation arise in much the same way, through a process of emergence. In complex systems that learn, diversity is a critical condition for the emergence of innovation and learning in organizations (Davis & Sumara, 2006), as discussed in the coming sections. However first we must recognize that emergence is not merely a technical term for any old kind of organizational change. Rather, it refers to levels of change that are deeply rooted in the organization where significant characteristics in the environments increase "the contours of the possible" for change itself (Davis & Sumara, 2006). This is a difficult concept for us when we realizes that in a state of constant flux we need a way to understand factors that influence the possibility for change (diversity) and the characteristics of levels of change/emergence (Goldstein, 2010). An example works best:

> *When carbon, oxygen and hydrogen atoms bond in a certain way to form sugar, the resulting compound has a sweet taste that is not in any of the separate atoms themselves* (Capra, 2002).

Sweetness is a feature that *emerges* from complexity in Capra's example. It is more than the sum of its 'parts'. The same is true for organizations. Emergence is not a synonym for transformation. *Emergence* is complexity science's term for the creation of organizational processes, structures and practices that add greater functionality and adaptability in the face of an increasingly turbulent environment. So given that emergence is a phase of change in complex systems, and that diversity and redundancy create the potential for emergence (via learning among people), we need to understand a some of the features of complex systems or ecosystems that we will call complex organizations.

3.2 Complex Systems:

Complex systems cannot be reduced to their parts because "they are always caught up with other systems in a dance of change" (Davis, Sumara and Kapler, 2008). Complex systems are more spontaneous, unpredictable, irreducible, contextual and adaptive. Complex and complicated systems are often confused and that confusion represents our paradigm shift. The following table illustrates the distinctly different features of complicated and complex systems:

Table 1. Complicated Vs. Complex Systems. Source: Kowch after Davis, Sumara and Kapler (2008, p. 77).

Complicated (Mechanical/Functional)	**Complex** (Learning or Organizing)
Physics (Newton)	Biology (Darwin)
Machine metaphors	Ecosystem metaphors
Linear imagery	Cyclical, recursive imagery
Input/output flows	Feedback loops/regulation
Efficiency-oriented	Sufficiency-oriented
Goal-oriented	Growth-minded
Reducible to parts	Incompressible (fractal)

Cilliers (1998) identified ten characteristics of complex systems: (1) big, with many agents; (2) actors change one another over time; (3) all elements interact with others. Some redundancy; (4) relations are nonlinear; (5) short range network connections; (6) positive and negative feedback looks regulate activity; (7) open systems; (8) state of disequilibrium; (9) Context, history and time matter; (10) each element is ignorant of the entire system. Characteristics 2 and 3 [actors *change each other* over time via interaction and *all elements interact with each other* and 8 (state of disequilibrium] matter most toward our understanding about why *diversity* and *learning* lead to *adaptable* and *smarter* complex organizations (McKelvey & Lichtenstein, 2007).

3.3 Can Organizations be Framed as Ecosystems?

Yes. The Greek word "*eco*" means "household" or "community, so the term "ecology" refers to a particular kind of community. Examples from the biology disciplines include coastal bays, rain forests and such as nested systems just as organizations have units, task forces and subgroups (Marion & Uhl-Bein, 2001). Both biologists and complexity researchers agree that a thriving ecology is a set of nested subsystems embedded in a community of resonant interactions with each other and their shared environments. A vibrant ecology is always changing in many, many ways so it is considered to be an ***emerging*** complex system. Few scholars study organizational emergence today but those who do find that

diversity is critical to emergent learning and emergent adaptive organizations (Goldstein et al., 2010; Oblensky, 20010). *Organization ecosystems* have the same basic features of *complex* systems, summarized as: (1) diversity (across the networks); (2) Experiments (with novelty emerging from diversity); (3) Intricate networks connecting nested subsystems to one another; (4) Innovation conferring new functionalities and adaptability (to jolts); (5) Critical periods of instability. Yes, organizations can be framed well as ecosystems. We have learned that organizations are complex emergent ecosystems that are depending on some specific conditions for their chances to emerge and to adapt. Next, we explore that complex systems do exhibit intelligence and that complex systems with people (organizations) can adapt effectively via collaborative learning.

3.4 Emergent Intelligence: Can Ecosystems "Think and Learn" (Adapt)?

The only stable ecosystems in existence are dead systems (Waldrop, 1992). Living systems are in constant flux (Waldrop, 1992, Capra, 2002). It follows that: (1) an organization cannot be dead; (2) organizations are in constant stages of flux, called emergence and that (3) existing organizations are complex systems. Some complexity researchers find that emergence (system wide change) across an organization is guided (or enabled) by a simple set of innovation rules dependent on diversity in the system (Goldstein et al, 2010). So what is the cause of organization emergence? For parsimony and before we explore ***organization emergence***, we should offer a simple example of complex emergent "intelligence" or "smartness" from nature.

An Example of Simple "Intelligence" in Complex Natural Organizations

Computer science complexity thinkers discovered (simple) basic rules that individual fish, birds and bees follow to organize their movements in large swarms so that they change speed and direction with terrific speed without crashing into each another (Partridge et al., 1980). These simple rules are used for all computer game animations today where many bodies travel in "swarms". (Organization theorists muse that if employees could do this, organizations would be more adaptable).

The rules are simple:

1). **Avoidance & separation** (avoid bumping into the being ahead, behind, above and below you.
2.) **Alignment** (move in the direction that those closest to you are heading).
3.) **Cohesion & Attraction** (move toward the position of those closest to you).

So swarms are intelligent. They can also learn and adapt together. Scientists have modeled this behavior as well to analyze traffic, human crowds and to set up Google searchers on the internet. The basic principles of pattern recognition and collective movement hold up pretty well.

Basic rules ***do*** apply within unsteady state and seemingly chaotic complex systems. These are not chaotic, free-for-all or unbound systems at all, yet they do flourish as open systems. By discovering the rules, researchers can understand cause/effect relationships (Partridge et al., 1980; Barabasi, 2010).

Have you ever wondered how swarms of bees fly to a patch of blooms with such speed and accuracy, without each bee crashing into one another or getting lost? The answer is a far less 'managed' process than you might expect (Fisher, 2009). In fact, similar complex rules/thinking underpins the way Google searches, smartphone tower and face recognition technology function. Social science researchers use these principles to describe and analyze large political, social (Scott, 2000) and influence networks (Kowch, 2003).

The Conditions for Complex Adaptation:

While people are far more evolved than bees of course, we can use a bee swarm example to realize that while complex fish swarms use rules to act collectively, bee swarms can make decisions collectively (as can groups of people).

This means that complex systems (organizations) can learn and adapt (become smarter) using similar principles.

While complex organizations can adapt via collaborative, networked learning, certain conditions must exist for that complex organization to have a chance to adapt.

Those conditions are: ***specialization, diversity, redundancy and the ability to organize interests*** as networks.

How a bee swarms organizes their collective work has been described by digital photo technology and it has been successfully simulated since by using Partridge's (simple) rules. Applying those rules gave Martin Lindauer the first understanding of how bees organize their ***emergent intelligence***. Lindauer discovered that a few leading and faster 'streaker' bees possessing a clear idea of the location of the target take flight first, followed immediately by hundreds of worker bees. Guidance is achieved by a cascade effect in which uninformed individuals (with no idea where they are going) align their directions and speed with those of their neighbors. Even if only *a few of the bees* know their way Partridge's three rule (avoidance, alignment and cohesion/attraction), the whole swarm moves in the direction of the 'streaker' bees. The purposeful movement of bee swarms, in other words, is an example of a very simple form of complex "intelligence" that arises from simple local interactions. Beyond the scope of this paper, similar principles are used by organization researchers to map and interpret the emergence of influence and interest organization relationships across organizations (Kowch, 2003; Kowch, 2007). Yes, complex can organizations think (and learn). As leaders, it is out challenge in the 21st century to understand the conditions necessary for system intelligence as a thoughtful mix of diversity and redundancy within our envelopes of 'specialization', so that people and organizations (complex systems) can learn well.

If a system has intelligence and if it is complex, it can learn and it can adapt. But what does diversity have to do with that? Answer: Without diversity, the organization cannot change, as we explore next.

4.0 Diversity as a Condition for Organization Emergence – It's All About Potential

While demonstrating a primitive form of network intelligence, the bee swarm example did not demonstrate the importance of diversity in a complex, emergent (changing) organization. Researchers have found that diversity is a critical attribute for any complex organization to change completely (transform). In this paper we have foreshadowed that two fields of study can overlap to offer a powerful framework for understanding the ***critical importance of diversity*** to complex organizations: (1) diversity offers an organization its very *potential* for ***"learning*** its way ahead" (smarter emergence) in unsteady states (via learning/knowledge building) and; (2) diversity offers an organization its very *potential* for ***novelty*** and subsequent innovations (organization science/innovation) that attract people toward change.

A bee swarm with emergent intelligence capability can become 'smarter' and adaptable. First, we must imagine bees swarming in an unpredictable context – say when a road is constructed across the bee flight path. To survive, a swarm must be able to adapt so it can make honey another day. Fort his learning to occur, Davis (2006) says that diversity must be present as a potential for the swarm to learn and to adapt its organizing abilities. For example, to be robust (live) our 'streaker' bees would need to have learned, over time, flight-path-avoidance techniques for intrusions for that system to be "smarter" or more intelligent. That knowledge building (potential) depends on some ***differences*** among the challenged streaker bees – specifically on their degree of specialization, which is created by the tension between the diversity among the streakers and their redundancy in the system. The same is true for groups of people with differences among them – alternative perspectives, representations and interpretations for example add potential for a complex group of intelligent people to do better on a problem, collectively for as Page finds in his social simulations "diversity trumps ability" when it comes to innovative problem solving (2007). So ***diversity found across the organization offers the <u>potential</u> for complex groups to do better work***. Next we explore the potential for an organization's "smarter emergence" from a complex systems learning perspective, finally outlining how features of complex systems offer such organizations the chance for system wide change (emergence). Here, we explore a shape of the possible.

4.1 "Smarter Emergence": Diversity and Redundancy as Conditions for System Intelligence

Rethinking Specialization:

Every organization is emerging at some rate in order to exist. Learning science researchers have discovered that the very potential for system emergence is critically dependent on three learning system conditions: (1) ***specialization***; (2) ***network learning*** and (3) ***enablers and regulation*** (Davis & Sumara, 2006). Conditions 2 and 3 are more related to the qualities or dynamics of an emerging system, so they are beyond the scope of this paper. However ***specialization*** contains the key to understanding diversity and its importance for an organization to even have a fair chance at emerging as a network of complex goings-on.

Specialization: Necessary tensions (Kuhn, 1977, Rorty, 1989) exist in all ecosystems, and do specializations among people. There is a need for both differences and similarities in complex systems because unsteady states *demand* different contributions (diversity) in different system contexts (Waldrop, 1992; Cilliers, 1998. As well, a degree of commonality and duplication among the subsystems so that they can "stand in" and share meaning with each another, should one fail (redundancy) is also necessary for a complex system. Thus, diversity is one of two elements comprising an organization's *degree of specialization*. If a system is overspecialized, it has little chance to perform let alone change (imagine a hospital with 100% of its staff being cardiologists). Specialization is the single most important condition in terms of learning system affordances that offer organizations a chance (potentials) for (good) systemic tensions to exist between (a) ***diversity*** and (b) ***redundancy*** in the learning project as "energy for emergence". Diversity and redundancy are *complementary*, not opposing features of specialization that "define the range and contours of possible responses" in a learning context (Davis & Sumara, 2006; p. 137).

(a) ***Diversity in complex learning systems***: According to Davis & Sumara (2006) the development of systemic intelligence depends critically upon diversity among its participants (agents, actors, learners or nodes, however defined). Indeed, the robust intelligence of a complex organization depends on levels diversity found among and between collaborating participants as a source of (more) possible responses to emergent circumstances. Some of the *diversity attributes* found in people and complex system organizations (and subsystem units) that learn are:

- Contextual: history, experience, skill, knowledge, values and ideologies

- Difference: among participants, creating a source and range of possible responses to emergent learning circumstances or knowing. The possibility for novelty in learning/knowledge building.

(b) ***Redundancy in learning systems***: Redundancy means that the other guy has just enough of what you have to both communicate and work with you and to possible do the tasks you do, in some measure. It does NOT mean wasteful duplication. In ecosystems, ***redundancy plays two roles*** in emergence. First, redundancy: (1) *makes working together* possible through (knowledge and same-knowledge of) shared texts, language, experience and responsibilities and (2) second, redundancy *makes systems more robust* because people or subsystems are capable of "standing in" for one another over time, or for "filling in" the gaps in each other's knowledge or capabilities. While duplication is a problem in efficiency management, redundancy in ecological, computing and complexity science means there are "backup" elements in dynamic systems that can co-compensate. This is particularly handy for systems that acknowledge that they exist in our commonly far-from-equilibrium ecosystems.

Figure 1 demonstrates the complementary roles of redundancy and diversity as catalysts for emerging learning systems.

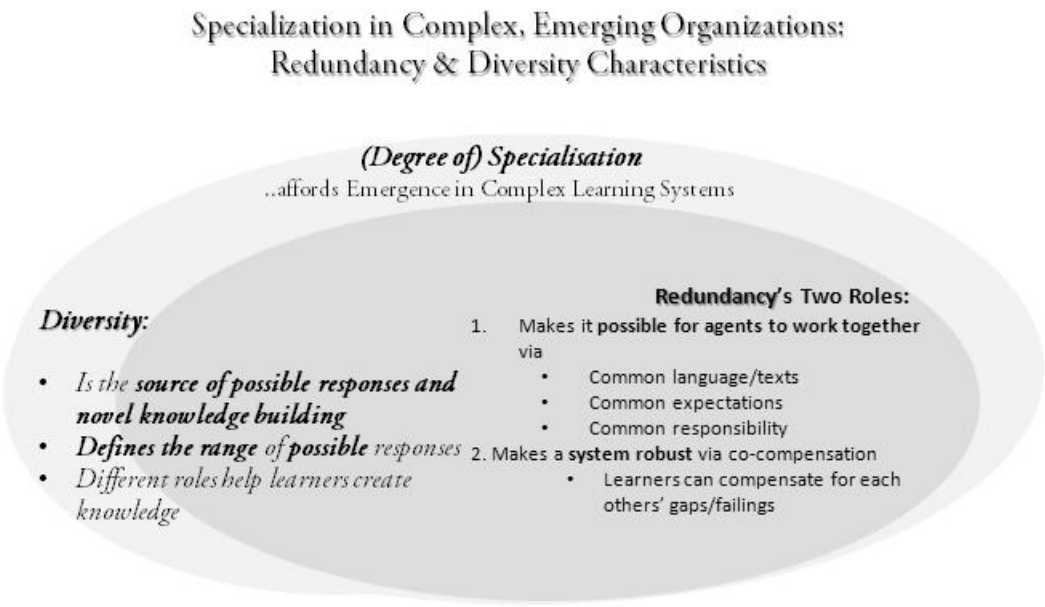

Figure 1: Diversity and Redundancy as Affordances for Learning System Emergence: (after Davis & Sumara, 2008).

4.2 A Framework for Leading Smarter, Adaptive Organizations: Knowing Your Organization's Capacity for Emergence

(The right mix of diversity, redundancy and the capacity of organizational networks to organize interests in far-from-equilibrium contexts).

We have examined that specialization (redundancy and diversity) in an organization is about the intensity of collective participant experience realized as a mix of *diverse* characters and *redundant* features among the network participants. Overspecialized work networks (the wrong mix) are much less likely to organize interests well as high capacity interest organization network (Kowch, 2003). By mapping these high and low diversity and redundancy features in a learning system we realize that inflexible systems have minimum redundancy and a high degree of specialization, where adaptable systems have a high level of redundancy and a low level of specialization. Organizations with the highest potential to emerge really are capable of systemic intelligence (Davis & Sumara, 2006) or "smartness" thoughtful, collective acts of emergence shaped by diversity.

Getting work done together in a complex organization (that learns) means also having the *capacity to make decisions or to organize interests* not as a hierarchical structures per se, rather ***as learning networks*** embedded with the right mixes of diversity and redundancy among people.

Only a handful of education leadership scholars closely examine complex organization relational networks beyond the use of such a "convenient" metaphor, as we have said. But empirical studies are emerging to describe and analyze the ability, type and potential of relational (leader networks) (Kowch, 2003; 2005, 2007; 2009). By adding the dimension of interest organization capacity for our working networks, (Figure 3) we can characterize emergent learning system potentials for emergence with their potential to get work done. In sum, we can plot the mixture of diversity, redundancy and network capabilities to get work done in one context for the first time.

Kowch (2003) demonstrated that the complex emergence of ideas and policy networks across large institutions and political ecologies across entire states could be defined, interpreted and predicted using network and policy theory to identify six characteristics of high capacity networks (Kowch, 2005; 2007;2009):

1. a clear *concept of role* in collective work
2. a supporting *value system*.
3. a unique, *professional ethos* in the field.
4. a capability to *generate information* internally
5. a capability to maintain *cohesion*
6. a capability to *organize and manage complex tasks*, leading toward the creation of a response
7. a capability to *rise above self interest*

In the knowledge era, much has been written about networked, transforming organizations Modern technologies allow us to describe and interpret patterns within, among and between vastly complicated, organized collective work/ within relational, networked ecosystems (Castells, 2004; Kowch, 2009). Yet most leaders focus on power, pyramid structures or culture to understand our collective work in organizations, of which most are deeply embedded with old and neo-bureaucracies (Clegg, Harris and Hopfl, 20011). Figure 2 is a useful new framework for leaders to understand this important interplay between diversity and redundancy in complex learning systems.

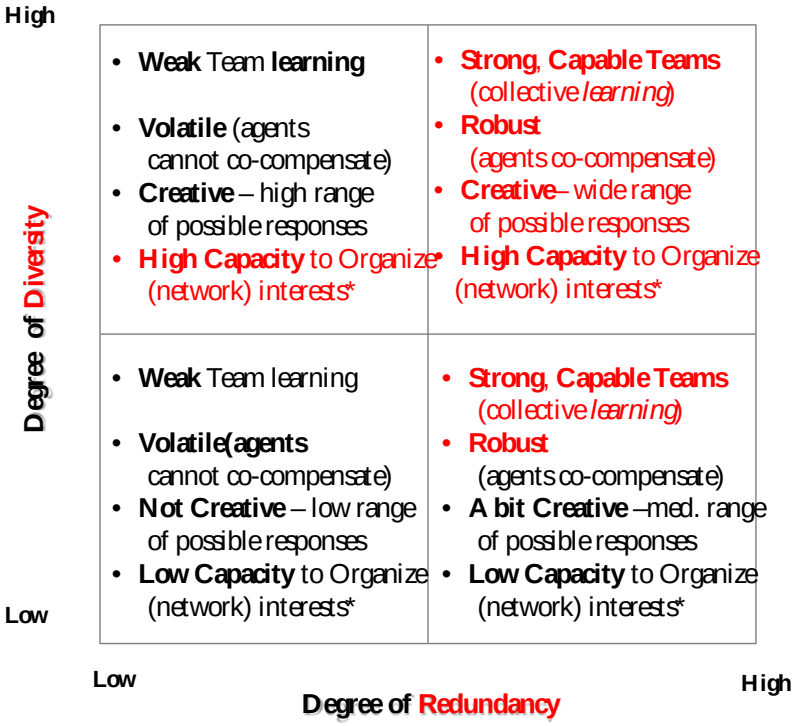

Figure 2: **The Characteristics of Complex Adapting Organizations that Learn**:
Source: Kowch after Davis & Sumara (2006;2008)

Thus, Figure 2 offers framework for characterizing previously inconceivably complicated system or organizations that learn. Unlike previous thinking, this framework recognizes that the organization and its networks exist in unsteady states as an interconnected collection diverse and redundant people with a range of abilities to organize interests and to spark innovation across a range of diversity and redundancy characteristics.

By analyzing these features with an eye to mapping out just how likely certain mixes of these features indicate an entire organization's potential to emerge, we can identify high, medium and low potentials for emergence (Figure 3.). This is a framework for helping leaders to understand if your complex organization is mostly comprised of show horses, race horses bureaucratic horses or work horses, independently of the state of emergence or the volatility in your contingent ecosystems.

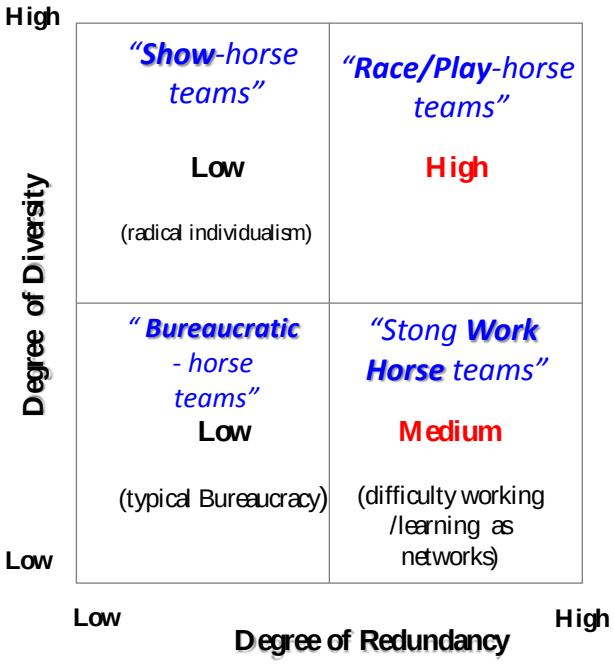

Figure 3: **Complex Organization Emergence Potentials**.
Source: Kowch after Davis & Sumara, 2006 & Kowch, 2003.

4.3 "Adaptive Emergence": Diversity as a Seed for Novelty and a Source for Adaptability

Complexity researchers studying both organizations and learning both agree that diversity is a critical factor enabling (and constraining) the emergence of complex organizations. A slight difference is that organization scholars are shifting toward the concept of "ecologies of innovation" recently, taking a perspective that organization emergence, one possible can occur through the creation of *innovation* ecologies in the context of the organization (Goldstein et al., 2010, p. 8). Ecologies of innovation are, not surprisingly a consolidation of some of the complex ecosystems explored earlier (Cilliers, 1998; Davis, Sumara & Kapler, 2009) but exhibit the following 5 features:

1. These *are systems of* ***difference*** where micro level ***diversity*** supplies the ecology with seeds of novelty
2. ***Experiments*** in the system move parts of the system away from normal routines, resulting in **novelties** that move the system to new opportunities (sometimes)
3. Intricate ***networks*** *connect to interdependent subsystems*
4. ***Innovations*** conferring new functionalities that enhance adaptability to unexpected changes or "jolts" from the environment. A 21st century leader competency will be the ability to recognize,

amplify and nurture networks where novelties and tension are directly associated in firms (Johnson et al., 2011).

5. ***Critical periods of instability*** exist that allow for substantial transformations of behaviors and dynamics. A 21st century leader competency will be to lead and recognize these periods of instability along with the phases of emergence (change).

Organization theorists focus on diversity in terms of ***systems of difference*** some, but more recently more exclusively on ***diversity as the source of adaptability*** in the emerging organization.

> *Differences in intentions and perspectives are the fuel for complexity…for the generation of information that is central to novelty creation… [And from novelty creation follows experimentation, amplification and innovation emergence]* (Goldstein et al., p. 84).

4.2.1 Systems of Difference:

Difference in organizations is a seed for novelty, which is the spark to the kindling for experimenting new things. Difference is energy in an emerging system. Linking closely to biodiversity research, organization theorists say that a prime feature of innovation ecosystems is *difference* among system elements or 'agents' as a precondition to stability. This came from biodiversity research showing that populations oscillate (a lot) when there was little difference between species in an ecosystem (Elton, 1955).

Organization thinkers understand emergence is not a continuous arc, but that emergent systems occur in a certain order with distinct features: (1) disequilibrium, (2) amplification, (3) recombination and (4) feedback and stability. Difference and diversity happen both before stage 1, and during "disequilibrium". As meaning emerges through differences in member's backgrounds skills, opinions and perspectives these differences help drive emergence as people search to find meaning in between and within the "noise" or "gaps' between expected information and the perceived meaning of actual circumstances (information sciences). Patterns in this discourse emerge whereby the *strength of weak ties and relations* (network theory) and other analytics help researchers understand which differences matter to what sorts of relational patterns, and how issues emerge as catalysts for collective work in unsteady contexts (Kowch, 2003; Scott, 2000). A main task for future leaders will be unearthing differences in the agents and patterns of organization as conditions for system emergence. Contemporary organizational

theorists also posit that *diversity, not just difference* is a more important feature in leading ecologies of innovation (Goldstein et al., 2010).

4.3 Diversity as the Seeds of Novelty – the Sources of Adaptability

A lot of emerging goes on before a novelty in an organization fits within an adaptable organization. In ecology research, the greater the diversity within a system, especially at the micro levels of individual differences and group-level heterogeneity, the *higher the potential exists that these differences* can be amplified into real innovations (Bradbury, et al., 1996; Forno & Merlone, 2007). A particular form of diversity at the micro level is suggested as a place for leaders to focus when nurturing novelty.

Micro (human, person) level diversity is the seed for novelty, and it is possible only if there is freedom to depart from what is expected. Organizational theorists point to ***technology*** as the best example one of the most significant system novelty or "discontinuity" so important in the initial stages of emergence (disequilibrium) in complex organizations (Hazy, 2009). They use technology examples to explain how diversity is the source of adaptability, and how leaders must step back and promote the tensions between expected performance and actual performance, letting novelty attract enough interest to be tested in the organization. They find that when ***novelty or a small variation*** is expressed through a small discontinuity in technology, it becomes an attractor for experimentation an ever-faster emerging organization (disequilibrium phase). Once the novelty is adopted or receives "attraction", the system develops beyond the "amplification" stage via the subsequent tensions created in the amplification and recombination stages of emergence. People coalesce around new ways of doing. This results in greater levels of adaptability from the system. Since emergence pushes beyond the specific context in which it appears, what actually emerges (patterns, items or ideas) is not known beforehand, and is accordingly outside the control of any "leader".

Goldstein et al. (2010) offer one example of micro diversity in unsteady conditions. When Netflix began in 1998, DVD players were rare and this organization was in the business of renting DVDs by mail at a time when few DVD players could be found in homes. So Netflix teams looked outside the firm (across semipermeable organizational boundaries) into their wider ecosystem to partner with DVD makers and to offer free DVDs to DVD machine buyers, generating a potential customer list for DVD rentals. When Amazon.com began shipping DVDs soon after, Netflix again worked with the ecosystem to learn and to partner with Amazon to advertise Netflix products online. It strengthened its relations in the

movie distribution ecosystem, which helped them enormously when they partnered again to ship their movies online. This diversity of thinking and adaptability demonstrates the Netflix organization's adaptable, robust (sustainable) emergence during terrific change contexts both *outside* and *inside* the firm. "structure". As we learned from Section 2.0 in this paper, that feature of "outside looking" emergence (and perhaps inside *learning*) marks a profound difference between complex adaptive systems/diversity thinking and even the most current "distributed learning" and 'transformation theory' underpinning leadership thinking today. Much more research needs to be done on the topic of diversity as a seed for novelty and emergence patterns. This research is still too abstract, and needs to be taken up in the study of emerging organization more globally. One of the original thinkers on micro diversity offers sound advice for leaders and scholars in this emerging research area:

> *Even though one cannot understand what exactly creates the micro-diversity underlying a system, it can be established that all the underlying phenomena obey the same kind of behavior – that of evolving complex systems. By allowing ourselves to be "evolvers" and by exploring our own diversity, a richer set of possibilities are created on which the collective system can thrive*. (Allen et al., 2010).

5.0 Conclusion

Cascading financial failures and inevitable resource shortages in the public are indeed changing the personal, social, economic and political landscapes in our world. As a response and for new leaders, this paper traced organization and leadership history to suggest evolution in our way of thinking about organizations as complex systems. Instead of denying the tremendous connectivity that modern technologies afford us today, we discovered that the seeds of emergence in tomorrow's organizations arise from knowing a mix of diversity and redundancy better within our organizational ecosystems, not from organization charts. We explored that system intelligence or "smartness" is possible, and includes leader and system learning potentials made available only by leaders knowing the diversity and redundancy in organization networks. To increase the chance that we will lead more adaptable organizations against the backdrop of constant change, we can consider the differences and novelties arising from system "noise" as seeds for new experiments that change the very purpose of organizations emerging in stages. In preparing this paper the author also realized a serious need for more focused research on diversity in leadership contexts.

The complex ecosystem (leadership) study area is populated by very few interdisciplinary researchers integrating technology, administration, policy and organization theory. This is unbelievable when we know that technology and innovation not only drive organization emergence, but often create instability in the ecosystems engaging modern large organizations. Overall, complexity thinking about leading education systems is 20 years behind that of our colleagues in other disciplines, yet we uniquely understand learning as a function of adaptability. We should catch up sooner to prepare Ducker's new generation of leaders to lead adaptable organizations with the potential to avoid so many cascading system failures in our emerging knowledge era.

Anything less will result in more skylights among taller towers amidst increasing public displeasure with our approach to leadership today.

Key Terms: Leadership; Organization Design, Organization Change, Diversity, Specialization, Leading Change, Complex Adaptive Systems; Complex Systems; Complexity Theory; Education Technology.

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