

2 CRITICAL SYSTEMS THINKING

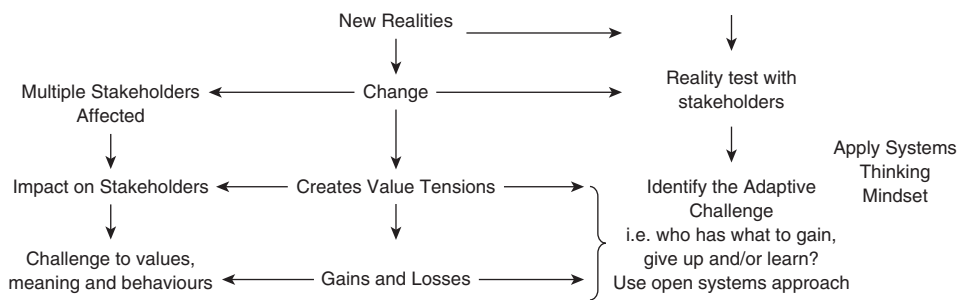


Figure 2.1 Critical systems thinking

INTRODUCTION

In Chapter 1 we explored the impact of new realities and the value tensions they create. We said that dealing with change is difficult because of the loss it implies. We also discussed how new realities are often complex to identify.

In this Chapter we discuss systems, **systems theory** and the importance of having a **systems thinking mindset** if one wants to recognize new realities and be adaptive. New realities are invariably systemic by nature. They are not isolated incidents that only affect a local or small part of a system. The repercussions of new realities reverberate throughout the system. The ripple effect is often subtle and covert, requiring a systems mindset in order to be seen and understood.

Systems theory provides a way of seeing the larger picture without losing the importance of detail. Systems theory advocates understanding the organization as a living system. Since it is a living system, understanding its behavior requires attention to narrative (i.e. its story), patterns of behavior between parts of the system, and inter-relationships between those parts. The organization as a living system is treated as a whole, as are its parts. In looking at wholes the systems thinker applies his or her imagination in order to understand the values and roles that systems and their parts represent to one another.

System dynamics, a partner approach to systems theory, provides a method for looking at the reinforcing and non-reinforcing behaviors that either support or challenge attempts to change. It supports systems analysis especially with regard to the role of feedback. The insights we gain from system dynamics help us better understand how change affects the overall system and where points of resistance might lie.

Even though we may adopt a systems thinking mindset, we know our thinking skills have limitations. Our mental models and cognitive maps are limited and biased. The information we perceive and receive is selective, often superficial, and outdated. A systems thinking approach invites us to challenge our mental models and question the rigor of our critical thinking. Systems thinking competence and critical thinking skills are the *sine qua non* of good leadership.

THE ADAPTIVE AGE

The Panacea of the Technical Fix

The twentieth century will be remembered for humans' achievements in establishing new frontiers in technical brilliance. It was a century filled with new ideas, new inventions, and the emergence of new paradigms. The result is that it turned us into a **technical fix** society. During that century the emphasis on the technical panacea for all problems reached outrageous proportions. Inventing and designing new technical processes became the principal method for dealing with human problems. Whatever obstacle we encountered we sought solutions in yet another technical fix. The fix might be an aspirin, an abortion clinic, cosmetic surgery, a larger welfare cheque, weight-reduction tablets, a reorganization, downsizing, or outsourcing. The technical fix supposedly made us feel younger, older, slimmer, safer, smarter, more competitive or more powerful. But do technical fixes really solve our problems or are they just that: short term technical fixes?

The twenty-first century is challenging us with new problems. Some of these so-called new problems are actually old problems never truly fixed by our previous technical fixes. Our health statistics have not improved; obesity has reached drastic proportions; poverty in real terms is on the increase, and reorganization, downsizing and outsourcing are popular methods for distracting us from our inefficiency and work ethic complacency. To top it all, we are rapidly destroying our environment.

At the time of writing we are facing the humongous mortgage crisis that has exceeded anyone's most pessimistic expectations as it ravages financial centers across the globe. Our technical fixes, new committees, new banking rules and new legislation (for example, the Sarbanes-Oxley 2002 act) have got us nowhere, it seems. Many say we are back to the 1979 world economic crisis, if not even that of 1929. What have we actually learned in thirty years? Are we truly better off? What kind of leadership vision got us here?

In this chapter we discuss the power of systems thinking to get at the root causes of problems and provide us with ways of seeing the world that do not result in quick fix technical solutions.

A New Age

A culture's characteristic way of thinking is embedded in its concept of reality, i.e. its world view. A change of world view brings cultural changes and leads to what historians call a 'change of age' (Ackoff 1999, 4). Today, our world view is changing in fundamental ways. One could say we are undergoing a change of age.

In my previous book, *Leadership through Strategic Planning*, I argued that we are moving into what I called the 'adaptive age.' The adaptive age will bring a backlash to our customary dependence on technical fixes. There will be a renewed return to values and meaning making and while technical solutions will remain a significant factor of life, greater emphasis will be placed on the humanistic aspect of systemic issues. In this shift to a more adaptive approach to problem solving, we will recognize the interconnectedness of our planet and its people. We will be forced to pay more attention to our systemic interdependence. We will recognize the need for a systems perspective in order to understand the globalizing world, the problems it faces and their potential solutions. We will grasp that problems cannot be seen or addresses in isolation.

The adaptive age will call for a different type of leadership. Leaders will need to think and respond systemically. They will need to be able to see relationships and patterns as opposed to single issues or events. Leaders will need to recognize that the soft issues are the hard issues and that the power of change lies in the human spirit and not in technical solutions. Above all, we need new leaders with new frames of consciousness.

THE FOURTH WAVE – A CHANGING WORLD

According to Maynard and Mehrtens, authors of *The Fourth Wave*, the hallmarks of a changing world, include:

- A shift in consciousness;
- Disenchantment with scientism;
- A focus on inner sources of authority and power;
- Re-spiritualization of society;
- A decline of materialism – new definitions of wealth;
- Political and economic democratization;
- Movement to beyond nationality to global citizenship.

(Maynard and Mehrtens 1993)

A New Mindset

Danah Zohar, in *Rewiring the Corporate Brain* (1997), explains how the 'New Science' (relativity and **quantum physics**) of the twentieth century is challenging us to rethink our basic categories of perceiving the world. She explains the need for a shift from atomistic thinking towards holism and the emphasis on seeing relationships; from the understanding of parts through fragmentation to seeing parts in integration; from emphasizing the determinate to yielding to the indeterminate, unknowable and uncontrollable.

The **New Science** teaches us that little is certain and predictable. Instead the world moves within ambiguity, uncertainty and infinite possibility. New possibilities are continuously emerging; little can be isolated and controlled; living systems are contextual and self-organizing.

Zohar takes the new realities of the New Science and illustrates the impact this has on the management of organizations. She claims that understanding the nature of change means being open to all possibilities; that bottom-up leadership is more consonant with the way energy flows in systems, and that imaginative and experimental mindsets are critical in order to respond to changing environments. She advocates that managers become better at asking new and different questions based on new and different assumptions. She points out that the questions we ask determine the answers we get as well as the answers we do not get. She insists that questioning, finding patterns and emphasizing relationships at all levels are requirements of effective leadership.

CRITICAL FINDINGS OF THE NEW SCIENCE

The New Science relates to the modern physics of **relativity** and quantum theory.

Relativity relates to Einstein's notion of the relationship between time and space: Mass is nothing but a form of energy (energy E equals mass $m \times c$ the speed of light squared) – $E = MC^2$

Quantum theory includes the following ideas:

- Energy is not discrete but comes in small packets of light called quanta.
- At the subatomic level there is no such thing as solid objects.
- Matter comprises both particles and waves; nothing is solid.
- Particles can only be understood in relation to the whole.
- Atomic events have a tendency to occur; there is no certainty.
- Tendencies are probabilities of interconnections; everything is connected with everything else.

- Nothing is an isolated entity.
- There are no building blocks: only a complicated web of relations of the whole.
- The whole includes the observer; the observer is always part of what he or she observes.
- Observations influence results.

Capra, (1991: 52–84)

Margaret Wheatley, in *Leadership and the New Science* (1994), takes a similar approach to Zohar. Wheatley claims we need new images, new metaphors and new ways of thinking. Organizational leaders and managers need to see the universe as an endless profusion of possibilities, and relationships as bundles of potentiality. Living systems respond to disorder with renewed life, and growth is found in disequilibrium rather than balance.

Wheatley emphasizes the fact that we participate in reality and should give up seeing ourselves as independent observers. Together we are constantly creating the world; we are evoking it rather than discovering it. In light of these realities leaders need to create fields of vision rather than trying to create paths. Orienting one's consciousness to these new realities is essential for embracing the future. Wheatley too advocates 'think living systems.'

THINK SYSTEMS

- Think possibilities not solutions.
- Encourage bottom-up, distributed leadership.
- Focus on new and different questions.
- Challenge existing assumptions.
- Look for patterns and relationships.
- Find new images and metaphors.

WHAT IS A SYSTEM?

A system is a regularly interacting and interdependent group of parts, items or people that form a unified whole with the purpose of establishing a goal. There are numerous types of system. There are for example biological systems (the respiratory system); mechanical systems (air-conditioning systems); ecological systems (plant life); social systems (groups and communities), and economic systems (business organizations).

A system is always embedded in other systems; so any system is always a combination of systems and sub-systems. Arthur Koestler coined the term **holon** to refer to that which is whole in one context, and simultaneously part in another (Koestler 1967). Holons are nested within each other. Each holon is nested within the next level of holon, assuring their interconnectedness and interdependence. For example, the nation of the United States is a system and Corporate America is a sub-system of that system. A company is both a sub-system of Corporate America and a system in its own right where its Board of Directors is in turn a sub-system of the company. If one thinks about it carefully, the interconnectedness of systems is infinite.

Reality constitutes holons. Holons (wholes) are part of other wholes with no upward or downward limit. Nothing is independent; everything is part of the **holarchy**. The nation is a system, the earth is a system, our galaxy is a system, and the cosmos is a system. All of these systems are inter-related. Quantum physics tells us that these inter-related and interconnected systems affect one another in the most amazing ways even when the parts of the various systems appear to be distant from one another. So for example, women across the world form a system and women in China form a sub-system of that system. Due to the nature of systems, we can know that whatever impacts Chinese women will in some way impact women across the world.

Systems range from simple to complex. The more complex a system, the greater the number of its sub-systems, and the more intricate their operations. Sub-systems are arranged in some form of hierarchy that facilitates achieving the sub-system's goal which is in service of the larger system's goal. Hierarchy is central to systems theory in that it is the theory of wholeness. Hierarchy derives from *hieros*, which means sacred or holy, and *arch*, which means governance or rule. **Hierarchy** thus means 'sacred governance' (Wilber 1998: 55). From a systems perspective hierarchy describes an order of increasing holons representing an increasing wholeness and integrative capacity (Waddock 2006: 56). Each sub-system has its own boundary that contains the inputs, processes, outputs and feedback loops that contribute to the overall system performance and goal (Senge 1990).

Systems import all kinds of elements from the other systems of which they are part. For example if the larger system is unhealthy or insecure and experiencing fear, the sub-systems will import these emotions into their environments and they will be insecure and fearful too. If the larger system is at war, the sub-systems will become warlike too. If the company as a whole behaves as a corporate bully, its divisions and departments will mirror this kind of behavior. Similarly if the company as a whole lacks rigor; has no checks and balances and behaves recklessly, the board of directors, as a sub-system, will reflect the same attitudes and behaviors. (See macrocosm-microcosm described below.)

LIVING SYSTEMS AND ADAPTATION

The Goal of Living Systems

Quantum physics claims that all matter is in some sense living in that it is in continuous motion. Even rocks are 'alive' and form part of a living ecological system. All systems are therefore living systems. Living systems have one primary purpose or goal and that is 'survival.' Conscious living systems wish for more than survival; they aspire to healthy and prosperous survival. Different types of living systems might construe 'healthy and prosperous' survival differently. For example, family systems might strive for emotional survival; social systems for political survival; economic systems for economic survival. Nevertheless, no matter how it is interpreted or measured, survival is the primary and most immediate goal of every living system.

Let us continue with the previous example. A nation is a system. The goal or purpose of this system is survival. A nation comprises many sub-systems and these sub-systems also have sub-systems. Therefore states, provinces or counties might be one form of sub-system and then there are social communities and economic groups that form another level of sub-system. If we think about these systems, they all have their own individual goals, boundaries and processes aimed at contributing to the overall goal of national healthy and prosperous survival. The social sub-systems contribute political, social, cultural and communal health. The economic systems contribute economic health, and so on. While each sub-system has unique properties and processes, the goals they set out to achieve are always in the service of the goal at the next systemic level. The contribution each sub-system makes to the larger system may be different, but the goal is always the same – to contribute to survival. If we have healthy family systems, we have a healthy community system. If we have healthy community systems, we will have healthy state or county systems and a healthy national system. The opposite is obviously true – unhealthy families lead to an unhealthy national system. If a sub-system is unable to contribute to the survival of the larger system, it loses its relevance and soon dies.

Even though we tend to measure our systemic goals using all kinds of metrics, for example, GDP, birth rates, death rates, infant mortality rates, income levels etc., the ultimate goal living systems seek to achieve is survival, and beyond that 'good' (what I have termed healthy or prosperous) survival.

Adaptive Systems as Open Systems

In order for systems to be healthy and stay alive, they need to be open to external forces and thus be open and responsive to change. Change is reality. Closed systems

cannot survive for long as they are in denial, or out of touch with reality. Closed systems that do not change lose their relevance. Living systems stay alive by being open and dynamic (Von Bertalanffy 1969: 32). This makes them complex to understand and manage. This complexity is exacerbated by the fact that systems resist change as change always implies learning and transformation. Learning and transformation always require giving up something for something else.

As we discussed at length in Chapter 1, this giving up is experienced as loss. Usually this loss relates to a sense of identity and self-worth. A very common example of change and loss in the business organization is the impact of changing technology. Organizations have to keep pace with rapidly changing technology in order to remain competitive. They need to continually forgo old practices in favor of new ones. These changes have implications across the organization. Not only does the overall organization as a system need to change, but the sub-systems need to change and adapt too. The image of the company needs to be honed in tune with the changes; the corporate culture changes as work practices change, and employees require continuous retraining to keep apace with change.

Continuous, rapid change demands that a system continuously renew its inputs, processes, outputs and feedback loops to survive. This is no easy task! Systems that adapt well, survive. Those that either close their boundaries in order to deny new realities or adapt poorly die. Adapting to new realities is what keeps systems relevant to the larger systemic whole. In Chapter 1 it was pointed out that loss of relevance leads to death!

WHAT IS SYSTEMS THEORY?

General Systems Theory

General Systems Theory developed from the study of biology in the 1920s. This theory centered on the living systems that comprise the natural world and the common laws governing those systems. The major premise that evolved from General Systems Theory is that the common laws that govern natural systems can serve as a conceptual framework for understanding the relationships in any system. Systems theory, the outgrowth of natural systems theory, emphasizes viewing systems as a whole and gaining a perspective on the entire entity before examining its parts (Haines 1998).

Systems theory provides a different approach to grasping and working with reality. Previously our world view saw reality as comprising many parts that could be put together, taken apart, and studied in isolation. Thanks to quantum physics our world view has now changed. This new understanding of the world is that it comprises an infinite network of living systems (Capra 2004). Systems theory

advocates that in order to understand who we are, what is changing, and what we are faced with we need to think systems. To think systems means to see things as *holons*; that is to look at all things as a part of a system that is part of other systems. We can look at the individual as a system that is part of other systems; the group, the organization, the industry, the community, the nation, the biosphere, all as part of interwoven systems. A systems perspective always treats systems as integrated wholes of subsidiary systems and never as an aggregate of parts.

Applying Systems Theory

Irreducibility of systems

Systems theory develops our understanding of systems by focusing on the structured relationships that form part of any system. The relationships among the parts of a system have certain characteristics that together manifest irreducible characteristics of the system itself. In other words, all systems have properties of their own that are not reducible to the parts. We are aware of this when we think about groups and group dynamics. Groups are systems. We recognize that the group system has a character and a mindset that exists apart from the aggregate characteristics and mindsets of its individual members (Ackoff 1999). (See Chapter 6 for a discussion of groups as systems.)

Studying the behavior of the whole

By studying systems in their wholeness as systems we can find out things about them: their strengths, weaknesses and how they behave under certain conditions. We can also learn about the role the sub-parts of the system play without having to identify and analyze each individual unit or part. The importance in understanding systems is to identify relationships and situations rather than atomistic facts and events. Frequently our strategy for dealing with complexity is to undertake piecemeal analysis. Given the true nature of things this clearly results in oversimplification. Systems thinking offers us a more adequate method of grasping the complex nature of reality while still remaining relatively simple. The systems thinking approach takes a number of different interacting things and notes their behavior as a whole under diverse influences. Think of the way we observe and analyze teams. We can assess the team as a system at one level in contrast to trying to look at the interactions and responses of each team player. We adopt a similar approach when it comes to organizations. We talk about the culture of the organization, the organization's strategy and its reaction to competition. We do the same with nations and international regions when we talk about the response of 'the Chinese,' 'the Indians' or the 'Asian bloc.'

System characteristics or personality

Clusters, groups or systems appear to have their own personalities or characteristics. Even as individuals join and leave the group, the essential nature of the group stays the same. Changes in membership do not lead to radical changes in group characteristics. Such characteristics of wholes are typical of groups of interacting parts where the parts maintain some basic set of relationships among themselves. The characteristics of groups take on a life of their own that cannot be reduced to the properties of the individual parts. It is a rare circumstance when an individual can make a radical impact on the character of a group, organization or nation. So dealing with wholes provides us with strategies for dealing with infinite numbers of data points or events in a holistic manner (Laszlo 1996). It is what Peter Senge in *The Fifth Discipline* (1990) calls a way of seeing the forest and the trees.

Structure determines behavior

Systems theory tells us that a system's overall behavior depends on its entire structure. Living systems structure themselves in order to optimize their chances of survival. Think of how much time organizations spend on getting the structure right to achieve their strategic goals. The New Science teaches us that systems work best when the parts are allowed to self-organize rather than have structure logically or rationally imposed on them. Alas, we often ignore this reality. (See 'Technical Work' in Chapter 4)

Dynamic equilibrium

Systems theory also tells us that systems continually strive to attain dynamic equilibrium both internally and with their environment. System face persistent threats from both within and without. Striving for dynamic equilibrium means that the system is always in some tension between controlled order and chaos. The key to optimum performance lies in finding the optimum point of tension. The forces that pull for both order and chaos are the energies generated as the system performs its functions while simultaneously renewing and recreating itself in order to adapt to continuously changing new realities. New realities are always arriving and the quest to attain dynamic equilibrium never ends. The system must adapt within the bounds of compatibility with the whole of which it is part. Pursuing dynamic equilibrium and adapting to change stokes system vitality. It is this vitality that stimulates the creative and adaptive forces innate in all living systems.

Systems have an optimum size

There is an optimum size for all systems. This optimum size is intrinsic to the system and is a dynamic concept. What this means is that the system as a whole has an inherent respect for what its optimum size should be: the optimum size is an integral natural feature of the system's make up. This size can change as the system alters its functions and configuration, but there will always be some limit beyond which the system cannot function effectively or efficiently. Straining this limit places the system's survival at risk. To illustrate this vital point we can turn to the human body. Every person has a cardiac system

that suits his or her body. As a person grows and develops, that system will change in size and in function. A heart that is too large or too small will cause heart failure. The right size of heart that makes for effective cardiac functioning will fall within some dynamic range which the system will strive to maintain. The same goes for organizations. Organizations that are too small cannot function economically or competitively. Organizations that are too large become unwieldy, overly bureaucratic, and ultimately ineffective. Survival invariably requires some form of break-up or realignment.

Organic behavior

Systems thinking forces one to think organically; to see relationships rather than people and events; to see patterns rather than isolated incidents, and to think images, metaphors and symbols rather than data, algorithms and building blocks. The fundamental principles of living systems include openness, interrelationship and interdependence.

APPLYING SYSTEMS THEORY

- All systems are alive.
- All systems are interdependent with other systems.
- Systems strive for survival.
- Systems exist within a hierarchy.
- Systems need to be open systems to survive.
- Systems have irreducible characteristics that belong to the system as a whole.
- Sub-systems contribute to the survival of the larger system.
- System behavior depends on the system structure.
- Systems thrive on self-organization.
- Understanding systems means understanding patterns, relationships and roles.
- Systems live in dynamic tension between order and chaos.
- Systems strive to attain dynamic equilibrium.
- The greatest system learning and adaptation occurs at points of disequilibrium.
- There is an optimum size for all systems determined by their inherent nature.

THE MACROCOSM—MICROCOSM PRINCIPLE

An integral part of systems theory is the **macrocosm—microcosm** principle. This principle holds that in a living system the characteristics and force fields that exist in the whole system are recapitulated in every part of its sub-systems. For

example, the DNA that makes up the human body is contained in every cell of the body. Scientists need only a scrap of skin or a drop of body fluid to determine the genetic make-up of the entire body. The microcosm reflects the macrocosm and vice versa.

If we transport this concept into the realm of human organizations we observe that the values, attitudes and behaviors of for example an industry are reflected in the organizations that make up that industry. A relatively easy example is the financial services industry. Think of how the competitive culture of the industry is mirrored in its various organizations. Similarly, at a more micro level, within the sub-systems of the organization, for example, divisions or departments will reflect the culture and the competitive behavior of the overall organization. Although the emphasis may vary – some departments may mirror the larger system more clearly than others – the same strands of ‘DNA’ will always be present. By taking a **systems perspective**, adopting the macrocosm–microcosm principle, we find that by researching small systems we can learn a lot about large systems and vice versa.

The macrocosm–microcosm principle can be very helpful when we are considering new realities and the impact of change. With systems thinking we look at the overall picture and its effect on whole systems. This big picture or bird’s-eye-view approach gives us hints as to how the new realities will affect the sub-parts of the system. If the larger system is in resistance, it comes as no surprise that the sub-systems will be too. What we observe, however, is that each sub-system will manifest its resistance in a way that is consonant with the functioning of that part. In other words, sub-systems will ‘do’ their resistance differently. We just need to know how to read the patterns. The challenge for leaders is to develop sensitivity to reading these patterns and knowing how to respond to them. We reserve further discussion on this issue for Chapter 6.

LEADERS NEED COMPETENCE IN SYSTEMS THINKING

The largest gap in the intellectual ability needed for effective leadership in the knowledge age is systems thinking. Without it, leaders can’t understand the relation of global forces to local pressures, macro policy to micro implementation, and social character to individual personality. Without it, their organizational vision will lack coherence. When linear thinkers connect the dots, they draw straight lines rather than the dynamic interactive force field that represents the knowledge-age organization.

(Maccoby, *The Leaders We Need*. 2007: 186.)

A SYSTEMS THINKING MINDSET

Big Picture Thinking

Systems thinking is a fundamental disposition and an orientation to life. A systems thinking mindset employs a systems thinking approach to viewing the world and perceiving reality. The basis of systems thinking lies in understanding that all living systems are integrated wholes linked together by a network of relationships. To understand systemically is to understand the nature of relationships. For a systems thinker, understanding the network of relationships and investigating how the relationships contribute to the systemic properties of the system and its sub-systems is critical work. The systems thinker understands that perceiving reality is to perceive a certain network of relationships. Therefore, thinking systems, thinking networks, means thinking relationships.

A systems thinking mindset seeks out patterns and relationships rather than forces and events, and organizes complexity into coherent stories about those relationships. In order to do this, systems thinking not only looks for the bigger picture but tries to get that bigger picture from a range of viewing points. Seeing the bigger picture provides different information and insights as to the roles of the parts in the whole. Looking at wholes also provides new and different insights into how the parts relate with one another and how these relationships influence the systemic nature of the whole (Laszlo 1996).

At a simplistic level, a systems thinking mindset is like a movie camera; moving backwards and forwards, looking for the larger perspective and honing in on one detail and then the next; then moving back again to reflect the relationship between the details of a larger vista. The eye of the systems thinker is looking for relationships: existent and potential; strong and weak; significant and irrelevant. The mental models of the systems thinker reflect networks and relationships rather than linear cause and effect processes. These mental models are scenario driven rather than event driven, and they deliberately embrace ambiguity, uncertainty and contingency.

A systems thinker realizes that change is constant and that therefore relationships are in continuous flux. Since the structure of the relationships determine the activities and performance of any system, by observing the nature of system relationships and how they are changing, a systems thinker can see and possibly anticipate the changing behavior of the system. This task would be far more difficult and even impossible to carry out if each unit or event of the system or each strand of the network were to be analyzed as it responded to changing circumstances. For example, it is far easier to look at team behavior and map how that changes than to factor in the changes adopted by each individual player. Patterns, movement, change, relationships, system structure and interconnectivity are the lenses of a practiced systems thinker.

A NETWORKED WORLD

Albert-Laszlo Barabasi in his book, *Linked* (2003), discusses in detail how everything in the world is interconnected. He argues that the world wide web we so readily refer to is not limited to cyberspace and technology. It is manifest throughout the cosmos, in nature, in society and in business. Barabasi argues that networks are ever present. What we need is an eye for them. Society is a complex social network, which through the six degrees of separation makes the world far smaller than we imagine. He argues that we need to change our cognitive models from linearity to networks and relationships.

Malcolm Gladwell, in his well-known book, *Tipping Point* (2002) also discusses how social reality comprises networks. He explains the role of connectors, nodes and links and how they influence what happens in the network by influencing the network outcomes.

As we learn more about how networks in living systems form and operate, we observe that the existence of networks does not signify equality, lack of hierarchy or a level playing field. On the contrary: different points on a network have different capacities, strength and potentials and it is these features and patterns that distinguish one network from another even though they are all inter-related. Living networks are also inherently dynamic. They evolve, break up, reconstruct and change in order to respond to the changing environment and new realities (Barabasi 2003).

In a living system the activity of each party in a network affects the activities of the other parties at the same time. As all activity is occurring simultaneously, it is exceedingly difficult to isolate not only the timing, but the sequence of events. A systems thinking approach places emphasis on being in a state of preparedness to respond to a change as a whole, rather than being dependent on devising a series of specific responses to a set of predicted changes.

A SYSTEMS THINKING MINDSET

- Reality is seen as an inter-related network of systemic relationships.
- The network of relationships is infinite and always inviting new possibilities.

- Reality is apprehended through system narratives.
- Narratives place emphasis on values, roles and patterns of changing relationships.
- Reality is explored from multiple competing perspectives.
- Reality is appreciated as comprising multiple competing perspectives.
- Reality is in flux, ambiguous, uncertain and moving toward new possibilities.
- Change occurs simultaneously and not in linear sequence of cause and effect.
- System components assume roles to advance the survival and health of the greater system.
- Understanding systems requires an interpretation of values, roles and relationships.
- System roles reflect its values, emotions and mindset (beliefs and assumptions).
- Systems can never be totally understood – an element of mystery always exists.

Values and Roles

Now we have looked at a systems thinking mindset in the abstract, let us apply a systems thinking approach to understanding organizations, particularly business organizations. First, let us consider what it is that a systems thinking approach is inviting us to look for when we analyze a system. Essentially our search is for clues as to what a system and its sub-systems represent to one another and to the larger systems in which they are embedded. These representations take the form of values, for example 'competence,' 'safety' and 'integrity,' and roles: for example 'techies,' 'police force,' 'mavericks,' 'heroes,' 'losers' or 'clowns.' These values and roles provide us with information about the network of relationships in the system.

Clearly there are technical tasks and technical roles in our organizational system too. These are the ones we are more familiar with. There is the CEO, the financial controller, HR, the technical team, PR, marketing and sales executives and so on. For every task there is a role. Technical roles are assigned in order to get the technical tasks done. While these tasks and roles are fundamental to the organization achieving its primary goals, from a systems perspective this is not what we are primarily interested in. What we are most concerned with is organizational values and how the psychological and emotional roles assigned to people within the system contribute to its survival and adaptive capacity. For example: every system must have people technically competent, tangibly able to carry out the organization's mission and

achieve its tangible goals. We therefore need technically competent people. So with our systems thinking lenses we look at the system as a whole as well as its sub-systems with a view to understanding which parts of the system contribute competence *to the system*. We may find it is not the technical team of Ph.D.s who relate to others with competence. It may not be the financial department that represents accountability, or the HR department that represents caring. Maybe it is the warehouse team or the delivery staff who have assumed the competence role in the system. This observation gives us huge information. Why is, let us say, the warehouse team the carrier of competence in the system? What relationships does the warehouse team have that provide it with competence in our system network? What does the warehouse team do or achieve for the system that endows it with the value of competence and gives it the role of system 'expert' or 'savior' or whatever? The fact that the Ph.D. technical team may deliver its prototypes or new products competently is not the issue. The question is: Who does the *system* rely on or lean into for competence? Or integrity? Safety? Strength? Stability? Weakness? Corruption? Dysfunction...and so on. These are system-assigned values and roles, and the system has its reasons for assigning those roles! As system thinkers we are interested in uncovering some of those reasons. (Read Chapter 6 for a deeper understanding of how this works in organizations.)

PERSONAL EXERCISE

Think about your favorite organization – 'Greenpeace,' 'Apple,' 'Benetton,' 'Toyota,' 'IKEA.' What values do you associate with it? Maybe it represents values such as caring, excitement, color, elegance. What role does it play in the world as you see it? Advocate, maverick, challenger, ecologist, home builder...?

Now select an organization of which you are part. What values and role does this organization represent in its larger system/s? How and why does it manifest these values and play this role? What other systems is it dependent upon to play this role? What could change these relationships? Where are its strengths and weaknesses?

Now consider your department or function. What values and role does it represent to the larger organization? How and why does it manifest these values and play this role? What other sub-systems does it depend on to do this? What have you learned as a result of this analysis?

New Realities

A systems thinking approach looks at the values and roles in the system and the challenge to those roles and values as a result of new realities. Although values and roles may be represented by individuals as well as functions or departments, a systems thinking approach refrains from personalizing issues where possible, preferring to focus on the larger picture.

The values and roles assumed by sub-systems align with the needs of the larger system. As the needs of the larger system change due to new realities and new circumstances, it becomes necessary for values and roles of sub-systems to change accordingly. Failure to respond to the needs of the larger system creates disequilibrium, distress and dissonance. A systems thinking mindset looks at how changing realities place pressure on the system and its sub-systems and observes its efforts at resistance or adaptation.

We explore values and roles in great detail when we discuss organizational behavior, group dynamics and change in Chapter 6. What is important at this juncture is to grasp that systems thinking provides a holistic approach to understanding reality. This approach stresses the composition and configuration of values and roles; how they serve the goal of system survival and how they change in the face of new realities. Imagination and the ability to use metaphors when analyzing and describing the world is essential to a systems thinking mindset, since it is in the subtlety with which things are perceived that one can really grasp a system's dynamics.

THE SYSTEMIC NATURE OF NEW REALITIES

The source of new realities is the environment new realities arrive, i.e. New realities a they have from the larger system.

- They always systemic they have an effect across systems;
- They are arrive in patterns and waves, i.e. not they are isolated, unrelated incidents or events;
- They are not necessarily linear in apparent cause-effect impact;
- They always impact several relationships or stakeholders;
- They have a ripple affect across systems – a new reality for one part of the network creates a new reality for another;
- They simultaneously create new realities across networks;
- They are often first recognized intuitively;
- They impact values and roles represented by parts of the system;
- They often change relationships between networks and sub-systems.

NOT SEEING THE WORLD WITH A SYSTEMS MINDSET

Months after the event, it was reported that the animals fled the northern tip of Sumatra days before the massive tsunami hit the Banda Aceh coast in 2004. At the time no one paid heed to the behavior of the animals. They were not reading systems, looking for patterns or seeing relationships. The cost of this oversight was huge! Consider what might have been saved instead of the huge devastation and tragic loss of human life.

Now let us reflect on many of the so-called surprise events of our time – Bhopal, Chernobyl, 9/11, Katrina, Kashmir, to name a few; if we had been thinking systems, networks, relationships, and if we had worked with new realities as they arrived and not long after the event, maybe history would look a little different now. Hindsight is a tough teacher.

An Open Systems Approach to Organizational Analysis

Strategic management in organizations is continually striving to find better tools of analysis. The **open systems approach** is slowly gaining more and more enthusiastic adherents. As organizational managers develop in their appreciation and understanding of organizations as living systems, they recognize that the best way to understand them is to treat them as such.

An open systems approach to organizational analysis is based on three major assumptions:

- The only meaningful way to study an organization is to study it as a system.
- Organizations are open systems that exchange matter with the environment.
- Organizations exist in tension with manifold stakeholders who have many competing values and interests. Adaptation requires finding a dynamic point of equilibrium between these changing tensions and new realities in the environment.

The Systemic Leadership approach adopts an open systems approach to understanding how new realities impact the system as a whole and the changing values

and roles in the system and in the sub-parts of the system. Here is a step by step method for analyzing a system based on the ideas we have explored.

Open system process of analysis

- 1 Define a conceptual boundary for the system you are going to analyze. Is it the global arena, the nation, a particular industry, or ...? In the globalizing world of today your boundary is most likely to be wide, as nations and industries are no longer geographically defined. Be sure not to define the boundary too broadly as the analysis will become too complex to handle. If you define it too narrowly you will of course miss critical issues.
- 2 Identify key trends and new realities manifest in the macro environment. Here you will need broad horizons since everything is related to everything else. On the other hand, clearly you cannot embrace everything, so thoughtful screening will be necessary.
- 3 Identify the key systems and sub-systems that make up the larger system you have defined in (1).
- 4 Establish the systemic properties (values and role) of the larger system.
- 5 Establish similar properties of the sub-systems of the larger system.
- 6 Define the organization as a system and establish its values and role in the larger system. Do the same for its sub-systems.
- 7 Identify key stakeholders in the macro environment; in the organization; in the organization sub-systems. Identify their most important values and their inter-relationships.
- 8 Consider how new realities are challenging system and sub-system boundaries, values, roles and relationships.

BENEFITS OF SYSTEMS THINKING

A systems thinking approach to perceiving reality and understanding the world and reality has many advantages. Let us look at a few of these advantages from an organizational perspective. It

- helps managers look at organizations from a broader, big picture perspective, something many people avoid or ignore;
- focuses on the inter-relation of parts and systems and how they work together rather than on isolated events and individuals;

- leads to a more insightful understanding of the environment in which the organization is operating;
- allows for a better understanding of what it means to be in relationship;
- places emphasis on analyzing narratives rather than linear cause and effect events;
- helps uncover the driving forces behind relationships and how relationships play themselves out in reality;
- helps understand the meaning making between the parties of a relationship;
- leads to the identification of new relationships that had not yet been considered;
- results in a better understanding of the stakeholders affected by the actions of the organization;
- uncovers the meaning-making and value tensions that arise in systems as they are tested by new realities;
- alerts managers to the multiple activities that occur at any one point in time;
- encourages the identification of patterns. Identifying patterns of behavior facilitates seeing how a system is configured. Knowing a system's configuration, i.e. its structure, can provide insights into the system's ability to be adaptable and flexible;
- prompts ever more subtle questions instead of ending the search with what seem the most expedient answers.

SYSTEMS THINKING EXERCISE

Part 1

We often use metaphors to name the values and roles sub-systems represent within the larger system. The types and variety of these roles and functions are legion. They are only limited by the imagination. In order to grasp these concepts it may help to consider a simple system: your own family system. Take a moment to think about the members that make up your family system. What roles and

values do they represent in the system? Use your imagination to define the roles and functions of each person. There may for example be an aggressor, an avoider, an enabler, a hero, a savior, or a clown. Now consider the values that can be attached to those roles and values. The aggressor is associated with the anger in the system; the avoider is associated with fear of conflict; the enabler strives to bring back disequilibrium and establish harmony in the system; the hero demonstrates the courage of the system; the savior ensures survival, and the clown holds laughter and stress release. The family system needs all of these roles, functions and values for 'survival'. Through the interaction of the parts of the system, the family coexists in a dynamic tension that strives for some kind of equilibrium or reasonable harmony. Various family members play their part to help make this happen. Survival of the system is paramount.

Questions:

- 1 What values and roles do different members represent in your family?
- 2 What value and role do you represent?
- 3 How do the values and roles serve the system?

Part 2

Let us imagine that in our make-believe family the savior in the family dies. This is a sad new reality for each individual member and also a devastating one for the system as a whole. The role of savior was needed by the system. Now the savior, who represented hope and salvation, is gone.

Questions:

- 1 Using systems thinking what will happen to this family system? (Think values, roles and relationships.)
- 2 What is the adaptive challenge to the system? (Refer to Chapter 1.)
- 3 How would you exercise leadership in this situation?

SYSTEM DYNAMICS

Using an interdisciplinary approach, system dynamics provides an analytical method for learning about the dynamic complexity of systems and especially the role of feedback. Drawing on psychology, economics, mathematics, physics and

other social sciences, systems dynamics provides tools to improve and develop the mental models we hold regarding systems (Sterman 2000).

System dynamics is an aid to systems thinking. It is more rational and logical and less imaginative and intuitive than the approach described above where we analyze the values and roles parts play in a system. System dynamics is concerned with feedback in systems as an impetus to learning. It also looks at the mental models we bring to decision making and provides frameworks and heuristics for testing these mental models.

Importance of Feedback for Learning

What system dynamics teaches us is that the dynamics within systems arise from the interaction of positive or self-reinforcing feedback loops and negative or self-correcting feedback loops. For example if one organization decides to drop prices to raise demand, very soon competitors will be doing the same. The price war is on. This describes reinforcing behavior that supports the impetus of change. A negative or self-correcting feedback loop describes system behavior that opposes change. For example if less nicotine is included in cigarettes in order to reduce smoking, smokers will smoke more cigarettes to get the dose they need. These actions challenge the attempt to change the habits of smokers. Hence they are non-reinforcing (Sterman 2000).

Learning in systems is provided by the feedback process in a system. When systems try to change, certain factors support that change (positive feedback) and certain factors counter that change (negative feedback). Two types of learning are typically described. There is single loop learning and double loop learning.

Single loop learning is fairly superficial. Here we simply respond to what we have learned by trying new inputs or new processes. Our way of seeing the world or the system has not changed. For example: The temperature has dropped outside. I need to raise the heating system thermometer.

Double loop learning, on the other hand, is where information about the real world alters our decisions within the context of existing frames and decision rules. For example: The temperature has dropped outside. I need to consider the most effective way to warm the house. Besides the heating system, what else can I try? Maybe turn off the heating vents in unused rooms; close doors to the basement and attic; draw the curtains ... and soon invest in solar panels.

Bill Torbert in his book entitled *Action Inquiry* (2004), describes a triple loop feedback that adds another dimension to feedback. Triple loop feedback relates to being self-reflective with respect to the present relationship between our

effects on the outside world simultaneous to feedback loops one and two. In other words we obtain feedback on our action(s), our strategies, and our attention and impact at the same time. Triple loop feedback makes us present to ourselves in the now moment, bringing deeper insights into our impact on what we do. For example: I am concerned with the most efficient way to heat my house. Given the cold weather, probably so is everyone else. What is this doing to the demand for energy? How am I contributing to the energy crisis? What are my responsibilities as I try to heat my house efficiently? Which of my actions are responsible, given my concern about the use of energy?

Effective leadership embraces a systems mindset and takes note of the feedback loops that are either reinforcing or countering change in the system. Feedback processes provide information regarding the dynamics of the system. Chapter 6 provides insights on these dynamics.

CHALLENGES TO OUR THINKING PROCESSES

We have seen that identifying and responding to new realities is difficult. It is difficult because new realities are typically complex systemic issues and due to people's tendency to resist change, people prefer to ignore them or to respond to realities of their own choosing. We have also discussed how our abilities to understand the dynamics of systems is limited and that our cause-and-effect linear mental models do not serve us well in a system-interconnected world. Because clear, thoughtful and rigorous thinking is so important for effective leadership, it might be helpful to reflect on some of the limitations to our thinking and learning processes.

Limitations to Effective Thinking and Decision Making

The real world is complex, dynamic and continuously changing. We selectively screen out some new realities because we cannot pay attention to them all. Nor can we possibly grasp all the interconnections and what they mean. It is impossible to observe all the changes that are going on even if we know that one change in one system has ramifications everywhere else. We do not know and cannot predict with accuracy the time delays between cause and effect across systems. We know many things are occurring at once. We have to accept uncertainty and unforeseen possibilities as the potential results of our actions.

When we receive information **feedback** we exercise selective perception. This perception is based on our own perceptive limitations and biases. Even if 'perfect information' were to exist, our thought processes and projections would distort it in some way or another. We see and hear what we want to see and hear, and we look for information that confirms our opinions. One question is: How might we look for information that challenges our cherished views?

Often the information we receive is inaccurate or incomplete. There is a time delay between the event and the information feedback on event. This delay renders all information redundant in some way. Information feedback is thus biased, limited and 'old'. We must ask ourselves how we might really participate in new news.

In order to survive we create mental models that are simplistic, easy to use and that confirm our biases and expectations of the world. If we do not make time and devote energy to revising our mental models they become stale and lack rigor. Our challenge is to keep challenging and renewing our mental models.

Our decisions often suffer from poor execution and implementation. The reasons may be perceptual biases, reliance on poor quality information, or inept mental models. We need to ask ourselves where our greatest limitations lie and how we might overcome them.

PERSONAL EXERCISE

- 1 Are you aware of your mental models and the critical assumptions on which they are based?
- 2 Do you regularly challenge those assumptions?
- 3 Consider the last time you misread or misjudged something. What did you learn about your assumptions and mental models from the experience?
- 4 When was the last time you explicitly 'changed your mental models'?

To exercise effective leadership requires good thinking skills. At best it requires a systems thinking mindset that is open to all kinds of possibilities. Exercising leadership requires the ability to look at the bigger picture while not losing the detail. It requires triple loop learning and awareness of the limitations to effective thinking and decision making. Systemic leaders are adept at systems thinking and appreciate their own cognitive limitations. This explains their commitment to partnering with others in the reality testing process. This theme is developed in Chapter 4.

DECISION-MAKING COMPLEXITY

- Understanding the dynamic complexity of the world
- What to take account of and what to ignore
- Understanding simultaneous action and reaction
- Timing between stimulus and reaction
- Knowing what is concurrent and what is sequential
- Combinatorial complexity of infinite possibilities
- How feedback creates learning

EXECUTIVE SUMMARY

This chapter has emphasized the importance of systems thinking and the need for critical thinking skills to stay abreast of new realities. Effective leadership is highly dependent upon the ability to see the larger picture and to understand the interconnectedness of all living systems.

Here are some of the main points discussed:

- Everything is part of a system, and systems are part of systems. There are many types of system. All organizations are a network of systems.
- The primary goal of all systems is survival.
- In order for systems to survive they must be open systems. Closed systems die sooner rather than later.
- A system has characteristics of its own; it is more than its parts, and cannot be reduced to an aggregation of its parts.
- The importance of systems lies in their structure; how the networks and relationships within the system are configured to achieve the system goals.
- Systems are in continual motion. They are continually in the quest of dynamic equilibrium which is the tension between chaos and order.
- Systems thinking is a mental disposition that sees reality as a series of inter-linked systems. The focus of the systems thinker is on patterns and relationships and how these are affected by new realities.
- A systems thinking mindset looks for the values and roles played by the various parts in the system to better understand how they contribute to the organization's survival.

- A systems thinker realizes that all change is in some way systemic and that responding to new realities requires a systemic approach.
- Systems thinking uses a triple loop feedback approach to learning about the impact of change in the system. Mental models are continually tested and revised so as to limit the natural impediments to critical thinking.
- Our thinking and learning processes are limited. We need to recognize this fact and understand how and why. This reflection helps us embrace ambiguity, uncertainty and change in a constructive way.

KEY CONCEPTS

Adaptive age
Critical thinking
Feedback
Holons
Holarchy, hierarchy
Macrocosm–microcosm
Mental models
New Science
Open systems approach
Relativity
Systems thinking mindset
Systems perspective
Systems theory
System dynamics
Technical fix
Quantum physics

CASE STUDY

KILLING THE WRONG DISEASE

In the 1950s the World Health Organization tried to eliminate malaria in northern Borneo by using the pesticide Dieldrin to kill mosquitoes carrying the disease. Initially, the project seemed a great success. Not only did the mosquitoes and malaria disappear, but the villagers were no longer bothered by flies and cockroaches. But then their roofs began falling in on them and they faced the threat of a typhus epidemic.

First hundreds of lizards died from eating the poisoned insects. Then the local cats died from eating the lizards. Without the cats, rats ran rampant through the

villages, carrying typhus-infested fleas on their bodies. On top of that, the villagers' thatched roofs were collapsing. The Dieldrin killed wasps and other insects which ordinarily ate the caterpillars that fed on the thatched roofs (Dreher 2000).

Questions:

- 1 Using systems thinking how would you analyze what occurred in this story?
- 2 What mistakes did the World Health Organization make in trying to eliminate malaria?
- 3 Is there any incident that has occurred in your organization that has parallels to this story?
- 4 List in detail what you have learned from this exercise.

ORGANIZATIONAL EXERCISE: ONE CUP OF YOGHURT AT A TIME

The Nobel Prize winner, Muhammad Yunus, founder of Grameen Bank in Bangladesh is a Systemic Leader *par excellence*. A former economics professor at Chittagong university, he chose to study the lives of rural Bangladeshis living in extreme poverty close at hand. The result is the Grameen Bank Group of companies that provide microcredit and other critical services to over 2.5 million poor people in Bangladesh. His insights into the realities of the life of poor people has inspired others all over the world to engage in various forms of micro lending and micro finance. By understanding the structural barriers that create and perpetuate poverty, he has been able to create new attitudes and new opportunities for poor people around the world.

Yunus's fascinating story begins in 1974 with his identifying forty-two people who owed less than \$ 27 to usurious moneylenders in the village of Jobra. This micro amount of debt (to us, but certainly not to the poor) kept the borrowers enslaved to the rules and demands of those from whom they borrowed. Yunus took over these loans and this began his venture into tiny loans to aid people in self-employment. In 1983 Grameen Bank was born.

In 2005 Yunus entered into a joint venture with Group Danone. Danone is a large French corporation, one of the world leaders in dairy products, known for its nutritious foods and its brand named Danone yoghurt. Yunus and Danone committed their organizations to create health foods to improve the rural diet of children in Bangladesh. Millions of the poor in Bangladesh suffer

from malnutrition. The challenge for the Grameen–Danone joint venture was how to create a product affordable yet nutritious and accepted by the local people.

The entire approach to the project was carried out using a systems perspective. First the nature of the problem was analyzed by involving as many stakeholders as possible. The poor families were consulted; the local farmers were involved; suppliers of other foodstuffs were investigated; distribution outlets researched and so on.

The final outcome was brilliant. After a huge amount of investigation and research an idea was launched. Yoghurt is a popular food in Bangladesh and Danone has expertise in producing yogurt. Yoghurt has nutrients that are good for the intestines and help reduce the effects of diarrhea. It was decided that the target market of the yoghurt product would be rural villagers and their children who live on less than \$2 per day. The challenge was how to launch a fortified yoghurt product at a price poor people could afford on a regular basis. Further, as there were no refrigeration facilities either in the form of refrigerated trucks or fridges in the villages, these was the challenge of how to get a fresh product to the consumer before it had turned acid and became inedible. Distribution had to be fast to get the yoghurt into the children's stomachs within forty-eight hours.

The solution was as follows:

- Food production, retailing of the product, and consumption would be as close to one another as possible.
- A micro factory would be built close to the community buying the product.
- Local people would work in the factory.
- Local farmers who had cows, or who borrowed from Grameen Bank to buy cows, would supply milk to the factory.
- Milk prices were guaranteed to the farmers for one year ahead so they could have some certainty regarding their income.
- To provide sufficient sweetness, molasses from date palm trees particular to Bangladesh would be added to the yoghurt.
- Biodegradable corn starch containers, which when discarded would turn to compost, would be used as packaging for the yoghurt.
- 'Grameen ladies', women who borrow from Grameen Bank and are mothers living in or near the village, would be distributors of the product.
- Distributors would be trained in nutrition and in the value of selling the yoghurt fresh.

- Insulated cooler bags would be provided by the factory to the distributors of the yoghurt.
- Limited supplies would be delivered every day to ensure freshness of the product and minimize the loss of the yoghurt through becoming inedible.

The project has been a huge success. It was a win-win for everyone. Everyone in the system was involved. The local expertise of people was tapped and they have both contributed and gained as a result. The factory is their factory. The health of the project directly relates to the health of their community. New jobs were created; new technologies were tested out; women and men had their part to play as factory laborers, farmers, suppliers and distributors; children had access to nutritional foods; waste was minimized, and the profits generated were plowed bank into the community in the form of more money for more poverty-reducing programs.

There was no pressure for growth, profits, or shareholder returns. This small model of development is elegant in its simplicity and sustainable. Here everyone is a leader and everyone is a follower. The network of connections is used to enhance the well-being of the entire system.

Questions:

- 1 Using the open systems approach, what do you learn about the sustainability of this project?
- 2 What behaviors are required to ensure this project will sustain a win-win for all stakeholders?
- 3 What new realities might challenge the viability and future of this project?

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MANAGING ORGANIZATIONAL CHANGE APPROACHES TO LEADERSHIP

Leadership Model/Perspective	Leadership Authors		
Army Model	Bennis		
Presidential/Political Model	MacGregor Burns Neustadt		
Corporate/Skills Set	Drucker	Kotter	Kouzes & Posner
Servant/Stewardship	Moss-Kanter De Pree Covey	Gardner Gardner	
Character/Philosophy	Conger Badaracco	Hersselbein	
Psychological	Goleman Lipman-Blumen		
Systems	Schein Senge	Wilson Heifetz	
New Sciences	Capra Wheatley Jaworski	Youngblood Beerel	