# On the status of boundaries, both natural and organizational

## A complex systems perspective

*December 31, 2001 · Emergence*

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**1** Emergent Publications, **2** ISCE

Richardson K, Lissack M. On the status of boundaries, both natural and organizational: A complex systems perspective. Emergence: Complexity and Organization. 2001 Dec 31 [last modified: 2016 Nov 21]. Edition 1. doi: 10.emerg/10.17357.46c0fd124e6b5ca3f21351a55a78e995.

Contemporary science with its strong positivism tends to trivialize the nature of boundaries. Boundaries are supposedly real and our ability to recognize them as such is regarded as a straightforward exercise. This by-product is a direct result of science's focus on the quantifiable and mathematizable (Goodwin, 2000). Given such a naïve belief in the (ontological) status of boundaries, it is easy to understand how some scientists can wholeheartedly buy into their models as true representations of what is. If absolute boundaries exist, then as scientists we have simply to map them and with a little mathematical manipulation "hey presto!"—we have true knowledge of the universe. Scientists aren't the only ones who approach nature in such a black-and-white manner, however. We are all frequently guilty of unquestioningly accepting the efficacy of certain physical and conceptual boundaries that may be totally inappropriate for the context of interest. Managers cling on to organizational models that have far outlived their use and relevance; politicians dogmatically cling to ideologies that should have been put to rest many decades ago; employees at every level of organization naïvely assume that their view of the world is the "right" one.

Decision makers often think that failure more often than not results from the bad implementation of their decisions. It is both interesting and worrying that they rarely consider their methods of analysis to be the source of error. Regarding bureaucrats, Jervis (1998: 311) says:

> *Confronted with disasters that may have been caused partly by their own previous actions, modern bureaucrats and politicians are adept at using this as further evidence for the need for yet more "rational" intervention and control; a more refined and careful use of "improved" technology … the poison is also the cure.*

Complexity thinking forces us to review our conceptions of what natural boundaries are. Are they real in some absolute sense? Or are they no more than, and no less than, social constructs? Are some boundaries more real than others? Or are all boundaries equal?

It should be noted that we use the term "natural" in its broadest sense. We are not merely concerned with atoms and molecules, which is how physicists traditionally apply the term. We are concerned also with the boundaries that describe organizations, departments, and teams. Some scholars would argue that the boundaries that delimit such "objects" are far from "natural," being no more than mental constructs. However, a complex systems view regards these sorts of boundaries as just as natural as more traditional, physical boundaries. The temporary boundaries that define a "team," for example, although they may be somewhat more difficult to identify, are real in the sense that the boundaries that define a molecule are real.

You might ask why such a discussion of boundaries is important. The fact is that all of our human knowledge and understanding is built on a foundation of assumptions that implicitly regard natural boundaries as such, that is, these underlying assumptions carve up the whole into (sometimes arbitrary) parts that are assumed to have ontological status. If the boundaries implicit in particular knowledge are real, then a very strong case for the ongoing validity of that knowledge can be made. So an exploration into the status of natural boundaries is an exploration into the status of our knowledge. Unfortunately, all too often boundary assumptions go unquestioned, resulting in flawed understanding and leading to flawed decisions and actions.

Galal and Nolan (1995) recognized this issue:

> *Once we acknowledge informal collectivities of people as organizations we can imagine economic and political boundaries determined by extents of territorial or resource control, and even legal notions of boundaries based on expectations of ownership and obligations among different parties. Apparently spontaneous in occurrence, the abstractions called boundaries would become necessary in demarcating property, differentiating among groups, distinguishing between organizations and their environments, and even in the more esoteric form defining appropriate moral behavior for a person. The concept of boundaries would therefore become essential in order to organize people and resources for purposeful function and eventually as an important management tool in modern organizations … Boundary concepts are inherently interdisciplinary and interrelated. Managers have used boundaries albeit not always explicitly. Describing the various boundary views allows managers to be more precise in thinking about what roles the boundaries play.*

Consider the trend toward the "boundaryless" organization (Ashkenas *et al.*, 1998). The current management literature (both trade and academic) is replete with articles claiming that (as one conference program put it):

> *Speed, flexibility, integration and innovation are becoming the new drivers of organizational success. Institutionalizing these new success factors requires not just new technology, but also a loosening of boundaries— between the levels of the hierarchy, between the functional areas and departments, between suppliers and customers, and, increasingly, across geographic borders.*

Cross *et al.* (2000) continue:

> *An open systems perspective entails attending to boundary issues (Katz & Kahn, 1978) … Boundary refers to the domain of effort through which an organizational entity interacts with its environment in order to survive (Scott, 1992). Boundary activities are those in which the focal organizational entity engages to create and maintain its boundaries and to manage interactions across those boundaries … adopting more boundarypermeable or boundaryless organizational structures does not eliminate the need for boundary work. Rather, boundary activities increase. Responsibility for boundary management activities migrates downward and is defused across a wider range of work units and organizational actors.*

## DEFINING COMPLEX SYSTEMS

In Richardson (2002) a complex system is defined as follows:

> *A complex system is comprised of a large number of non-linearly interacting non-decomposable elements. The interactivity must be such that the system cannot be reducible to two or more distinct systems, and must be sufficient (where the determination of "sufficient" is problematic) to allow the system to display the behaviours characteristic of such systems.*

Previously a complex system (Richardson *et al.*, 2000, 2001) has been derived simply as a system comprising a large number of nonlinearly interacting entities. However, systems that we might call complicated, such as a computer system, contain a large number of nonlinearly interacting components (transistors have a nonlinear response, for example). The principal difference between a complicated system and a complex system is *not* the presence of large numbers of entities and nonlinear interactions. The key difference is the nature of the overall connectivity, particularly the existence of feedback mechanisms.

Despite the existence of nonlinearity, complicated systems do not selforganize into new structures. They do not display a wide range of qualitatively different behaviors. The extent and nature of the nonlinear interactivity are what differentiate between a complicated and a complex system. The division between these two categories at a compositional level is very blurred, however. It is problematic to know from compositional information whether a system is complicated or complex without having information about its behavior. Complicated and complex systems, then, can only safely be differentiated from each other by observing their respective behaviors. (But note that such observation depends on our ability to recognize such behaviors, which is not necessarily a trivial undertaking.)

Complex systems potentially display many qualitatively different behavioral regimes (the nature and variety of which evolve), as well as exhibiting emergence, that is, the emergence of macroscopic system structures and behaviors that are not at all obvious from their microscopic makeup (Allen, 1999). Complicated systems do not. The order parameters that best describe the current behavior of a complex system are not fixed; they evolve qualitatively as well as quantitatively. Complicated systems have qualitatively fixed order parameters. The subsystems of a complex system are emergent and temporary (and possibly critically organized; Bak, 1996), whereas the subsystems of a complicated system are prescribed and fixed.

The last differentiator listed above hints at a boundary issue, that is, the boundaries describing subsystems in a complicated system are prescribed and fixed, whereas the boundaries delimiting subsystems in a complex system are emergent, critically organized, and temporary.

By this definition most organizational working boundaries are those of a complex system. As Lesser and Storck (2001) describe it:

> *One might think of a group of people playing in a field defined by the domain of skills and techniques over which the members of the group interact. In the "game" played on the field, the number of "players" is indeterminate. In fact, being able to maintain the community by bringing new members onto the field is an important defining characteristic. Being on the field provides members with a sense of identity—both in the individual sense and in a contextual sense, that is, how the individual relates to the community as a whole. A sense of identity is important because it determines how an individual directs his or her*

*attention. What one pays attention to is, in turn, a primary factor in learning. Therefore, identity shapes the learning process. The relationships within the community are enacted on the field, which provides an initial set of boundaries on the interactions among its members and on their goals. And, as with most field-based games, overall community welfare ultimately is more important than individual goals.*

## THE NATURE OF BOUNDARIES

If one were to view the spatiotemporal evolution of a complex system, it would be observed that different structures wax and wane. In complex systems different domains can emerge that might even display qualitatively different behaviors from their neighboring domains. A domain herein is simply defined as an apparently autonomous (critically organized) structure that differentiates itself from the whole. The apparent autonomy is illusory, however. All domains are emergent structures that persist for undecidably different durations. A particular domain, or structure, or subsystem, may seem to appear spontaneously, persist for a long period, and then fade away. Particular organizations or industries can be seen as emergent domains that are apparently self-sustaining and separate from other organizations or industries.

Figure 1 illustrates the spontaneous emergence of order in a simple complex system (the mathematical details of which are not relevant for

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**Fig. 1: Figure 1**

The emergence of domains (or systems)

this discussion). Different domains emerge whose “edges” (boundaries) change and evolve as the system evolves. Although a snapshot of the system’s evolution would show clear structures, it would be wrong to assume that such structures were a permanent and real feature of the system; the structures are emergent and temporary, and so any knowledge built on them would (at best) be limited and provisional.

While all boundaries are emergent and temporary, some boundaries may persist for very long periods. For example, the boundaries that delimit a proton (which is arguably an emergent manifestation of the combined interactive behavior of quarks, or superstrings) from its complement—the rest of the universe—persist for periods theorized to be longer than the current age of the universe (possibly > $10^{33}$ s), after which the boundaries are theorized to decay (through the emission of an X particle), allowing a new set of boundaries to emerge (a positron and a pion, which then decays/reorganizes into three electromagnetic showers). Not all boundaries are so persistent. The boundaries that describe an eddy current in a turbulent fluid (which could be seen as the emergent property of the liquid’s constituent molecules) are incredibly short-lived when compared to the proton and less identifiable.

Most boundaries of interest in our daily lives exist somewhere in the middle of these two extremes. The boundaries that define the organizations within which we work, those (conceptual) boundaries that define the context(s) for meaning, the boundaries that define ourselves (both physically and mentally) are generally quite stable with low occurrences of qualitative change, although quantitative change is rife.

It is also important to recognize that the observation of domains, and their defining boundaries, depends on the scale, or level, in which one is interested (which is often related to what one wants to do, i.e., one’s purpose). An example of persistent boundaries and resulting levels again comes from the natural sciences. The hierarchy of quarks ? bosons and fermions ? atoms ? molecules ? cells ? and so on is very resilient (especially at the lower ends) as well as displaying different levels of emergence. Choosing which level to base our explanations within is no easy task, particularly as any selection will be deficient in some way or another. The informal structure of sociotechnical organizations, from cliques to teams, also exemplifies emergent hierarchy, although considerably less stable than the hierarchy of matter.

At the level of quarks (even if we could directly observe that level), say, it would be difficult to distinguish between two people, although at the molecular level this becomes much easier, and at the human level the task is beyond trivial. The level taken to make sense of a system necessarily depends on the accuracy required or what is practically achievable, and of course one’s purpose. Organizations (economic domains or subsystems) are very difficult, if not impossible, to understand in terms of individuals, so they are often described as coherent systems in themselves with the whole only being assumed to exist (the general unhappiness of the modern employee is a testament to the dangers of oversimplifying this particular organizational topic).

In short, the recognition of boundaries is problematic as well as being related to the level of aggregation that we choose to view.

This emergent domain aspect of complex systems is complexified further when the behaviors of different domains are included. Let's assume for the moment that we are interested in a particularly stable domain, a certain organization for example. We might perform some kind of analysis, such as a cluster analysis, that allows us to extract a number of order parameters (i.e., parameters that when changed, change the domain's behavior) and their interrelationships that seem to characterize the observed domain's behavior. We can then draw a picture of the domain's phase space, which will provide information regarding the qualitatively different modes of behavior of that domain for varying times—a behavioral view, if you like, as opposed to the structural view depicted in Figure 1.

Figure 2 shows the evolution of such a phase space for a very simple nonlinear system. The two order parameters are position (*y*-axis) and velocity (*x*-axis) and the two main shades represent the two main attractors for this system (black represents an unstable equilibrium attractor). So, on the first snapshot (taken at time = 0), depending on what the initial values are of the order parameters, the system is either attracted to the attractor represented by the light gray or the attractor represented by the dark gray.

The proceeding snapshots show how the phase space evolves with the two qualitatively different attractor spaces mixing more and more as time wears on. What we find for this particular system is that, although we know that there are two distinct attractors, after quite a short period the two attractor spaces are mixed at a very low level indeed. In fact, the pattern

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**Fig. 2: Figure 2**

The emergence of qualitatively stable behaviors

becomes fractal, meaning that we require infinite detail to know what qualitative state the system will be in. So, even with qualitatively stable order parameters, qualitatively unstable behavior occurs (Sommerer & Ott, 1993).
Despite this continuous mixing of states, stable areas of phase space *do* emerge and persist. Figure 2 shows an example of this by highlighting the emergence of a stable region that persists to the end of the modeled evolution. This is of interest because it demonstrates that not only is quantitative prediction problematic, but qualitative prediction is also problematic (as opposed to being impossible).

Nevertheless, remember that the example given is for a stable domain with qualitatively stable order parameters. For a domain that is an emergent property of a complex system having other emergent neighbors, the order parameters will not necessarily be qualitatively stable. The defining order parameters might be *qualitatively unstable*. (This demonstrates that the order parameters are simply trends that offer a superficial— although often useful—understanding of any real system of interest.) The evolution of these phase variables will depend on the interaction between the neighboring domains, which is a manifestation of causal processes at the lower levels (an argument for meta-order parameters, perhaps). This introduces nontrivial difficulties for any observer's attempts to make sense, that is, derive robust knowledge. The fact that such change is not random, with the existence of stable structures as well as behaviors, means that the possibility of deriving useful understanding is not wholly undermined.

## BOUNDARY DISTRIBUTIONS

The basic conclusion to which the complexity-based argument given thus far leads is that there are no real boundaries in any *absolute* sense (although, given the extreme stability of some boundaries, this in no way suggests that in certain instances assuming the *existence* of particular boundaries is inappropriate). How are we then to derive knowledge of particular systems (particularly if no systems really exist)? As mentioned above, the situation is not as dire as it might immediately seem, although social scientists are potentially affected more than those in the natural sciences given the differing stability of their respective subject matter. There is no need to follow the radical holists to model the world, the universe, and everything in order to gain robust knowledge. In the field of complexity there is evidence that, while there may be no real boundaries, there are resilient and relatively stable emergent structures. In fact, there is a distribution of boundary stabilities. No evidence is given for what this distribution may actually be; it is simply argued that there is a distribution and that the existence of any distribution requires a review of popular sensemaking approaches. Figure 3 illustrates a possible stability distribution (which has no theoretical or empirical basis).

At one end of the stability spectrum there are boundaries/structures so persistent and stable that for most intents and purposes it can safely be assumed that they are in fact real and absolute. Boundaries describing the objects of science-based technology exist toward this end of the spectrum. Such long-term stability allows a "community of inquirers," for example the scientific community, to intersubjectively converge on some agreed principles that might actually be tested through experiment. Under such conditions it is quite possible to develop quasi-objective knowledge, which is largely (but not ultimately) absolute. The existence of such persistent boundaries allows for something other than a radically holistic analysis; this may explain why the scientific program has been in some ways so successful when it comes to technological matters. In many circumstances reductionism is a perfectly valid, although still approximate, route to understanding. In short, what is suggested here is that

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**Fig. 3: Figure 3**

A possible distribution of natural boundary (structure) stability

scientific study depends on the assumption that natural boundaries are static, and that if one can “prove” that the boundaries of interest are in fact stable and persistent then the scientific method (if such a thing actually exists) is more than adequate.
At the other end of the stability spectrum we have essentially “noise,” in which the lifetime of apparent boundaries might be so fleeting as to render them unrecognizable as such and therefore unanalyzable. Under such circumstances attempts to develop knowledge are strongly determined by the whims of the individual, with observed boundaries being more a function of our thirst to make sense than an actual feature of “reality.” To maintain a purely positivistic position, one would have to accept radical holism and consider the entire universe—a practical absurdity and a theoretical impossibility. This is the only method by which absolute knowledge could possibly be derived.

Fortunately, a vast majority of the perceived universe isn’t quite so nebulous. This doesn’t mean, however, that boundary recognition and allocation constitute a trivial exercise. In fact, without the ability not only to determine the stability distribution but also to recognize where the objects of interest exist on the curve, it is very difficult to determine how to approach them. Radical positivists might argue that a rigorous implementation of the scientific method is appropriate across the board. We have already suggested that the application of the scientific method makes clear assumptions about the ontological status of boundaries that we believe cannot be supported. We would argue that the social sciences, with their willingness to work with a plurality of (possibly incommensurable) methods and perspectives, are more suited to deal with a state of affairs in which boundary recognition and allocation are deeply problematic. This position reflects Cilliers’ (2001) concern that “[i]n accepting the complexity of the boundaries of complex systems, we are committed to be critical about how we use the notion since it affects our understanding of such systems, and influences the way in which we deal with them.”

In organizations, this sense of complexity and boundaries makes itself evident in the very concept of identity. In a recent *Academy of Management Review* special issue, Albert *et al.* (2000) phrased it succinctly:

> *Identity and identification are powerful terms. Because they speak to the very definition of an entity—an organization, a group, a person—they have been a subtext of many strategy sessions, organization development initiatives, team-building exercises, and socialization efforts. Identity and identification, in short, are root constructs in organizational phenomena and have been a subtext of many organizational behaviors. As conventional organizational forms are dismantled, so too are many of the institutionalized repositories of organizational history and method, and the institutionalized means by which organizations perpetuate themselves. Increasingly, an organization must reside in the heads and hearts of its members. In the absence of an externalized bureaucratic structure, it becomes more important to have an internalized cognitive structure of what the organization stands for and where it intends to go. A sense of identity serves as a rudder for navigating difficult waters.*

## A UNIVERSAL WHOLE

The only real absolute boundaries in a complex system are those that define the basic constituents and their interrelationships. All other boundaries are emergent and temporary. In order to relate these arguments to the real world, it is assumed in addition that the universe is a complex system, that is, the one and only well-defined system. If we accept the current picture of theoretical physicists, then the universe is a vast agglomeration of superstrings (see, e.g., Greene, 1999). Defining the universe as a complex system suggests that it is a vast collection of nonlinearly interacting superstrings. As such, the only boundaries with any absolute ontological status are those that describe each superstring and their interrelationships (which would all be the same if the universe were a gigantic cellular automata experiment). All other boundaries are, as already asserted, emergent and temporary.

Regarding the universe in these terms has profound consequences for the status of all of our knowledge, including scientific knowledge. If we could find a theory of everything that would fully describe the universe at the superstring level (assuming them to be the ultimate fundamental constituents), then we might be able to develop absolute understanding. However, the emergent processes are intractable, that is, there is no algorithmic shortcut from one emergent level of aggregation to another. The only way to quantify the emergent products is to run the system. This is quite obviously beyond us mere mortals—even managers! So, while it may be a reasonable position to accept willingly that there is a theory of everything with which scientists might be able to claim absolute knowledge (although complete validation would be impossible), this does not lead to absolute knowledge of other emergent levels of aggregation. In short, scientists can never (and will never) have absolute (and therefore infallible) knowledge. Our knowledge is no more than a superficial and flawed account of what actually is (this doesn't undermine the utility of such superficial knowledge, however).

The only potentially feasible route to absolute knowledge is through a theory of everything that, because of the inherent nonlinearity, would be severely limited (giving absolute understanding of only one physical level of reality). The resulting conclusion is that no single perspective can ever claim to capture the rich complexities and subtleties of *any* observed phenomena. However, as already suggested, there do exist very stable and persistent (critically organized) natural "boundaries," or "structures," so the creation of very stable and reasonably representative knowledge is also possible. Nevertheless, given the problematic nature of boundary recognition and allocation, the whole notion of knowledge is itself problematized.

To mitigate the difficulties that complexity raises for our ability to know anything, it has been suggested that a pluralist epistemology is developed contrary to the quasi-monist epistemology of science, the scientific method (Richardson, 2001, 2002; Richardson *et al.*, 2001). Pluralism accepts that all conceptual perspectives (underpinned by conceptual boundaries) have the potential to shed light on a particular part of the universe. However, taking this position literally leads to a relativist philosophy that more or less excludes the influence of the universe and leads to Feyerabend's (1975) "anything goes" position. In Richardson *et al.* (2000, 2001) it was argued that scientists (as must we all) must respect both the influence of the universe (as they already do) and the many explanatory possibilities of pluralism. Pluralism must go hand in hand with criticism—critical pluralism. Through criticism, the strengths and weaknesses of different conceptual boundary configurations (perspectives) can be assessed in terms of the perceived context.

This leads to an emergent philosophy in which a critical dialog occurs between ourselves, the conceptual world, and the natural world (all of which are interrelated in nontrivial, evolving ways). The relationship between conceptual boundaries and natural quasi-boundaries is thus neither simple (naïve realism) nor absent (radical constructivism).

## THE RELATIONSHIP BETWEEN NATURAL AND CONCEPTUAL BOUNDARIES

Given that there are no true boundaries, we are forced to assume boundaries because of limited cognitive resources: our inherent human need to reduce the complex. Some of these boundary judgments will be reasonable, some of them will not be. Given that there can be no description other than the description of the whole (which is plainly impossible), it is straightforward to conclude that all descriptions must necessarily be metaphorical in nature. Even mathematical models are metaphors for reality, a metaphor simply being a partial description of one thing in terms of another. In the case of mathematics, the universe (one thing) is partially described in terms of selected mathematical constructs (i.e., other things). As all explanations must be by their very nature metaphorical, we must treat them as such rather than implicitly assuming that our explanations are homological with the object they claim to describe. As already suggested, this isn't that big a disaster for knowledge. Although Truth might not ever be obtained in an absolute sense, our words, concepts, and theories can point toward the Truth without ever fully expressing it.

This view undoubtedly denies (naïve) realism in that conceptual boundaries (which are implied by explanation) do not perfectly map to their espoused objects. There is no one-to-one correspondence of our ideas to objective reality. However, this denial of realism does not recoil into an argument for constructivism. Constructivists (at least the radical sort), as has already been suggested, argue that all boundaries are created in our minds and as such do not correlate with objective reality at all. The position argued herein, which is based on the problematic distribution of natural boundary stabilities, falls between these two extremes. Rather than having a fixed relationship with natural boundaries, or having no relationship at all, conceptual boundaries do have a complex and changing relationship to reality. Sometimes this link might be so tenuous as to be unusable. Sometimes it is so strong as to give us the impression that we might actually have absolute Truth to hand.

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**Fig. 4: Figure 4**

The relationship between natural and conceptual boundaries for different epistemologies

The key difference between this position, which has been called quasi-critical pluralism (the “quasi” is attached to acknowledge our inability to be absolutely unbiasedly critical—there is no such thing as a “view from nowhere”—as well as the resource limitations that prevent us from being truly pluralist) and realism is that it explicitly acknowledges the problematization of boundary recognition, which is trivialized in most realist philosophies. The key difference between Q-CP and constructivism is that Q-CP acknowledges that the world does indeed play an integral part in the evolutionary relationship between reality and our ideas. Figure 4 illustrates the different relationships between conceptual boundaries and natural boundaries for these different philosophies.

The above is no mere philosophical debate as far as organizations and management are concerned. Nardi*et al.* (2000)

> *argue that it is increasingly common for workers to replace the organizational backdrop and predetermined roles of old style corporate working with their own personal assemblages of people who come together to collaborate for short or long periods. These assemblages are recruited to meet the needs of the current particular work project. Once joint work is completed, the network has some persistence; the shared experience of the joint work serves to establish relationships that may form the basis for future joint work.*

What label attaches to such a grouping? How can it be attended to and managed? No longer can we accept that organizational identity is core, distinctive, and enduring (Albert & Whetten, 1985). Gioia*et al.* (2000: 64) argue that “the seeming durability of identity is actually contained in the stability of the labels used by organizational members to express who or what they believe the organization to be.” If it is only the labels that are enduring, then identity questions are preoccupied with the philosophical arguments above. In organizational terms, what the discussion above implies is a need to attend to and actively discuss boundary and identity issues (which imply definite boundaries); such discussion needs to be dialog among parties— that is, a plurality of perspectives—and not dictates from above—that is, a singular perspective.

Yan and Louis (1999) stress:

> *Contemporary work environments necessitate a type of activity, that is, bringing up boundaries at the work unit level. This inward-facing boundary work consists of two principal functions: creating and maintaining a compelling image of a common task, and creating and maintaining a shared sense of the climate of the group. The task is to “distinguish” the focal work unit from other units competing for the time and energies of its members, and to sharpen its identity in the minds of its members … Available wisdom on what boundary work entails and how it may be accomplished does not adequately reflect specific conditions associated with contemporary work environments. Developing “boundary-competent” work unit leaders entails helping them recognize and legitimate the work of buffering, spanning, and bringing up work unit boundaries.*

What Yan and Louis stress at the work unit level, Lissack and Roos (1999) stress at the organizational level with their emphasis on coherence as the key element in *The Next Common Sense.*

Coherence is efficiency in action, whether applied to people or to organizations. Coherent people thrive mentally, emotionally, and physically. Coherent organizations thrive in the attainment of their purposes. Coherence is not a rigid state, but rather is a process that reflects the ongoing alignment of identity, purpose, and values. When a system is coherent, virtually no energy is wasted to achieve internal synchronization. Others may call this “being in the flow.” Power is maximized—the power to adapt, flex, and innovate, resulting in a major leap in efficiency and effectiveness. Organizations, being comprised of people, operate in the same way. As coherence increases within individuals and teams, a much higher level of organizational coherence and alignment is possible—coherence between the organization’s goals, its viewpoint, and its actions. The presence of coherence is more likely to contribute to the accomplishment of shared purpose.

Asking people to undertake actions that conflict with their sense of identity will not give rise to coherence. Who we are and who we believe our organization is cannot be placed in conflict with the actions that we are asked to take—in the absence of at least threatened coercion. And coherence is the opposite of coercion. This is a tricky leadership challenge in any organization. In a complex business environment, where customers, suppliers, rivals, industries, and people at all levels seem to be interwoven in intricate ways, stimulating and nurturing coherence call for time, effort, and perspective. Without a coherent viewpoint in our organizations, managers are doomed to spend most of their time and energy attempting to control people's actions. Few companies can afford that.

Coherence stems from identity, viewpoint, and action. We all must work to know our identity (who am I? my company? my team? what do I believe in? value? etc.) and our personal goals, as well as those of our organizations. We must develop a stance from which to view the world. And we must find actions to take without compromising our identity. When all three work in sync, mastery is attained. It will take time, effort, and perspective. It will take recognition that what works in the world of clearly defined industries, organizations, and areas of responsibility tends to fail in a world where all of this is interrelated. It demands attention and dialog about boundaries, both natural and organizational.

## CONCLUSIONS

In most of the problems facing contemporary humanity, boundary recognition and allocation are at best problematic. Most of these problems are social (used in the broadest possible sense) in nature: How do we move forward with globalization—do we regulate (homogenize) everything or do we learn to sustain and manage difference? How can we develop a symbiotic relationship with our climatic environment (without simply turning every electrical device off)? Or, more down to earth, how might we manage a multitude of cultures across the diverse set of teams, workgroups, and alliances that make up the modern organization?

For these problems, as with many others, we will need to develop (relearn?) the skills to enable the development of local knowledge (through Q-CP) without always falling back on to prevailing dogmas. The status and value of scientifically derived knowledge (or any form of knowledge, for that matter) need to be questioned, allowing, if the perceived (intersubjectively agreed) context demands, the privileging of other types of knowledge. Even if we can fulfill this nontrivial task, we must still remember that much of the knowledge developed is certainly approximate and provisional, often requiring radical revision as the future unfolds. This tends toward an evolutionary epistemology and away from a single coherent and universal epistemology. This is not the death of universals, but a leveling of the playing field.

Furthermore, this is not a move from naïve objectivism to naïve subjectivism. These extremes are too restrictive in a complex world: Objectivism discourages change as many "real" boundaries are regarded as immovable, whereas subjectivism undermines the importance of boundaries by viewing them as no more than imaginary delusions of individuals, groups, or society at large and therefore arbitrary. Complexity thinking offers a more sophisticated notion of boundaries. This is a middle way in which the "complex" relationship between natural boundaries (as viewed from a complex systems perspective) and socially constructed boundaries (concepts and symbols, also seen from a complex systems perspective) is of central importance—an importance that demands dialog.

## References


1. Albert, S. & Whetten, D.A. (1985) "Organizational identity," in L.L. Cummings & B.M. Staw (eds) Research in Organizational Behavior, Vol. 7, Greenwich, CT: JAI: 263-95.

2. Albert, S., Ashforth, B., & Dutton, J. (2000) "Organizational identity and identification: Charting new waters and building new bridges," Academy of Management Review, 25(Jan):13-17.

3. Allen, PM. (1999) "Modelling complex economic evolution," in Evolution and Self- Organisation in Economics, Selbstorganisation: Jahrbuch fur Komplexitat in den Natur— Sozial und Geisteswissenschaften, Berlin, Germany: Duncker and Humblot.

4. Ashkenas, R., Ulrich, D., Jick, T., & Kerr, S. (1998) The Boundaryless Organization: Breaking the Chains of Organizational Structure, San Francisco: Jossey Bass.

5. Bak, P (1996) How Nature Works: The Science of Self-Organized Criticality, New York: Copernicus.

6. Cilliers, P (2001) "Boundaries, hierarchies and networks in complex systems," International Journal of Innovation Management, 5(2): 135-47.

7. Cross, R., Yan, A., & Louis, M. (2000) "Boundary activities in 'boundaryless' organizations: A case study of a transformation to a team-based structure," Human Relations, 53, June.

8. Feyerabend, P (1975) Against Method, London: NLB.

9. Galal, H. & Nolan, R. (1995) “Toward an understanding of organizational boundaries,” Harvard Graduate School of Business Administration Working Paper 95-057, Boston.

10. Gioia, D., Schultz, M., & Corley, K. (2000) “Organizational identity, image, and adaptive instability,” Academy of Management Review, 25(1): 63-81.

11. Goodwin, B. (2000) “Out of control into participation,” Emergence, 2(4): 40-49.

12. Greene, B. (1999) The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory, New York: W. W. Norton.

13. Jervis, J. (1998) Exploring the Modern, Oxford, UK: Blackwell.

14. Katz, D. & Kahn, R. (1978) The Social Psychology of Organizations, New York: Wiley.

15. Lesser, E. & Storck, J. (2001) “Communities of practice and organizational performance,” IBM Systems Journal, 40(4).

16. Lissack, M. & Roos, J. (1999) The Next Common Sense, London: Nicholas Brealey.

17. Nardi, B., Whittaker, S., & Schwarz, H. (2000) “It's not what you know, it's who you know: Work in the information age,” First Monday, 5(5), http://firstmonday.org/issues/issue5_5/nardi/index.html.

18. Richardson, K.A. (2001) “On the status of natural boundaries and the limits to knowledge: A complex systems perspective,” paper presented at workshop on Living with Limits to Knowledge held at Central European University, Budapest, 22-23 June.

19. Richardson, K.A. (2002) “The hegemony of the physical sciences: An exploration in complexity thinking,” forthcoming, available at http://www.kurtrichardson.com/KAR_Hegemony.pdf.

20. Richardson, K.A. & Cilliers, P (2001) “What is complexity science? A view from different directions,” Emergence, special issue “What is Complexity Science?,” 3(1): 5-22.

21. Richardson, K.A., Mathieson, G., & Cilliers, P (2000) “The theory and practice of complexity science: Epistemological considerations for military operational analysis,” SysteMexico, 1(1): 25-66.

22. Richardson, K. A., Cilliers, P, & Lissack, M.R. (2001) “Complexity science: A 'gray' science for the 'stuff in between',” Emergence, 3(2): 6-18.

23. Scott, R. (1992) Organizations: Rational, Natural, and Open Systems, Upper Saddle River, NJ: Prentice Hall.

24. Sommerer, J. C. & Ott, E. (1993) 'A physical system with qualitatively uncertain dynamics,” Nature, 365: 138-40.

25. Yan, A. & Louis, M.R. (1999) “Migration of organizational functions to the work unit level: Buffering, spanning, and bringing up boundaries,” Human Relations, 52(Jan): 96-120.