

Leadership and Meta-System Challenges: A Literature Review and Synthesis

Eric J. McNulty

Lesley University

Leadership and Meta-System Challenges: A Literature Review and Synthesis by [Eric J. McNulty](#) is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License](#).

Based on a work at www.richerearth.com.

Permissions beyond the scope of this license may be available at <http://www.richerearth.com>

Abstract

This paper examines the literature on systems and systems-based leadership to gain insight into how to lead in the face of meta-system challenges: those “tough problems” which may be easy to identify yet which are difficult to solve such as the threats posed by climate change and global urbanization. They involve many stakeholders with diverse interests and divergent perspectives on the scope and shape of the challenge.

Selections from the traditional leadership literature are also reviewed to discover both their applicability and limitations with regard to leading in complex systems. Three particular issues which this literature fails to address explicitly arise from this exercise: complexity, agency, and emergence.

The large modern city is used a proxy for the environment in which such challenges may unfold as these meta-systems are loci of organization and activity around the globe.

The City as Meta-System

A system is a set of elements that work together (Alexander, 1966); a set of elements that, because of their interconnection, produce a distinct pattern of behavior over time (Meadows, 2008, p.2). The modern city is a meta-system: a system comprising sub-systems, or nested systems (and networked systems), each of which is interdependent with the others and with the whole itself, and in which the whole is dependent upon the component systems. There are at least five such sub-systems found in virtually any city no matter its geographic location or state of development: economic, environmental, infrastructure, knowledge, and social.

The economic system is that set of arrangements through which goods and services are traded both within the city and with other entities. The environmental system comprises the natural elements of the city: the ground on which it is built, its sources of water and air, and the mountains or oceans that may define its borders. The infrastructure system comprises the built components of the city: structures, travel ways, water delivery and waste disposal mechanisms, power lines, and such. The knowledge system is that through which learning and experience are captured and lessons transmitted among residents including the education of new generations of residents. The social system is that set of arrangements through which residents of the city interact with other residents and outsiders including governance structures they create, levels of status they confer, spiritual rites they practice, and norms and mores they adopt

Thus the modern city is a human interaction network comprising both natural and built elements (Hawley, 1986). The elements in each subsystem can influence the others but no single component of the network controls or can direct all of the others. The sustainability of the city requires that each of these systems operates smoothly with regard to its own function and also in its interactions with the other systems. As a result of system interdependencies, the failure of any one of these sub-systems may cause the failure of the meta-system.

Coward & Salingaros (2004) saw cities as complex adaptive systems and posited that cities exist for the exchange of information (with “information” broadly defined to include products, services, and funds as well as knowledge and data) and that they develop heuristically so as to optimize interaction of the components it comprises. There is an inherent tension between the desire of subsystems to optimize within that set and the desire of the meta-system to optimize overall information exchange.

Cities are at the center of a new Urban Age argued Katz, Altman, & Wagner (2008). They cited that more than half of the world's population now lives in cities and that that percentage will increase to 75% by 2050. In 1950, 40% of the world's urban population was found in the developing world – by 2030 the percentage is projected to be 78% (Soja, 2006). Cities will be the principle structures in which human activity will occur.

Cities are not islands, however, and are dependent upon their relationships with other cities in “relational hierarchies” (Neal as cited by Florida, 2008a) Cities are also dependent upon and interdependent with state, national, and international policies, regulations, and protocols covering a wide range of factors including trade, immigration, and environmental standards. Katz et al called for “integrative, multidimensional thinking and action” because “the path of development in many cities around the world is simply not sustainable socially or environmentally or politically – nor, ultimately, economically” (Katz et al, 2008, p. 476).

All cities are not the same. Alexander (1966) divided cities into two categories: natural and artificial. Natural cities are those which have risen up through organic growth over an extended period of time, such as New York or Rome. Artificial cities have been designed and built at city scale through a single effort, such as Levittown or Britain's New Towns or more recently Dubai, UAE and So Dong, Korea. I further break these down to reflect the distinct challenges leaders in cities will face in the decades ahead:

Legacities are natural cities with extensive sophisticated built infrastructure and formalized structures such as most of the cities in the developed world. These cities are facing the need to rejuvenate and retrofit this infrastructure to adapt to climate change, the aging of their

populations, and other changes in context. Such efforts can be “fine-grained, nimble, and locally embedded” (Ichioka, 2008).

Cities of Desire, or squatter cities (McGray, 2009), such as the *favelas* adjacent to Rio de Janeiro, Brazil have less sophisticated built infrastructure and minimal formalized structures (at least to an outsider’s eye). These natural cities are “slums” with no underground sewers, central business zones, or school districts. They are densely populated urban areas that have arisen adjacent to Legacities in part because individuals long for the economic opportunity of a city yet lack the economic resources to become part of the formal city structure.

Technotopias (also known as “eco-cities”) are artificial cities designed with a “comprehensive understanding of the complex interactions between environmental, economic, political, and socio-cultural factors based on ecological principles” (Alusi, Eccles, Edmondson & Zuzul, 2011). These efforts emphasize wide-ranging planning and management of city activities. Examples are Dongtan near Shanghai, China and Masdar City in Abu Dhabi.

New-old Cities are new artificial cities built, however, with the standards and perspectives of Legacities. For example, it is estimated that as many as 100 new cities are being constructed in China and while several are Eco-cities, many more are not (ICSNC, n.d.). These cities are being constructed in anticipation of expanding urban populations.

While cities have long emerged in places friendly to transportation such as harbors and rivers, the concept of the “aeropolis” – a city that arises around an airport is now gaining traction and could take the form of either a Technotopia or a New-old City. One is planned for Kuala Lumpur’s International Airport (Selangor State Investment Agency, n.d) and another at Senai International Airport in Malaysia (Musa, 2008).

Further expanding the concept of the city have been proponents of the megalopolis such as Kahn and Weiner (1967) and more recently Florida (2008b). Kahn and Weiner designated urban areas such as BosWah (Boston to Washington), ChiPitts (the Great Lakes area), and SanSan (Santa Barbara to San Diego) to reflect economic entities that transcended the political boundaries of the cities and states they comprise; Similarly, Florida identified global mega-regions as the “economic units that structure and orient the world economy” (Florida, 2008b, p. 74).

In order to understand the challenges leaders face in each of these types of cities one must first understand the principles that govern systems.

Principles of Complex Systems

Systems thinking is built on scientific observation of the natural world, principally through quantum physics, complexity theory, self-organizing systems theory, and chaos theory. This “new science” revealed “the inherent orderliness of the universe” (Wheatley, 1999, p.4). It stands at odds with the linear Newtonian worldview based on reason, predictability, and reductionist reasoning where the world is a machine that can best be understood by examining its individual pieces. Systems thinkers maintain that a complex system can only be comprehended through “contemplating the whole, not any individual part of the pattern” (Senge 2006, p. 6) and that it is dynamic and non-linear (Meadows, 2008; Senge, 2006; Wheatley, 1999).

The most significant determinant of system behavior is often purpose yet purpose can also be the most difficult to discern (Meadows, 2008, p.14). The leader must be aware that the system's purpose may not equate to human purpose nor that intended by any actor in the system

(Meadows, 2008, p.15). Purpose should thus be derived through analyzing behavior, not stated objectives, goals, or desires (Meadows, 2008, p.17).

The three basic elements in systems are stocks, flows, and feedback loops. Stocks are the elements that one can “see, count, or measure” (Meadows, 2008, p. 17). Examining the systems in the city meta-system reveals many stocks: capital, jobs, accounts payable, and accounts receivable in the economic system; trees, fresh air, clean water, and pollution in the environmental system; roads, bridges, railways, and buildings in the infrastructure system; and data in the knowledge systems. The most difficult to see, count, or measure are the stocks of the social system: e.g. trust, goodwill, bigotry, faith, and what Jacobs called “eyes on the street” that allow the assumption of “general street support” in the event of disruption (Jacobs, 1961, p.56).

Flows are the movements of elements into and out of stocks allowing the stock to increase or decrease. Payments and withdrawals affect the levels of economic stocks; births, growth, and deaths in the environmental system; building and demolition in the infrastructure system; bytes of information acquired or lost in the knowledge system; and promises broken or kept and friendships made or lost in the social system.

Feedback loops are the mechanisms by which flows are regulated. Balancing feedback loops seek a goal or stability much as a thermostat works to keep a room at a constant temperature. Reinforcing feedback loops push the system in a certain direction much as compounding interest causes a stock of money to accelerate its growth over time. Sales of goods create a feedback loop affecting stocks of inventory, cash on hand, and accounts receivable in the economic system, for example. New goods may be ordered to replace those that have been sold

and will be paid for by the increased cash on hand or credit made possible by the accounts receivable balance.

Feedback mechanisms do not always operate smoothly (Meadows, 2008, p. 30). They can be distorted by changing conditions, delays, or other factors. Distortions are pervasive in systems, particularly those involving large organizations with multiple layers (Meadows, 2008, p. 78). Senge (2006, p. 189) maintained that many of the “mental models” through which individuals approach a situation are “systematically flawed” because they fail to recognize some feedback loops, misread time delays, and may emphasize variables which are most visible rather than those with the greatest potential for influence. Meadows (2008, p. 22) said that such mental models are simplifications of reality and should not be mistaken to be the real world.

In the sale of goods example above, if the sales are higher than expected they may indicate rising demand that will continue to climb or a one-time blip caused by an extraordinary event. Whether the perceived change in sales is based on data reported by the hour, day, week, or month can affect how it is perceived and what action is then taken. So, too, can the position of the perceiver in the value chain and many other factors. The same dilemma would hold true with tax revenue for a city or donations to a non-profit.

Senge (2006, p. 27-40) regularly ran an exercise with students called "the beer game." In this game, the student played the role of a shop owner who experiences a sudden rise in sales of a certain niche beer that is mentioned in a music video. The students were asked to decide how to respond through their weekly orders to their distributor. Across several thousand iterations of the game, students consistently order such that they initially receive too little inventory and then ultimately too much because they misread the feedback loop in their store and do not have

visibility into the feedback loops between the distributor and the brewery. The initial distortion had cascaded through the supply chain and was amplified such that ultimately more beer was produced than could be sold.

The consistent results from the beer game impart these lessons: System structure influences behavior – different people made the same misjudgments and mistakes when placing orders for beer. Structure in human systems includes interrelationships and not simply visible limitations – system structure can be difficult to perceive. Leverage points, too, can be difficult to see until one thinks not only of one's own decisions but also how those decisions affect the decisions and actions of others (Senge, 2006, p. 40).

Echoing Senge's observation on leverage, Meadows (2008, p.3) maintained that in complex systems delays in feedback loops can create a situation in which problems can be difficult to solve by the time they become apparent. She also stated that in any physical system there will ultimately be a constraint to growth that will serve as a balancing feedback loop that counters the reinforcing loop that drives growth (Meadows, 2008, p. 59).

The dispute over climate change can be seen as a battle over the value and meaning of feedback loops. The stock of carbon dioxide (CO₂) in the atmosphere has increased most dramatically over the past 150 to 200 years (Maslin, 2009, p. 9, 121). Increases in the stock of scientific knowledge have allowed one to measure both the increase in the CO₂ stock as well as the possible flows that are increasing or decreasing that stock. Those who are alarmed by the increases advocate using other feedback loops such as regulation and pricing to alter the practices that are increasing the flow of carbon into the atmosphere such that the inflow is

diminished. They also advocate measures such as forest conservation to increase the flow of carbon out of the atmosphere through photosynthesis.

Others who are not alarmed do not find the feedback loop on the level of the stock of carbon dioxide in the atmosphere compelling. In their view, neither causes nor effects are clear and the increase in CO₂ may result from natural oscillations which are not yet fully understood. They see measures such as regulation taken to mitigate carbon levels as a distortion of market feedback mechanisms that help optimize the flow of capital in the economic system.

In simple terms, one side has greatest confidence in scientific feedback loops while the other has greatest confidence in economic feedback loops. Each feedback loop is subject to distortion through delays -- both sides acknowledge that any impact of climate change may be slow moving – and the larger the initial stock of resource, the longer it will take for balancing feedback loops to constrain the reinforcing feedback loops of growth (Meadows, 2008, p. 65). Each side is subject to bias such as emphasizing the sub-system in which it has greater investment over the others. Each may perceive an alternative purpose for the system. Each may fall prey to a tendency toward advocacy rather than inquiry (Senge, 2005, p. 183).

The relationships between the elements in a system are more important than the elements themselves (Wheatley, 1999, p. 36; Senge, 2006, p. 40). The individual elements, however, are more easily discerned than are the interconnections and interdependencies between them (Meadows, 2008, p. 14). In order to begin to see and understand system structure, a leader must begin to think of the world as a series of feedback processes (Meadows, 2008, p. 25); a leader must see the interdependencies (Senge, 2006, p. 343). Wheatley (1999, p. 45) maintained that the leader must focus on “critical connections.”

Complicating the task of understanding and leading in a system, according to Wheatley (1999 p. 44), is that no individual can ever know everything about the system as a whole and thus one cannot predict exactly what will result from one's actions and attempts to influence it.

An aphorism ascribed to Deming is that every system is perfectly designed to deliver the results it produces (Paulker, Zane, & Salem, 2005). Changing complex systems is hard because they are resilient. They "survive and persist" amidst changing conditions (Meadows, 2008, p. 76). Even changing all of the components of a system will not change the system if its purpose and interconnections remain intact (Meadows, 2008, p. 16; Senge, 2006, p. 40). Living systems change only to remain the same (Wheatley, 1999, p. 170) that is, to remain true to their original purpose.

Patterns of behavior are the result of structure and purpose; thus changing behavior requires changing structure (Senge, 2006, p. 52; Meadows, 2008, p. 89) and purpose (Meadows, 2008, p. 151). Structure includes interdependencies, interrelationships, processes, norms, objectives, rules, and other factors. So, too, must mental models be changed as individuals behave consistently with their mental models (Argyris as cited by Senge 2006, p. 164).

There are numerous leverage points for influencing change in a system. Meadows identified a dozen in ascending order of effectiveness: 12) Constants and parameters such as taxes and standards; 11) Stock buffers – stock size relative to flow; 10) Physically rebuilding the system; 9) Adjusting delays in the system; 8) Balancing feedback loops; 7) Reinforcing feedback loops; 6) Restructuring information flows; 5) Incentives and rules; 4) Enabling self-organization; 3) Shifting the goals or purpose of the system; 2) Changing the system paradigm – the mindset out of which comes the goals, structure, rules, delays, and parameter; and 1) Transcending the

paradigm by acknowledging that no paradigm represents the absolute and complete truth.

Meadows also maintained that the greater the potential effectiveness of the leverage point, the greater would be the resistance in the system (Meadows, 2008, p. 145-165).

Well-functioning complex systems are also self-organizing (Meadows, 2008, p. 87) in that they have the ability to evolve or change over time. This is a form of resilience and demonstrates the system's ability to learn, become more complex, and fulfill its purpose.

Hierarchy is present in complex systems as a result of self-organization. Such hierarchy in natural systems is built from the bottom up with each new level of complexity there to “serve the purposes of the lower layers” (Meadows, 2008, p.85). It must balance the needs of the subsystems and the meta-system by allowing both for coordination to achieve the larger system purpose while also preserving the functioning of the subsystems. The ability to align the purposes of subsystems and the meta-system is a characteristic of successful systems (Meadows, 2008, p. 16). Hierarchy creates resilience and allows a system to become a larger system: a camp becomes a settlement, which becomes a village, which becomes a town, which ultimately becomes a city.

When these concepts are extrapolated to the level of a large city with multiple sub-systems comprising many individuals and organizations, each with multiple stocks, flows, and feedback loops, and where there may be many who aspire to lead, each with different visions, one begins to comprehend the challenges of leadership of a meta-system.

Leadership and Systems Theory

Theorists taking a systems view of leadership extrapolate the science-based understanding of the natural world for application in organizations and structures created by

humans. Wheatley said (1999, p. 15) “organizations are living systems, possessing the same capacity to adapt and grow that is common to all life” and that in observing principles for well-organized systems in nature, “it is highly probable that those principles apply to human life and organizations as well” (1999, p. 162).

This is a view distinctly different from more linear views of leadership based on the notion of the leader as hero who provides direction, imposes order, and exerts control (Wheatley & Frieze, 2011; Snook & Khurana, 2009), the “triumphant individual” (Bennis & Biederman, 1997). The work of three authors has been examined as a proxy for more traditional thinking about leadership in the modern era: Peter Drucker, James MacGregor Burns, and Warren Bennis. Drucker is known as the “Father of Modern Management” though he also thought deeply about leadership (Cohen, 2010, p. 1). Burns’ 1978 book, *Leadership*, won both the National Book Award and the Pulitzer Prize. Bennis has been called “America’s leading thinker on leadership” (Schumpeter, 2010). These three have been chosen because of their wide influence in both the academy and practice. They have also been chosen because in the work of each -- particularly Bennis whose work is the most contemporary of the three -- can be found the foreshadowing of a systems approach to leadership. Much of the science that underpins systems thinking was not known or was in its infancy when Drucker and Burns wrote; Bennis was early in recognizing its significance.

Drucker’s most significant works were published between 1939 and 2006. He was rooted in the idea of the leader as the individual at the top of a formal hierarchy; the one who in charge of strategic planning (Cohen, 2010, p. 31). He saw the leader as one who exerted control in order to catalyze action and progress (Cohen, 2010, p. 62). The military was his model organization for

leadership (Cohen, 2010, p. 117) and his work is centered principally on leadership within a defined organization.

Although he also coined the term “knowledge worker,” a term today associated with autonomy and self-management, he believed that those workers needed a clearly designated superior and a structure that made plan decision making authority and responsibility (Cohen, 2010, p. 184-185). Drucker was not, however, a believer in pure command-and-control leadership (Cohen, 2010, p. 157). He advocated for treating and motivating workers as if they were volunteers (p. 211), said that leaders must understand those they wish to lead (Cohen, 2010, p. 7), and that different leadership styles or methods would be needed depending upon the situation and the individuals involved (Cohen, 2010, p. 186).

Drucker was an early advocate of corporate social responsibility, giving an indication that he understood that organizations and their leaders operated in a broader context, but held that “doing good” was not to supersede the corporation’s primary mission to profitably serve its customers. Drucker saw achieving profit as a social good. He also, however, advocated an approach of “first, do no harm” and saw an “unlimited liability clause on unintended consequences” of an organization’s actions (Cohen 2010, p. 97-106).

Burns (b. 1918) is principally a political biographer. *Leadership* (1978) was his attempt at a general theory of leadership and in this he focused principally on the political sphere. Central to Burns’ work was a distinction between power and leadership based on the concept of choice: individuals must be free to choose among competing ideas and individuals to follow (Burns, 1978, p. 36). If there is coercion, there is the application of power, not leadership. This limits the

application of Burns' work to organizational settings as followers within an organization lose much of their choice of leaders unless they opt to depart the entity completely.

Burns was rooted in the idea of a leader who could create an outcome and measured both power and leadership "by the production of intended effects" (Burns, 1978, p. 22). He saw the leader as able to "use and adapt chains of cause and effect" (Burns, 1978, p. 380). Still, in stating his belief that "leadership begins earlier, operates more widely, takes more forms, pervades, more sectors of society, and lasts longer in the lives of most persons than has been generally recognized" (Burns, 1978, p. 427), Burns showed that he saw leadership beyond traditional hierarchical structures.

Burns made a clear distinction between what he termed transactional leadership and transformational leadership. Transactional leadership exists when an outcome is achieved through the exchange of "valued things" though there is no enduring contact beyond the transaction. Transformational leadership occurs "when one or more persons *engage* with others in such a way that leaders and followers raise one another to higher levels of motivation and morality" (Burns 1978, p. 20). He also saw both power and leadership as relationships rather than things (Burns, 1978, p. 11). He observed that executives operated "by feel and feedback" (Burns, 1978, p. 380). These views are evidence that Burns saw an interconnection and interdependence between leader and follower which shares intellectual kinship with systems thinkers.

Bennis (b. 1925) began writing in the 1970s and was most prolific in the 1990s and 2000s. His work is an excellent bridge between that of traditional thinkers addressing organizational leadership and that of those who identify themselves principally as systems thinkers. Among his many works Bennis authored or co-authored "The Coming Death of

Bureaucracy” (1966), “The End of the Great Man” (1997), and “The End of Leadership” (1999). He acknowledged that traditional top-down leadership is dominant in “much of academic and popular writing” yet believed that it is “based on the myth of the triumphant individual” (1999 in Bennis & Biederman 2009, p. 377). He, like Burns, saw interdependence between leaders and followers. For Bennis this was because he saw organizations evolving from pyramids to “federations, networks, clusters” (1999 in Bennis & Biederman 2009, p. 383) and other less hierarchical structures.

In a clear departure from Drucker, Bennis noted how workers in Great Groups – often knowledge workers – worked hard and had high morale “without anyone hovering over them” (1997 in Bennis & Biederman 2009, p. 143). The leader, rather than an individual knowing each step of the way, was one who could articulate purpose and who can identify and nurture talent. The leader was a “pragmatic dreamer” who could “get things done” but had “immortal longings” (1997 in Bennis & Biederman 2009, p. 149). This leader was one who was an essential part of the system yet who did not control it. Enabling the freedom of the group to pursue fulfillment of the purpose in novel ways was among the leader’s most important tasks. The job of the leader was to optimize collective performance (Snook & Khurana 2009, p. 159).

Bennis was early to recognize the impact that the “new science” had the potential to revolutionize the thinking on leadership. In 1964 he and Phillip Slater wrote, “Men have committed themselves to an individualistic, linear, competitive, atomistic, and mechanistic conceptual world—one which they now dominate. But ironically, science—once the most extreme expression of this world—has now rendered it obsolete. Recent advances in physics and biology have opened up an entirely new conceptual universe. The cosmos, scientists have begun to realize, is not a mechanism constructed of little particles that can be taken apart and put

together—it is a gigantic unity of which the significant elements are relationships” Further he acknowledged that the natural world is “relentlessly nonlinear” and that those who continued to pursue a linear path were “destined to be left behind” (Bennis & Slater, 1964 in Bennis & Biederman 2009, p. 102).

This is a selective look at the work of three important authors who have made significant contributions to the leadership literature. It serves, however, to illuminate from where we have come and how the stage was set for continued exploration of the application of systems thinking to leadership.

Complexity, Agency, and Emergence

Wheatley and Senge are among the best known among those identify themselves as system thinkers on leadership. Their work and that of others who have both preceded and followed them reveals three interrelated themes critical to leading the meta-system that are not addressed explicitly in most traditional thinking on leadership: complexity, agency, and emergence.

Complexity

Danielson (2011) posited that “the global environment is increasing in the degree of complexity for organizations operating anywhere in the world.” Complexity is a dimension of the challenges facing a meta-system such as a sustainable city. To simply think of “complexity” as the antonym of “simplicity,” however, understates the complexity of complexity.

Alexander (1966) contrasted the organizational principles of a tree and a semi-lattice as approaches to thinking about how many small systems make up a complex meta-system such as a city. He claimed that how one perceived subsets of elements in the system determined how one

saw the system and that the tree and the semi-lattice were distinct ways of organizing elements and subsystems. A tree is a collection of sets where with any two sets that belong to the collection one is either wholly contained in the other or they are completely separate. A semi-lattice exists “when two overlapping sets belong to the collection, then the set of elements common to both also belong to the collection.” The difference: in a collection with 20 elements, a tree “can contain at most 19 further subsets” while a semi-lattice with the same 20 elements can have more than one million subsets. Semi-lattices are far more complex than are trees.

Alexander analyzed nine artificial cities on four continents and found that underlying each of them was the tree framework. The structures of natural cities (and most living things), in contrast, were semi-lattices and this is the basis of Alexander’s distinction between the two. Both represent a view of order but the semi-lattice is a “thicker, tougher, more subtle, and more complex view of structure.” In Alexander’s view, a living city must be a semi-lattice.

Why would urban planners (and organization designers, executives, and others) consistently and persistently ignore the semi-lattice structure of natural cities? Alexander feels that it is in part the hard-wiring of the human brain to simplify in the face of complexity. This may have arisen out of a primitive survival instinct to reduce complexity in the environment. Alexander (in collaboration with Huggins) conducted experiments in which people were shown patterns with overlapping internal units. Participants in the experiments “almost always invented a way of seeing the pattern as a tree.” He also cited experiments by Bartlett with similar outcomes: individuals reorganized complexity into the simpler “non-overlapping units” of the tree.

Thus while humans simplify complexity their organizations, cities, and other entities must in reality embody complexity if they are to be sustainable over time.

Quoting Jung, Danielson (2011) maintained that the “directed consciousness” of modern society has reduced the adaptive capacity individuals need for addressing a complex global environment. The directedness, according to Jung, causes individuals to exclude that which is not compatible with one’s worldview and that worldview is biased in favor of what is known. One is thus left less well equipped to operate in the “gray space of unformed understanding” that exists between the known past and an “indistinct future.” Leaders face the challenge of “finding a third space to hold different worldviews or operating logics that often clash like fault lines.”

Jacobs cited research on the kind of problems in the history of scientific thought: simple problems (those with two, three, or four variables); problems of disorganized complexity (those with such a large number of variables that sophisticated statistical modeling techniques are required to begin to solve them by uncovering order and averages in the overall system in which the variables operate – short of this they may appear “irrational”); and problems of organized complexity (those which more than four variables yet fewer than those of disorganized complexity – and in which all of the variables are interrelated. The interrelationships hold the key to solving the challenge) (Weaver 1958 as cited by Jacobs, 1961, p. 429-433). Cities, Jacobs maintained, are challenges in organized complexity (1961, p. 433).

Senge (2006, p. 71-72) made the distinction between detail complexity and dynamic complexity which is similar to Weaver’s organized versus disorganized complexity model cited by Jacobs. Detail complexity is that in which complexity arises from the large number of variables. Dynamic complexity arises from the relationships between variables where cause and effect are not clear and may vary over time (e.g. the same intervention may result in a

dramatically different outcome in the short term versus the long term). Leverage, Senge maintained, most often resulted from understanding dynamic complexity yet most management systems are designed to parse detail complexity.

Senge maintained that “the art of systems thinking lies in being able to recognize increasingly (dynamically) complex and subtle structures” (2006, p. 124); that is, recognizing patterns, not pieces. In his estimation, few executives are trained to see both detail and dynamic complexity – to see both the forest and the trees.

Wheatley argued that there is a distinction between the complexity of nature and that created by humans. The latter results from the inability of individuals to grasp the foundations of the former: that “life uses networks; we still rely on boxes” (1999, p. 144).

Further she said that natural complexity, in the form of fractals, is built of simplicity in that fractals repeat simple patterns, changing size but not shape, to form complex objects. The basic shape of the fractal is the only constraint on behavior. A result is increased capacity to process information and resources. Organizations, she said, are all fractal in nature (Wheatley, 1999, p. 128) and the repeating patterns constitute the culture of the organization: how customers are treated by employees reflects how employees are treated by their supervisors and so on.

What is important, according to Wheatley, is to discern the quality of the fractals in a system, the distinguishing shapes, and how they differ from those of other systems (1999, p. 125). Doing so is necessary to see the system *as a system*. It is only then that leaders can begin to help provide the clarity that keeps complexity from degenerating into incoherence.

Agency

Griffin, Shaw, & Stacey (1998) described a tension between individual and collective, or decentered, agency in system design and evolution. One view held that individuals were primarily responsible for creating, planning, and realizing a complex system while the other saw both individual and collective forces co-creating systems: Individuals both play a role in creating the system and are created by the system. Patterns in the system are not “something hidden, waiting to be disclosed but something that is co-created by the agents” (Kauffman 1995 as cited by Griffin et al, 1998).

The dominant paradigm in management thinking is “organizing to realize prior intentions” (Griffin et al, 1998): individuals can make changes in themselves and the world around them to organize a system toward an intended outcome. Griffin et al remained unconvinced that this is possible, citing work from the Santa Fe Institute on non-linear systems (Holland 1995; Kauffman 1995; Goodwin 1994 as cited by Griffin et al, 1998) that indicated that change in complex adaptive systems comes not from the action of one agent but from the interactions between two or more agents. They took Senge and others to task for arguing rational constructivism to which intentionality and conscious design are central.

Senge, however, cited Bohm’s argument that all language and most thought is collective (2006, p. 225). Further Senge argued that collective coherence can be achieved when each individual points out incoherence to others (2006, p. 226) and sought to extend the principles he espoused to a level of “collective aspiration and shared commitment” (2006, p. 197). He saw teams, not individuals, as the fundamental units of learning (2006, p. xiii).

Wheatley (1999, p. 163) maintained that system viability was the result of collective agency: “no subatomic particle exists independent of its participation with other particles.” So

too with system stability which results from frequent, small “disturbances” in individuals or species constitute continual change within the meta-system that enable it to achieve stability over time (1999, p. 86-87). It is, in Senge’s terms, achieving system coherence by the system pointing out incoherence to itself. No agent is acting toward system stability yet it is achieved; there is “a profound relationship between individual activity and the whole” (Wheatley 1999, p. 167).

Intertwined with the concept of agency is that of control: how much can one control in a complex adaptive system? Wheatley argued that attempts to “impose control through rigid structures is suicide” (1999, p. 25). When a system is managed for stability by limiting small internal disturbances, the result is always “far-reaching destruction” (1999, p. 89). Rather than control, she proposed, the goal should be order. The question then becomes whether order can be imposed or whether it must be allowed to emerge.

Advocates of individual agency long argued to exclude “externalities” from an entity’s calculations of what it should and should not do. Externalities are those effects an individual or entity has on the world but for which one is not directly called to account. Pollution is a prime example. Meyer and Kirby argued that those days have passed and that leaders of corporations and other entities must now acknowledge and engage responsibly and rationally in ways that are “defensible to all stakeholders” where cause and effect can be determined, those affected can be identified, those affected have no way to opt out of the impact, the impact can be measured, and a price can be put on the impact. “A consensus will emerge that we are all responsible for our world and must work together to make it better” (Meyer & Kirby, 2010).

Porter and Kramer (2011) expressed this as creating shared value in the context of private firms. In their view, it is unsustainable for leaders to limit their focus to creating shareholder value. They must instead seek to co-create value with and for a broader range of stakeholders.

Emergence

Emergence, or self-organization, is a central principal of systems theory. There is neither a “head tree” in the forest nor a “chief cell” in a human body yet these systems grow, adapt, and change over time within natural boundaries. To systems thinkers, these forms and boundaries are emergent and are the result of self-organization; because there appears to be a design does not mean that there must have been a designer (Griffin et al, 1998). It is through self-organization that stability over time is achieved (Wheatley, 1999, p. 86). Meadows (2008, p. 159) maintained that self-organization is the strongest form of system resilience.

Wheatley held that effective to self-organization was a clear sense of identity and the freedom to self-organize (1999, p. 87) and that “the more freedom, the more order” (Jantsch 1980 as cited by Wheatley 1999, p. 87). It is through self-organization that complexity and hierarchy arise in natural systems (though it must be noted that hierarchy in nature is built from the bottom up with each new layer supporting the layers below it – the exact opposite of hierarchy in human organizations which tend to be viewed from the top down with each layer supporting those above it) (Meadows, 2008, p. 83-85).

How does emergence manifest itself in a city? Coward and Salingeros (2005) used a different approach to reach a conclusion similar to that of Alexander’s distinction between natural and artificial cities: natural cities emerge. They used the construct of information architecture to examine the functions of a city. This view contrasted how cities are often

designed – with designated areas for residences, offices, stores, etc. – with how they are used – with individuals regularly crossing functional boundaries to complete the tasks that make living in a city possible and desirable. Like Alexander, they eschewed the rigid planning principles of the *Congres International d'Architecture Moderne* that influenced much urban design and planning in the 20th century. In their view, a city that cannot dynamically adapt to the changing needs of those who inhabit it – that is, self-organize – will inevitably decay; one whose complexity is reduced beyond a certain threshold will be “dead and sterile.”

Traditional leaders are trained to favor simplicity in visual design and organizational structure, clearly delineated lines of responsibility, and specified levels of authority and control. Leaders in complex systems operate in a more dynamic context.

Leading to Meet Meta-System Scale Challenges

Meta-system scale challenges to sustainable cities -- such as climate change, global urbanization, and the aging of the developed world -- are well-documented yet this makes them no easier to solve. Meadows stated that knowledge that a problem exists is not sufficient for action. There was also be knowledge of resources, incentives, and consequences (2008, p. 14). These are “tough problems” in that they demonstrate three kinds of complexity: dynamic complexity (cause and effect are far apart in time and space); generative complexity (unfolding in unfamiliar and unpredictable ways); and social complexity (the people involved see things differently and so are prone to polarization) (Kahane, 2007, p. 1-2).

Tough problems are similar to what Ackoff called “messes” – challenges which can only be comprehended as systems, taking account of the interrelationships and interdependencies between the components as well as the dynamics of the whole (Ackoff, 1974 as cited by Kahane

2007, p. 31). They are also similar to what Churchman (1967) called “wicked problems” – a “class of social system problems which are ill-formed, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing.”

Thus if one who aspires to leadership in a system can do one thing it should be to advocate for a systems view and model behavior consistent with that (Spinosa, Glennon, & Sota, 2008). As stated earlier, no single individual can know everything about a complex system. However, the more individuals who can be persuaded to adopt a systems perspective, the greater the likelihood that they can together find clarity around a common purpose and that they will make the new connections from which innovation and fresh ideas can emerge (Wheatley, 1999, p. 104; Wheatley & Frieze, 2011). To become an evangelist for systems thinking is to freely admit that one does not have all of the answers, to acknowledge that one is open to other perspectives and will challenge one’s own mental models, and to accept that one is part of the system – because if one is not part of the problem, one cannot be part of the solution (Torbet, n.d. as cited by Kahane, 2007, p. 83-84). Such a stance prepares one for problem-solving activities that are “systemic, emergent, and participatory,” the only type suited to solving tough problems (Kahane, 2007, p. 32).

Senge argued that meta-system leaders must strive to be designers, teachers and stewards. As designers they would seek clarity of purpose, values, and vision. As teachers they would commit to learning and creating spaces where others can learn. As stewards they would articulate and serve a larger purpose while also working in the midst of change to preserve the identities and relationships valued by followers (2006, p. 321-335).

The authors cited in this paper also consistently advocate for focus on relationships, not things. This allows interrelationships and interdependencies to be discerned, feedback loops and distortions to them to be perceived, and purpose to be clarified. As existing relationships are acknowledged and appreciated, and new relationships are formed, the system is strengthened and develops greater capacity (Wheatley, 1999, p. 146). In bringing such relationships to the fore leaders may be better able to make decisions in the long-term interest of the system, decisions that may determine the sustainability of the system be it a city or a society (Diamond, 2005): like Diamond, British historian Arthur Toynbee, whose work was both global and longitudinal in nature, concluded that such decisions are critical. He is oft-quoted as saying that “Civilizations die by suicide, not from murder” (Toynbee as cited by Ruprecht 2009, p. 254).

Leaders must also understand that managing relationships and activities in an emergent, self-organizing system is not straightforward. Plowman et al (2007) argued that traditional approaches to leadership emphasize predictability and stability through controlling behaviors, organizing structures, designating authority, and planning interventions. In a complex system, however, they maintain that it is more important for leaders to disrupt exiting patterns, create constructive conflict, encourage novelty through simple rules and non-linear interactions, and help others make sense of change as it occurs. In their view, the precise contours of the future are unknowable and attempts to dictate them are futile. Leaders must instead seek to create the conditions in which a desirable future will emerge even while they accept that this future will be unpredictable in many specifics. Leaders can act as catalysts, or “tags,” who by directing attention to what is important and helping to distill the meaning of what is happening can enable or speed up specific behavior.

In seeking to understand and influence these relationships a leader must celebrate complexity (Meadows, 2008, p. 181). This paper has presented several frameworks for dealing with complexity. Though each is in some way distinctive, they share in common the need to move beyond the impulse to simplify in order to begin to understand the system. Complex systems are unpredictable and uncontrollable but they are comprehensible (Goodwin, 1994 as cited by Griffin et al, 1999). Though no one person is in charge of a complex system (Wheatley & Frieze, 2011), there is ultimately order in the seeming chaos when one gains the perspective and takes the time to see the whole: order cannot exist without disorder and neither can disorder exist without order (Wheatley, 1999, p. 22-23).

Leaders must also understand their mental models and those of others as they shape the assumptions they make about the world (Senge, 2006, p. 8). In organizational settings, Finkelstein found that executive failure most often occurred during periods of significant change. His was “the largest and most comprehensive study of business failure ever conducted” (Finkelstein, 2003, p. 44). In none of the cases Finkelstein examined was failure the result of unforeseen events. Instead, these executives failed to understand the full complexity of the system in which they were operating, did not foresee what were often logical consequences of the decisions they made, and failed to overcome the “installed base of ideas” that Finkelstein maintained exist in some form in every organization creating a “managerial mindset... that is very difficult to overcome” (2003, p. 166). Such mental models steer leaders toward fixed ideas and cause them to reject evidence that contradicts those ideas (2003, p. 167). Leaders must be flexible and willing to redraw boundaries and adapt structures when changes to the system are perceived (Meadows, 2008, p. 172).

To accomplish this, leaders should “listen for difference”: probe for how others see themselves as different from oneself and understand why the others care about the difference (Spinosa, Glennon, & Sota, 2008). In doing so, the leader both gathers important input for his or her perspective and validates the alternative viewpoint, taking a step toward a “new reality” in which the leader’s own viewpoint and that of the others can coexist and which may offer dramatic new possibilities.

Diamond, in his analysis of societal collapse argued the societies tend to hold onto a paradigm after changes in context have invalidated it. Central to Diamond’s research was a finding that many causes of collapse were perceived as short-term environmental aberrations that could be survived rather than long-term changes that required significant adaptation (Diamond, 2005).

In times of rapid or large-scale change, paradigms must be amended or replaced regularly. It is critical for leaders to be lifelong learners who regularly refresh and replenish their knowledge stocks (Meadows, 2008, p. 180; Wolfberg & Stumborg, 2007; Hagel, Seely Brown, & Davison, 2009). Knowledge can be a source of advantage in such situations and so leaders must continually seek new sources of insight and new ways of problem-solving that can inform response and adaptation.

The systems-based view of leadership is not naturally abundant. Rooke & Torbet developed a seven-tiered structure of leadership tendencies centered on “internal action logic” based on research over 25 years with managers and executives across for profit, non-profit, and government sectors. Only five percent of their sample showed the natural tendencies consistent with meta-system leadership – “no longer seeking personal skills that will make them effective within existing organizational systems” and instead pursuing the creation of “projects, teams,

networks, strategic alliances, and whole organizations on the basis of collaborative inquiry.” Only one percent had the internal action logic best suited for “society-wide transformation” (Rooke & Torbet, 2005). The largest concentration (38%) was found in a group that is knowledge and logic driven – characteristics one would not be surprised to find in fields such as urban planning, architecture, engineering, finance, and other technical specialties involved in creating and operating urban endeavors. They maintained that most senior management teams operate with an action logic based on “unambiguous targets and clear strategies, tactics, and plans.”

Meta-Leadership as an Organizing Framework

The characteristics of those teams are a far stretch from the world of Wheatley, Senge, and Meadows that is steeped in ambiguity, complexity, and self-organization. Can more systems-oriented leaders be cultivated? Rooke and Torbet (2005) argued that there could be upward mobility through the tiers though their research showed that the advancement was confined to a span of one rung. Their research did not explore what changes in early life education or experience might increase the number of people with a natural tendency toward the tiers of transformational leadership.

The meta-leadership framework and practice method (Marcus, Dorn & Henderson, 2006) may hold some insight and potential for the development of meta-system leaders. It was developed in the realm of crisis preparedness and response – an area dominated by technically proficient managers and executives yet requiring cross-sector connectivity for success – and so may be relevant to leadership of the sustainable city.

The meta-leadership framework comprises five dimensions: 1) the person of the meta-leader; 2) the situation; 3) leading down to an institutional base; 4) leading up to a boss; and 5) leading across to peers and other entities over which one has no formal authority.

Taken together, these five are a proxy for a systems-based approach to leadership. The first dimension places the leader squarely as part of the system, not separate from it. This reflects Wheatley's assertion one cannot lead from "outside the web of relationships through which all work is accomplished" (1999, p. 165). The second dimension, the context in which one hopes to lead, requires an understanding of feedback loops, mental models, and knowledge stocks and flows that can affect what one perceives as the situation and helps one come as close to objectivity as possible. The leader must strive for an accurate picture of reality and reveal it to others (Finkelstein, 2003). The third, fourth, and fifth dimensions present a three-hundred-sixty degree span of action and influence that is not constrained by organizational boundaries, formal position or hierarchies, or designations of authority.

The meta-leadership framework was the core of a series of 30 Meta-Leadership Summits for Preparedness held across the United States between June 2006 and March 2011. In total, approximately 4,000 leaders from the government, nonprofit, and for profit sectors were convened for these one-day events. In post-event surveys with 1968 respondents, 93% "agreed" or "strongly agreed" that the summits were a valuable use of time and 87% "agreed" or "strongly agreed" that they intended to apply the learning from the summits in their work. (Sobelson, Young, Marcus, & Dorn, 2011). While this research is only preliminary, it does indicate receptiveness to a systems-based leadership framework across all organizational sectors.

Conclusion

The literature indicates that leadership of complex systems is distinctly different from the models traditionally drawn upon for leadership of entities and in situations perceived as linear: It emphasizes relationships, embraces complexity and ambiguity, and encourages self-organization and emergence. It is a model of leadership that acknowledges that no leader has all of the answers, that relies on the ability to collaborate and co-create with a full range of stakeholders, and that pursues intent through clarity of purpose and meaning rather than scale. It measures success as realizing that purpose and on collective rather than individual achievement.

The city is a meta-system and has been called the fundamental unit of activity for human endeavors. Cities are “at the centre of the global economy, global challenges, and ultimately, global solutions.” They must be led as integrated, holistic systems if they are to be inclusive, prosperous, and sustainable (Katz et al, 2008).

Traditional training and education has produced leaders better suited to situations with unambiguous goals and directed strategies. The meta-leadership framework and practice model holds potential for helping those with traditional training to understand and deploy a systems-based leadership model and tools for meeting meta-system challenges and exerting leadership in the sustainable city. Realizing the extent of that potential calls for additional research on its application in more varied settings.

References

Alexander, C. (1965). A city is not a tree. *Design*. London Council of Industrial Design, 206.

Retrieved on April 9, 2011 from

http://www.chrisgagern.de/Media/A_City_is_not_a_tree.pdf

- Alusi, A., Eccles, R., Edmondson, A., & Zuzul, T. (2011). Sustainable cities: Oxymoron or shape of the future. *Harvard Business School Working Paper*. Retrieved on 10 February 2011 from <http://hbswk.hbs.edu/item/6609.html>
- Burns, J.M. (1978). *Leadership*. New York: Perennial/Harper Collins
- Bennis, W. & Slater, P. (1964, 1990, 1998). Democracy is inevitable. In Bennis & Ward Biederman (Eds), *The essential Bennis*, p. 99-117. San Francisco: Jossey-Bass
- Churchman, C.W. (1967). Wicked problems. *Management Science*, 14(4): B141-B142.
- Cohen, W.A. (2010). *Drucker on leadership: New lessons from the father of modern management*. San Francisco: Jossey-Bass.
- Coward, L. & Salinger, N. (2004). The information architecture of cities. *Journal of Information Science*, 30(2): 107-118.
- Danielson, C. (2011). Leading in uncertain times: Leadership characteristics of the self-transforming mind. *Integral Leadership Review*, 11(2). Retrieved March 15, 2011 from <http://integrallleadershipreview.com/2011/03/leading-in-uncertain-times-leadership-characteristics-of-the-self-transforming-mind/>
- Diamond, J. (2005). *Collapse: How societies choose fail or succeed*. New York: Penguin
- Finkelstein, S. (2003). *Why smart executives fail and what you can learn from their mistakes*. New York: Penguin Portfolio.
- Florida, R. (2008a, July 11). The days of urban sprawl are over. *The Globe and Mail*. Retrieved on May 3, 2011 from <http://www.creativeclass.com/rfcgdb/articles/Globe%20and%20Mail%20-%20The%20days%20of%20urban%20sprawl%20are%20over.pdf>

- Florida, R. (2008b). *Who's your city: How the creative economy is making where to live the most important decision of your life*. New York: Basic Books
- Griffin, D., Shaw, P., & Stacey, R. (1998). Speaking in complexity in management theory and practice. *Organization*, 5(3): 315-339.
- Hagel, J., Seely Brown, J., & Davison, L. (2009). The big shift. *Harvard Business Review*, 87(7/8): 86-89.
- Hawley, A. (1986). *Human ecology: A theoretical essay*. University of Chicago Press.
- Ichioka, S. (2008) Interventions: From theory into practice. In Burdett, R. & Deyan, S. (Eds), *The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society*, (pp. 412-471). London: Phaedon.
- ICSNC (n.d.). International Center for Sustainable New Cities: About us. Retrieved on April 10, 2011 from <http://www.icsnc.iit.edu/aboutus.html>
- Jacobs, J. (1961). *The death and life of great American cities*. New York: Vintage/Random House.
- Kahn, H. & Weiner, A. (1967). *The year 2000: A framework for speculation on the next 30 years*. New York: Macmillan.
- Kahane, A. (2007). *Solving tough problems: An open way of talking, listening, and creating new realities*. San Francisco: Berrett-Koehler.
- Katz, B., Altman, A., & Wagner, J. (2008). Positions: An agenda for the urban age. In Burdett, R. & Deyan, S. (Eds), *The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society*, (pp. 474-481). London: Phaedon.

- Marcus, L. J., Dorn, B. C., & Henderson, J. M. (2006). Meta-leadership and national emergency preparedness: a model to build government connectivity. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, 4(2), 128-134.
- Maslin, M. (2009). *Global warming: A short introduction*. Oxford, England: Oxford University Press.
- McGray, D. (2009, March 21). Stewart Brand: Save the slums. *Wired*. Retrieved on April 10, 2011 from http://www.wired.com/techbiz/people/magazine/17-10/ff_smartlist_brand.
- Meadows, D.H. (2008). *Thinking in systems: A primer*. White River Junction, VT: Sustainability Institute
- Meyer, C. & Kirby, J. (2010). Leadership in the age of transparency. *Harvard Business Review*, 88(4): 38-46.
- Musa, Z (May 22, 2008). Mega project in Iskander Malaysia. The Star Online. Retrieved on June 14, 2011 from <http://biz.thestar.com.my/news/story.asp?file=/2008/5/22/business/21290461&sec=business>
- Paulker, S.G., Zane, E.M., & Salem, D.M. (2005). Creating a safer health care system: Finding the constraint. *JAMA*, 294(22): 2906-2908.
- Plowman, D., Solansky, S., Beck, T., Baker, L., Kulkarni, M., & Travis, D. (2007). The role of leadership in emergent, self-organization. *The Leadership Quarterly*, 18(2007): 341-356
- Porter, M. & Kramer, M. (2011, January-February). Creating shared value: How to reinvent capitalism--and unleash a new wave of innovation and growth. *Harvard Business Review*, 89(1-2): 62-77.

Rooke, D. & Torbet, W. (2005). The seven transformations of leadership. *Harvard Business Review*, 83(4): 66-76.

Ruprecht, J. W. (2009). *Windward leadership: Taking your organization into the prevailing winds and political seas*. Minneapolis, MN: Two Harbors Press.

Schumpeter (2010, August 26). Bennis remembers. *The Economist*. Retrieved on 20 April 2011 from

http://www.economist.com/blogs/schumpeter/2010/08/warren_bennis_autobiography

Snook, S. & Khurana, R. (2009). Scott Snook and Rakesh Khurana on “The end of the great man,” in Bennis & Ward Biederman (Eds) *The essential Bennis*, p. 157-160. San Francisco: Jossey-Bass.

Sobelson, R., Young, A., Marcus, L., & Dorn, B. (2011). The meta-leadership summit for preparedness initiative: A model to improve public health preparedness and response. Manuscript in preparation.

Selangor State Investment Agency (n.d.) KLIA aeropolis an emerging airport city. Retrieved on June 14, 2011 from <http://ssic.com.my/MAB.pdf>

Wheatley, M. (1999). *Leadership and the new science*. San Francisco: Berrett-Koehler Publishers, Inc.

Wheatley, M. & Frieze, D. (2011). Leadership in the age of complexity: From hero to host. *Resurgence Magazine*, Winter 2011

Wolfberg, A. & Stumborg, M. (2007). Achieving clarity in a constantly changing environment. *Reflections*, 8(3): 11-22.