Autopoiesis and Fluid Self-Organizing Networks In Business

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"The most important thing in organizations is the patterns of interactions"
--J. Ollhoff and M. Walcheski

Abstract

The authors assert that fluid self-organizing networks are the natural state for humankind and claim that such networks are the antecedents of any organizing or organization which evolves from a sense of purpose among members of one or more networks. In a formal organization this activity entails initiating the process of autopoiesis - a process that seeks to build a closed self-sustaining purposeful system that will perpetuate itself in the face of any impacts from systems outside its boundaries. The authors emphasize that whilst autopoiesis is taking place, a process of socialization is taking place among members of all the extant networks. This leads to the development of one or more open and emergent systems that arise and live or die concurrently with the autopoiesis system. These complex adaptive systems (CAS) are themselves networks, and their structure and properties are summarized.

The authors stress that the systems that surround a business organization in today's complex business world are highly dynamic, competitive, and socially individualized, and demand behaviors that may only be produced by an organization based on an open system. The authors affirm that autopoiesis does not produce such an open system, but that fluid CAS do, and it is argued that CAS are therefore indispensible to an organization's viability. The authors claim that a balance must be struck between the processes of autopoiesis and the processes of socialization that provides the context in which CAS emerge and flourish. Thus, it is proposed that an organization could achieve viability by balancing a certain amount of organization versus a certain amount of instability, leading to predictability with disorder, and planned long-term strategy achieved through many concurrent short-term actions. The paper sets out in very practical terms how this may be accomplished.

Introduction

Fluid self-organizing networks are the natural state for humankind and a person may quite normally belong to some or many at any given time. Fluid networks are therefore the antecedents of any organizing or organization.

Organizing evolves from a sense of purpose among some or all members of one or more networks. For example, simply solving a problem in a group via some self-organizing process will invariably give rise to the emergence of one or more leaders who, with the support of other network members, organize tasks and duties. In an organization this entails initiating the more formal process of autopoiesis. Autopoiesis seeks to build a

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closed self-sustaining purposeful system that will perpetuate itself in face of any impacts from systems outside its boundaries.

In addition to the need for self-protection, imposition of organization is also undertaken in an attempt to attain power. For example, hierarchies have traditionally been imposed to give self-styled omniscient top leadership control downwards; the omniscient policies of the leadership were carried out obediently by their followers and such structured behaviors satisfied the needs of the surrounding systems e.g. the highly structured low-competition business environments and the ordered societies of the last millennium. In other words, this situation is consistent with Ashby's law of requisite variety (Ashby, 1964), and the degree of internal complexity that is sustained is just sufficient to overcome the external environmental complexity.

Even whilst autopoiesis is taking place among members of the leadership network and linked networks, a process of ongoing socialization is taking place among members across some or all of the extant networks. This leads to the development of one or more open and emergent systems that arise and live or die concurrently with the autopoiesis system ("the formal organization"). These complex adaptive systems (CAS) are themselves networks that are emergent and may or may not support the organization and indeed may destroy it from within.

The Structure of Complex Adaptive Systems

The structure of CAS can be summarized as follows (Stacey, 2001):

- CAS are comprised of large numbers of individual networks and agents linked through relatively weak and singular social ties
- The individual networks comprise agents who are linked through relatively strong and frequent social ties
- These networks and agents interact with each other according to rules that organize the interaction between them at a local level. In other words, an agent or network has a set of rules that determines how that entity will interact with a number of others and this interaction is local in the sense that there is no system wide set of rules determining the interaction. The only rules are the rules located at the level of the agent or the network itself.
- Interactions are endlessly repeated referring back to their rules, that is, interaction is iterative, recursive, a self-referential.
- The rules of interaction are such that the agents and networks adapt to each other. The interaction is nonlinear and this nonlinearity is expressed in the variety of rules across the large number of agents and networks.
- Ongoing variety in the rules is generated by random mutation and cross-over replication

The properties of the complex adaptive network system are as follows:

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- Coherent global patterns of order will emerge from the spontaneous self-organizing of the agents and networks as they interact according to their local rules. There is no overall blueprint
- There are one or more attractors about which patterns form. Novel innovative attractors will form in the presence of diversity

Dynamic Systems

The systems that surround a business organization in today's complex business world are highly dynamic, competitive, and socially individualized, and demand behaviors that may only be produced by an organization based on an open system. This is something that autopoiesis does not produce, but that fluid complex adaptive network systems do provide. Complexity scientists have argued that CAS are therefore indispensible to an organization's viability, since only CAS are able to adapt, survive, and grow under these conditions (Kauffman, 1993; Holland, 1995; McKelvey, 2004; Maguire et al, 2006). Further, Ashby's law of requisite variety (Ashby, 1964) – updated to the law of requisite complexity by McKelvey & Boisot (2009) and Boisot & McKelvey (2010) – indicates that organizations need complex internal dynamics to successfully cope with the complex external dynamics in their marketplace. Ashby's law applies from outside an organization to its lowest levels. In other words an organization needs internal requisite complexity (degrees of freedom) to defeat external environmental complexity (degrees of freedom).

This does not necessarily imply that there is no place for coordination and definition of policy etc., but that a balance must be struck between the processes of autopoiesis and the socialization that provides the context in which the complex adaptive systems may emerge and flourish. Thus, it is proposed in this paper that an organization could achieve viability and stability by balancing a certain amount of organization versus a certain amount of instability, leading to predictability with disorder, and planned long-term strategy achieved through many concurrent short-term actions.

Maintaining such a balance is critical, but unfortunately impossible by currently accepted business management methods. This is because the focus of performance improvement in a business organization is usually on management function and work activity function; however, if each is made to operate as efficiently as possible, the system as a whole will not operate as efficiently as possible – it is their interaction that is critical. In this paper we postulate dynamic '*zones of interaction'* between the top-down organizational forces of autopoiesis and the essentially bottom-up pressures exerted by the CAS elements. In these zones, representatives of both movements meet and negotiate the manner in which the business organization will function *for the good of all the stakeholders*. Such agreement will be dynamic and emergent based on the priorities and interactions of the two movements at any given time.

There needs to be awareness of the interactions of the four levels of purpose – customer, organizational, social & individual worker - and how well the organization performs is a function of all the people who are a part of it, and the commercial system of which it is a part, bearing in mind that the flow of influence in organizations flows in all directions. In

other words business success depends on an appreciation by those involved in autopoiesis of all the various networks, and of how the necessary critical interaction between the networks is achieved; at the same time, the social elements must be sensitive to the systemic influences between customer and the organization that influence autopoiesis policies.

Strategic Attractor

In a business organization that accepts both autopoiesis and the reality and influence of networks, and that seeks to operate as a system of fluid emergent complex adaptive networks within a organized framework, the function of autopoiesis would be only undertaken to develop the organizational structure (how it looks – its departments, groups, teams etc), and to outline its initial strategic "attractor" – a central core of business concepts and social norms to be refined and used by employees at all levels to shape the organization in a dynamic manner, not through elaborate rules and structures, but as employees "are trusted to move freely, drawn in many directions by their energy and creativity. There is no need to insist, through regimentation or supervision, that any two individuals act in precisely the same way. We know they will be affected and shaped by the attractor, their behavior never going out of bounds. We trust that they will heed the call of the attractor and stay within its basin. We believe that little else is required except the cohering presence of a purpose, which gives people the capacity for self-reference" (Wheatley, 1992; pp. 136).

In this sense the organization is both constant and emergent, and closely related to the needs of all the stakeholders, internal and external. In this view, autopoiesis itself will not be immune to emergence since the leadership networks that are largely responsible for maintaining it are themselves now open to the influences of other networks. In particular, opinion leader networks may be expected to act as seeds and catalysts for emergent properties and behaviors. Ironically, Mélèse (1991) argues that the more appropriate the complexity at a lower level, the simpler the complexity needs to be at the next higher level. In other words, the levels below remove degrees of freedom from the system, making the job at the level above easier.

Zones of Interactions

The first step in moving toward such an organization should be (a) to create a central core of business concepts and social norms (an attractor) to be refined and used by employee networks at all levels to shape the organization in a dynamic manner, and (b) to start creating a socialized environment based on trust, true dialogue, and the lessening of the power struggles that exist in organizations. These steps may be initiated by a CEO with vision and influence through the organization's leadership team, or more optimally, based on a 'transformative' approach where the organization's leadership networks and its CEO forge a unique 'solidarity network' in the 'zones of interaction' noted earlier, that is inclusive of all the important generic networks (see below) plus the critical individuals who may then all dialogue together in various ways for the good of all the stakeholders.

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The important generic networks considered here are:

- The leader networks
- The management networks
- The work-group/team networks
- The social networks
- The opinion leader networks
- Potentially …
    - Supply chain networks
    - Customer networks
    - Competitor networks

Critical individuals are:

- The CEO
- Network boundary spanners – people who link networks

This is not to say senior management does not have the final say in such an organization (final process of autopoiesis) but that the process is one of 'co-production'. Part of the deliberations of this solidarity network would be to explore and remediate their organization's Limits to Growth archetype and Shifting the Burden archetype[1] in network terms.

Second, the solidarity network has to collaborate in transforming their organization into high-performing CAS. To accomplish this, the solidarity network:

1. has to fully address the adaptive challenges facing their organizations in terms of the first principles of efficacious adaptation (McKelvey, 2004) i.e. the adaptive part of CAS;
2. has to make sure appropriate complexity dynamics operate at all levels, as their organization grows, differentiates, and becomes multilevel complex systems i.e. the complexity part of CAS; and
3. has to have scale-free dynamics to foster emergent complexity dynamics at multiple levels; i.e. the systems part of CAS.

Some leadership perspectives are highlighted in Figure 1 below, whereby the organization espoused in this paper is dynamically balanced in the 'zones of interaction' between the "Collaborative" segment and the "Entrepreneurial" segment depending on the push and pull between autopoiesis and CAS at any particular time.

Given the substantial size of most organizations, how might meetings in the zones between the forces of autopoiesis and CAS be populated without resulting in chaotic meetings? Depending on the size of the organization, representatives of autopoiesis may be easy to identify and exist in small numbers; however, the same method may be used as would be used to identify representatives of the typically much bigger CAS populations.

[1] Limits to Growth archetype and Shifting the Burden archetypes are systems thinking tools that help illustrate two common dynamics in organizations.

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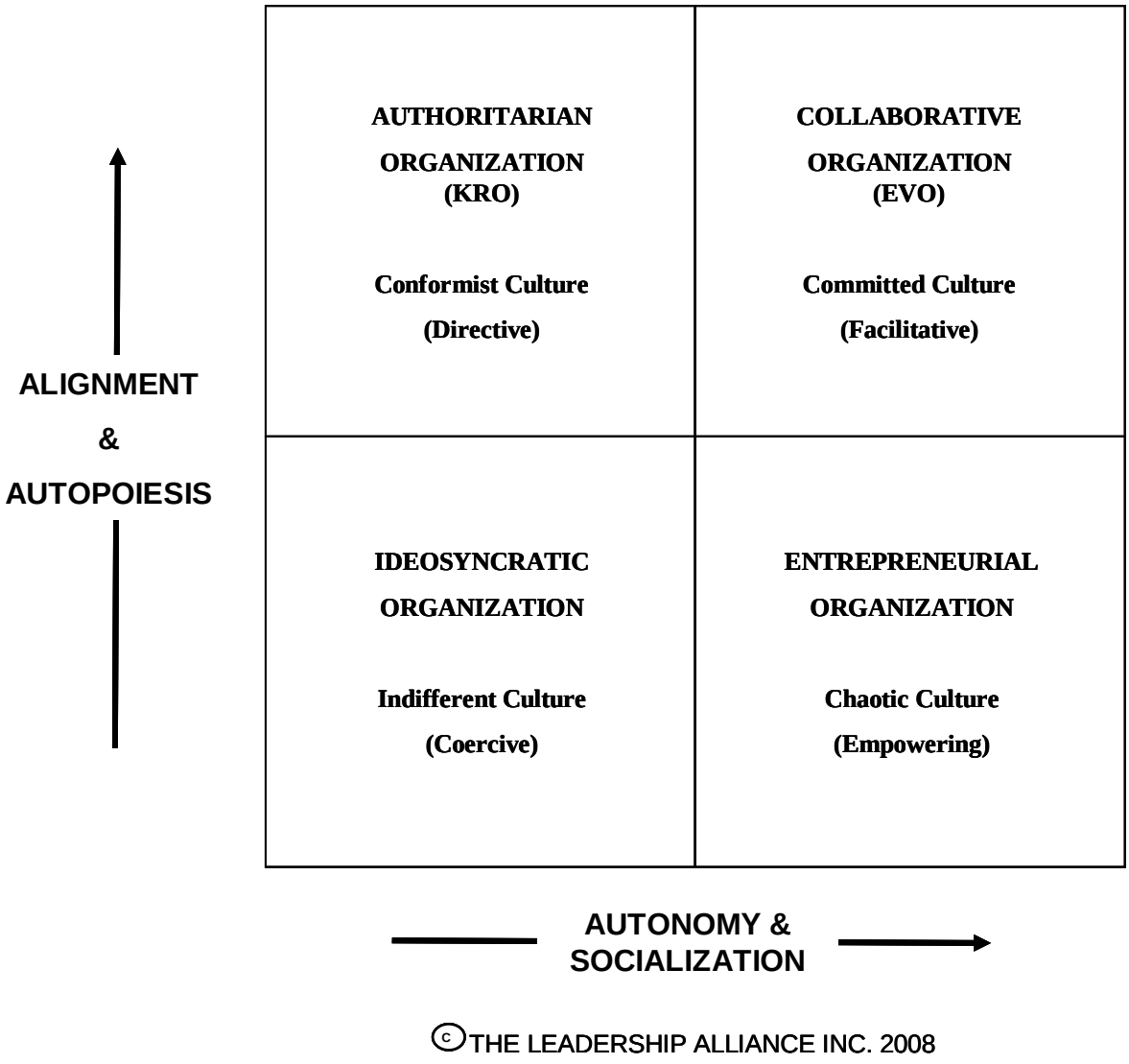
That is through identification of opinion leaders, and network boundary spanners who may then be utilized to represent or link their constituents/networks in the zones of interaction meetings. These individuals have the ear of their constituents, or access to them, and by nature are organizationally savvy. A negotiated result based on their work, or their ability to link networks, will be well accepted.

Figure 1: Leadership Matrix



Performance-Based Attractor

How then may an organization define a performance-based "attractor" that may be utilized for autopoiesis and CAS interpretation, and that provides a language in which the

negotiations take place in the 'zones' where the solidarity networks operate. The platform for this attractor and the language of negotiation are described in the following sections.

The platform is based in complexity science (Gleick, 1987) and Chaos theory (Fitzgerald, 2002). The richness of the diverse elements in a complex system allows the system as a whole to undergo spontaneous self-organization (Waldrop, 1992). Chaos by itself does not explain the structure, the coherence, and the self-organizing cohesiveness of such systems. Even the most chaotic of systems stays always within certain boundaries called "strange attractors" (Gleick, 1987) providing order without predictability. According to Wheatley (1992), one of the best ways to create control under these conditions is through the use of forces called "fields" - invisible forces that structure space or behavior. The concept of working with fields has long been accepted; see Bateson (1988), Mitroff & Linstone (1993), Boisot (1994).

It is argued that an organization must develop a visionary core at its "center" to provide such fields (McNeil, 1987; Wheatley, 1992; Smith & Saint-Onge, 1996). The organizational meaning thus articulated becomes Gleick's (1987) "strange attractor", and in this way individuals make meaning to produce order from chaos, giving form to work, and structure to what is happening at the level of the individual. In other words making practical what was described in an earlier paragraph as "(a) an articulation of the business concepts and social norms to be refined and used by employee networks at all levels to shape the organization in a dynamic manner, and (b) to start creating a socialized environment based on trust, true dialogue, and the lessening of the power struggles that exist in organizations. These steps may be initiated by a CEO with vision and influence through the organization's leadership team, or more optimally, based on a 'transformative' approach where the organization's leadership networks and its CEO forge a unique 'solidarity network' in the "zones" noted earlier, that is inclusive of all the important generic networks plus the critical individuals who may then all dialogue together in various ways for the good of all the stakeholders."

In the following paragraphs we describe the Shamrock Attractor, the three "field" system based on the theory discussed above, that we use to facilitate the solidarity network's collaborative transformation of their organization into high-performing CAS i.e. the process of 'co-production' espoused earlier. In so doing, as noted in a previous paragraph, such an organization becomes dynamically balanced in the 'zones' between the "Collaborative" segment and the "Entrepreneurial" segment (see Figure 1) depending on the push and pull between autopoiesis and CAS at any particular time.

The Three Systemic Fields

The three systemic fields in the Shamrock Attractor are termed *Focus*, *Will* and *Capability*. The generic model is presented in Figure 2, and represents here an outcomes-driven performance system. Performance is driven by the business outcomes desired; for example defined formally via The Balanced Score Card (Kaplan & Norton, 1996) or informally via simple objective-setting exercises.

The Shamrock Attractor has been introduced successfully since the mid-80's by one of us (Smith) to enhance performance in organizations as diverse as Exxon (Smith, 1993), Canadian Imperial Bank of Commerce (Smith and Saint-Onge, 1996), and IKEA (Drew and Smith, 1995). The model has also been used as the means to facilitate development of a learning organization (Smith and Saint-Onge, 1996); leadership (Smith & Sharma, 2002a/b); learning applications (Smith, 1997); and dynamic strategic planning (Smith, 2007).

The three fields in the Shamrock Attractor form a dynamic system. The actual current performance level achieved by the system depends on the interactions and interdependencies of the three fields. The field of Focus represents a clear definition and understanding of the performance proposed; Focus is associated with questions such as What ..?; How ..?; Who ..?; Where ..?; When ..?; Why ..? The field of Will represents strength of intent to action the performance defined in Focus; Will is associated with attitudes, emotions, beliefs and mindsets. The third field is Capability and it represents the wherewithal to transform into reality the performance defined in Focus; Capability is associated with such diverse areas as skills, SW/HW, infrastructure, budgets, tools, physical assets etc. A change in any one of these fields may effect a change in the state of one or both of the other fields.

Optimal Performance

Optimal performance is favoured when Focus, Will and Capability form a self-reinforcing system, with all fields in balance and harmony. As Figure 2 shows, current performance potential is represented by the degree of overlap of the circles; *whereas optimal performance is represented by complete congruence of all the three circles*. In any planning or pre-action initiative the principals will always assume that they have defined the ideal case – only reality will prove them wrong!

Areas shown in Figure 2 in which Shamrock Attractor fields partially overlap are typical of real-life situations. These imbalances and lack of congruence typically lead to misdirected and wasted efforts as well as loss of performance. For example, organizations often concentrate on developing an organization with strong Capability, without regard for the fact that their employees don't understand why such Capability is needed (weak Focus) or absent a cultural feeling that employees will fit and be retained in the new organization (absent Will). The key to performance optimization is the continual dynamic tuning of the degree of overlap of the fields based learning and on re-making and re-shaping meaning. This will be the main pre-occupation of the parties negotiating in the 'zones of interaction'

As Figure 3 illustrates, the performance model is consistent across all levels of the organization; however, the meaning/content of Focus, Will and Capability will change to reflect the changing contexts. This is a very important strength of the model. The language remains the same (F,W,C) for the CAS and the autopoiesis actors.

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Figure 2: Shamrock Attractor Performance System

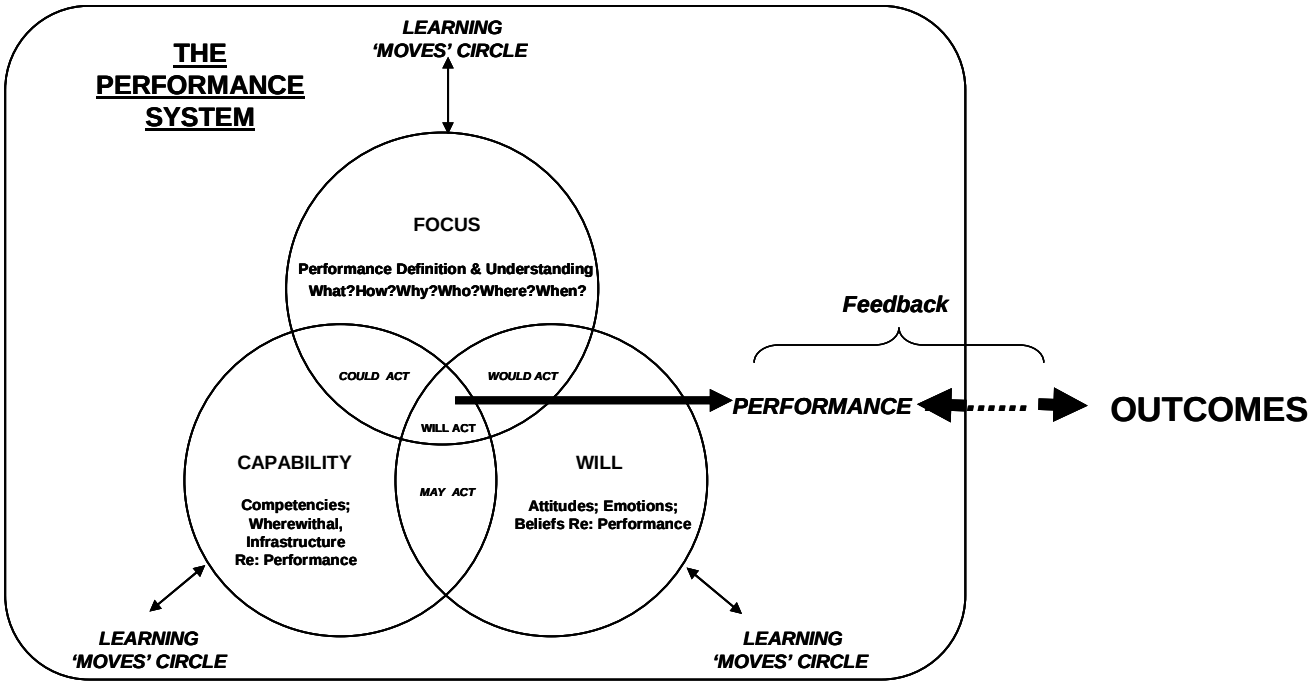
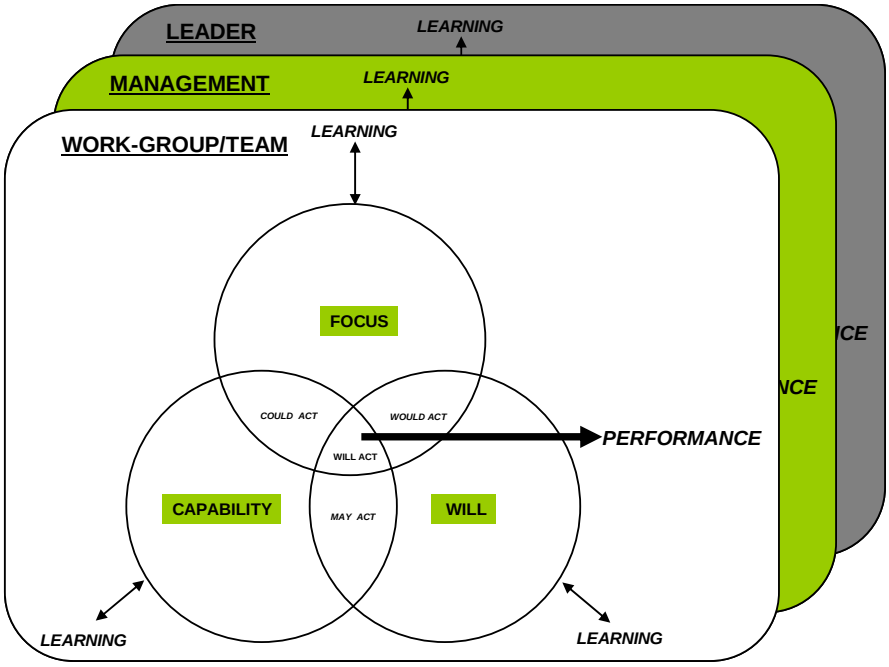


Figure 3: Replicated Model Used For All Networks



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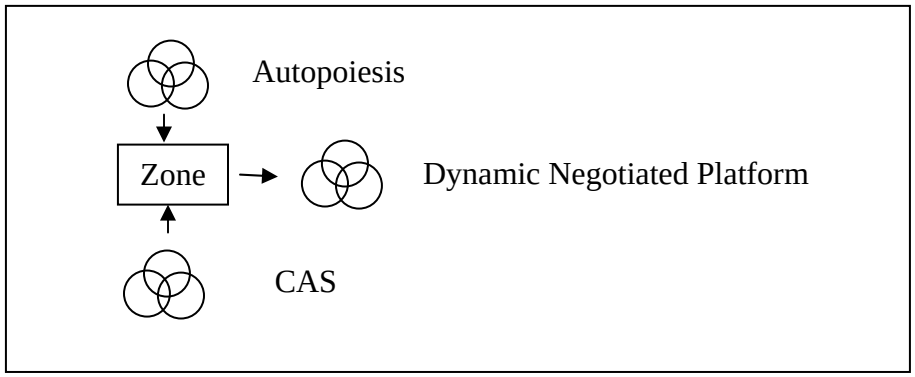
One may picture the zones of interaction as shown in Figure 4 where the forces of autopoiesis seek to impress their vision of the Shamrock Attractor downward through the organization. This is in opposition to the upward thrust of CAS entities who seek to have their vision of the Attractor accepted. The result is a negotiated Attractor that is both dynamic and acceptable to both upward and downward pressing forces. The language of negotiation is simplified since it is focused in only three fields F,W,C. The entities of autopoiesis and CAS all envision their attractor as "ideal" with F,W, and C in perfect harmony; the negotiated attractor will also be seen by all the parties as "ideal". Reality will provide the feedback, learning and sense making that drives the organizational dynamic.

In Figure 5 only two zones of interaction are shown, but inevitably there will be more, and formally within such zones, and less formally within the networks themselves, the Attractor will be shaped and applied in making meaning. The hard work will be in the continual re-negotiation to try to bring the three forces into harmony on a day to day basis, and as learning changes the content of the fields and the performance objectives; however, as discussed above, when Focus, Will and Capability are defined appropriately, optimum organizational performance *will be promoted naturally.*

Figure 4: Concept of Zone of Interaction



The Attractor is particularly important because it provides three "levers" that can be set by senior management *in concert negotiation with CAS* to position the organization to attain overall high-performance. The current actual influence of the fields can be measured and monitored and compared to the negotiated "ideal" envisaged (Smith & Tosey, 1999; Tosey & Smith, 1999).

Based on the authors' lengthy experience in "field" implementation in top-down structured organizations, Capability is most likely to be overdeveloped; Focus underdeveloped; and Will essentially undeveloped. Yet to optimize, or even maintain good performance, it is critical that balance and harmony are maintained among all the fields, since too much emphasis on any one or two of the fields is probably worse than too little. Negotiation including CAS elements will likely enhance the emphasis on development of Focus, and particularly Will.

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A wide range of initiatives can be launched to attempt to shape and harmonize the fields, and a selection of learning-related initiatives that could be used is presented in Drew and Smith (1995; pp. 10). An integrated, very focused intervention can be made in any organization to take the organization where it is to another level of involvement, engagement, and results based on the dynamic application of the CAS elements and interactions presented in this paper.

Figure 5: Typical Network Concerns and Zones of Interaction

NETWORKS	FOCUS	WILL	CAPABILITY
LEADER *Seeking:* *High Autopoiesis & Alignment* *Low Autonomy & CAS*	- Governance - Business outlook - Strategic etc. plans - etc.	- Shareholder confidence - Strategic Will - Cultural expectations - etc.	- Finance - Organizational structure - Facilities - etc.
ZONE OF INTERACTION	↕	↕	↕
MANAGEMEMENT	- Departmental plans etc. - Implementation plans etc. - Work flow - etc.	- Model the way - Inclusive operation - Open attitudes - etc.	- Budgets - Systems - Innovation capabilities - etc.
ZONE OF INTERACTION	↕	↕	↕
WORK-GROUP/TEAM *Seeking:* *High Autonomy & CAS* *Low Autopoiesis & Alignment*	- Purpose - Group/team makeup - Work details - etc.	- Non blaming - Social - Sharing - etc.	- Skills - Facilities - Measurement & reporting - etc.

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