

Identifying Organizations Fit for Change

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Abstract

Fitness is an evolutionary term, used to describe survival within an environment. Two questions related to organizational fitness for change are addressed: (1) how can the fitness of organizations be identified? (2) how do the results of different fitness assessments compare? Three different methods are employed to assess the fitness of organizations, addressing the capacity to communicate about the need for change, the capacity for change to emerge (complexity) and the capacity to handle different magnitudes of change.

The methodologies are a systems analysis of feedback loops, a complex adaptive systems analysis and an order of change analysis. The three methods are applied to Glor's (2001a) organizational change patterns as models of organizations that change in different ways, and also to eight case studies of the models. The fitness of the organizational patterns is compared across the three methodologies. While the three assessments produce some disparate results, they also yield some agreement about organizational fitness. As a last step, the organizational patterns are ranked for fitness for change.

Key Words: Fitness, complexity, organizational evolution.

Introduction

"Fitness" is an evolutionary term, employed to describe the survival and flourishing of a species following evolution or change in its characteristics. The species that survive and flourish have characteristics that fit well within their environment. In nature evolution has three processes—variation, selection and the capacity for self-organized emergence. This produces organisms fit to function in their environments at a point in time.

Fitness is the capacity of a species to change with its changing environment, yet maintain coherence. Fitness are thus about both change and constancy. They are usually considered as the capacity to respond to change in ways that permit survival. Change is about adaptation and resiliency while maintenance is about continuing activities, structure and function. Presumably not changing could also be fit, in contexts where the environment is not changing or where the species is not threatened by changes. Because these environments are few, species usually demonstrate fitness by changing, surviving and thriving.

In natural environments, organisms do not change much, but species do change, through the mechanism of genetic variation. Except in catastrophic situations that give substantial benefit to particular genetic anomalies, this is a multi-generational process as improvements slowly become more common. Human individuals and the human species have added another means of introducing variation—diffusion of innovations from other social groups (White, 1959).

Can the concept of fitness be applied to organizations? Application of evolutionary concepts to human systems is not new (e.g. White, 1959). Rogers, Medina, Rivera and Wiley (2005) saw the three evolutionary processes of variation, selection and emergence among humans as well. Aldrich and

Rueff (2006: 4) applied them to organizations, and added an additional process, namely struggle–patterned selection made among variations through struggle. Adaptability is crucial to survival and fitness for organizations, according to Michaels (2000), Aldrich and Ruef (2006), and Stacey (1996). While much research on the fitness of organizations focuses on the maintenance of structures and stability (Michaels, 2000), rather than emergence and change (Aldrich and Ruef, 2006: 3), this article emphasizes the capacity to adapt and change in order to be fit. While the terms *fit* and *resilient* reflect an outcome at a point in time, the term *adaptable* reflects the capacity to conduct a process, adaptation, that is necessary to fitness.

Caution must be taken with the notion of fitness. The organizations and organization populations observed at any one time are not the most fit in any absolute sense. “Rather, their forms reflect the historical path laid down by a meandering drift of accumulated and selectively retained variations.” (Aldrich and Ruef, 2006: 27). At the same time, by having survived to the point at which they are assessed, organizations exhibit fitness and capacity to survive.

When organizations are considered as a whole, rather than in parts, in other words when they are treated as systems, they can be seen to have some particular needs in order to be able to change.

Fritjof Capra (1996: 82-83) sees all systems consisting of living beings as being organized into networks, and that networks nest into networks. Systems and networks require a means to communicate so that they can adapt to (change in relation to) their exterior environment. Ralph Stacey describes complex human networks as ones in which the interaction between agents and systems is of a nonlinear form. Feedback on the consequences of behaviour is employed to construct models from which the rules of conduct, or schemas, are developed. In the light of further behaviour, these schemas are changed to produce more adaptive behaviour (Stacey, 1996).

This capacity to communicate is a first indication of organizational fitness.

Michaels (2000) indicates that the survival of organizations is dependent on their matching the level of complexity in their environment. In an environment increasing in complexity, if an organization does not co-evolve with its environment to become more complex, it will become less fit by remaining the same. Allowing organizations to respond to information, to become more complex, to self-organize, and to respond to and match the complexity of their environment increases their adaptability. From adaptation emerges fitness for the environment (or landscape), which also changes over time. Complexity is a second indication of organizational fitness.

Just as communication and complexity are necessary to fitness, so is the capacity both to maintain the organization and to change it. The capacity to both continually integrate and to differentiate is crucial to all social systems (White, 1959: 142ff). Aldrich and Ruef (2006: 4) define three fundamental aspects of organizations—socially constructed activities, boundary-maintenance and goals. For them, maintaining activities, boundaries and goals, together with the capacity to change, is an indication of a fit organization.

Socially constructed activities are treated in this paper as the day-to-day functions within the organization, including operating the organization (e.g. paying salaries, buying supplies), developing policy, delivering programs or services, or evaluating results).

Boundary maintenance, according to Arie de Geus (1997) and Mark Michaels, is “behaving in the way

that is required of the system at this point in time to enable its survival” (Michaels, 2000: 73). For them structural survival is the most important issue. Michaels sees fitness not only as a measure of status at one point in time, called success, but also as a measure of adaptability (Michaels, 2000: 20, 73). This pertains for organizations as well—the purpose of an organization is survival. Michaels, like Alrich and Ruef (2006), was thinking mostly of the private sector, while the focus of this paper is the public sector. Nonetheless, survival of structure is necessary to maintenance of any organization.

Van de Ven and Poole (2005) treat organizations as social entities or structures that retain their identity while changing from one state to another. Identity is thus also an important issue. Continuity of identity and purpose is necessary to both maintenance and change in an organization.

The capacity to maintain a balance between maintenance of the organization and changes to it involves maintaining a balance between ongoing differentiation and maintenance, and involves, for example, delivery of activities, survival of structure, and maintenance of identity. The balance between the capacity to maintain and to change activities, boundaries and goals while surviving is a third indicator of fitness.

In this paper fitness is examined in terms of these three indicators of organizational fitness—communication, complexity and the capacity to both maintain and change the organization.

The first key criterion of organizational fitness is effective communication. The relevant feedback is communication an organization is receiving about itself and its need to change. The multi-dimensional factors determining the organizational patterns can be treated as information. Extrinsic individual motivation, a top-down social dynamic and a major challenge can be considered negative feedback for change, while intrinsic motivation, a bottom-up culture and a minor challenge can be treated as positive feedback.

I previously applied Fritjof Capra and Norbert Wiener’s definitions of feedback in a system (Capra, 1996: 56-64) to the feedback loops of each organizational innovation pattern (Glor, 2001b). The results of this analysis were called the “likely fate” of the patterns. “Fate” was, in effect, the fitness of the organization (Glor, 2001b: Table 6). Here the feedback loop for the organizational patterns is re-analyzed, using a different definition of the character of the feedback loop. The methodology is discussed in the next section.

A systems analysis distinguishes two types of feedback, negative or self-balancing feedback loops, producing fixed (frozen) systems that do not change or evolve sufficiently to remain adaptive, and positive or self-reinforcing loops, which magnify the impact of changes, thus moving the system to new states. While self-balancing feedback loops are needed in closed systems requiring a steady state (for example, thermostats), self-reinforcing feedback loops are necessary in systems that must be responsive to their environment in more complicated ways (e.g. systems that use up resources and must admit more, and systems involving living creatures that interact with each other). A closed system with a self-balancing feedback system can thus be fit within the right context, but self-reinforcing feedback is required with living entities in order to maintain complex multi-systemic processes, including the life itself and organizations.

Some organizational feedback systems can be simple. For example, if a known amount of supplies need to be kept on hand, rules can be applied; no choices are required when supplies run low. Likewise, if customers can be made to wait, a relatively simple, self-balancing organizational supply

reordering system might be possible. If, however, additional factors must be considered, for example, the social and environmental impact of the supplies or sudden increases or decreases in demand or supplies must also be taken into account, judgments and a self-reinforcing feedback loop may be required. In reality, there are few simple, closed systems in organizations and thus few situations where a self-balancing feedback loop is more adaptive than a self-reinforcing loop that can respond to complex situations.

Organizational fitness has a second dimension—its capacity for change to emerge. To understand this capacity, organizations must be considered as complex systems. In complex systems the parts interact with each other and change emerges.

Complex biological phenomena evolve naturally to even more complex forms (Kaufman, 1995) and co-evolve with their environments. As they evolve, such complex phenomena self-organize into patterns, what Stuart Kaufman calls “order for free”. Like all complex phenomena, organizations are likely to evolve toward greater complexity. While the natural tendency is for organizations to become more complex over time on their own, human volition can both reduce the complexity of organizations and organize the complexity into patterns; for example, through leadership, priority-setting, strategic planning, budgeting systems, reorganizations, and auditing and accountability.

For the most part, environments also become more complex over time, although efforts are sometimes made to present them as less complex; for example, President Bush’s War on Terror presents security as *the* primary issue in our environment today, thus presenting the selection of priorities as a simple matter. At the same time, by focusing so much on security, Bush may have encouraged the entry of more actors into the domain (niche) of security, and thus unwittingly facilitated an increase in the complexity of the security issue.

Using an evolutionary approach, organizations can be considered to be goal-directed, boundary-maintaining, socially constructed systems of human activities (Aldrich and Ruef, 2006: 4). Because these three characteristics (and types of processes) of organizations interact with each other, and each of the three characteristics involves a number of aspects that also interact with each other, organizations can be seen to exhibit complex behaviour. To be fit, an organization must be able to receive, recognize and act on information, allow change to emerge from complexity, and respond to its environment in a way which matches the environment’s complexity through appropriate orders of change (Michaels, 2000).

According to complex adaptive systems theory (Kaufman, 1995: 86-92), systems exhibit three fitness states—fixed, edge of chaos and chaos. The most adaptable or fit state is at the edge of chaos, that is, neither in a fixed state nor in a state of chaos. Since all three states are possible, all organizations do not have the same fitness.

I previously conducted a complex adaptive systems analysis of the adaptability of the eight organizational change patterns (Glor, 2007 in press), by assessing the variety, reactivity, and capacity for self-organized emergence of each of the patterns and developing a complexity score for each one. In keeping with Kaufman’s approach, organizations at the edge of chaos were defined as the most fit. The methodology is described in more detail in the next section of this paper.

The third issue in organizational fitness relates to differentiating and integrating forces during change and their relationship to the organization’s environment. According to L. A. White, structure is about

differentiation and function is about integration (White, 1959: 142). Social systems “become more differentiated structurally, more specialized functionally, and as a consequence of differentiation and specialization, special mechanisms of integration and regulation are developed” (White, 1959: 144-45).

Some students of organizational change hold that survival of organizations is dependant upon their matching internally the level of complexity of their external environment (Michaels, 2000, quoting Stacey, 1996). If this is the case, because environments tend to become more complex, organizations must also constantly increase in complexity; that is, continually differentiate. By mimicking their environments’ complexity, the organizations’ (systems’) abilities to adapt to changes in their environments are optimized, and their fitness is high. To match different levels of complexity, organizations must be capable of several different orders of change. When changing, Aldrich and Ruef’s (2006) three fundamental aspects of organizations can be considered three orders of change: first order change, related to activities; second order change, serving to differentiate; and third order change, related to functions and identity that serve to integrate.

Assessing the orders of change is the final method for identifying fitness considered in this paper. Organizations and organizational patterns that maintain a balance among all their aspects (activities, structure and goals), not just one (such as structural survival), and that must address higher orders of change are considered more fit. Orders of change are examined by using case studies of the organization patterns, an inductive approach.

Distinguishing fitness through communication, complexity, and the capacity to both maintain and change the organization suggests that it must may be possible to identify how different kinds of organizations change. Organizational patterns have been distinguished and organizations distinguished by their change patterns (Glor, 2001a), by considering the patterns that are created by the relationships among three dynamics at work in organizations: the impact in an organization of individuals (differentiation), of the social collective (integration), and of the resources required to accomplish the goal of change. Concerning the collective, Prigogine and Stengers said, “Each individual action or each local intervention has a collective aspect that can result in quite unanticipated global changes.” (Prigogine and Stengers, 1979)

These distinguishing relationships were named individual motivation (distinguishing intrinsic and extrinsic motivation), organizational culture or the social dimension (bottom-up, top-down) and the challenge involved in implementing a change (minor/major). From these relationships eight organizational change patterns were derived—reactive, imposed, active, necessary, proactive, buy-in, transformational and continuous change (Glor, 2001a,b). Using the patterns to distinguish organizations by their ways of changing, it is possible to explore whether the patterns have differences in fitness.

By using evidence about communication and complexity from two deductive analyses of organizational patterns’ adaptability or fitness, and conducting a new inductive (case-based) analysis of fitness, about orders of change (described below), two questions are addressed: (1) how can the fitness of an organization be identified? and (2) how does the fitness of the eight organizational change patterns compare across the three methods of analysis?

Methodology

Three different approaches are employed to identify fitness and the results are compared. The first two approaches—a feedback analysis (Glor, 2001b) and a complexity analysis (Glor, 2007 in press) were developed previously and are used again. The feedback analysis is redone in a somewhat different way, however. In addition, a new analysis is introduced, that is, an example of each pattern is studied. The first two analyses are deductive, while the third is inductive. Deduction is based on analysis from stated premises, whereas an inductive analysis uses evidence from part of a class as evidence about the whole class.

Fitness is thus assessed three ways, from the perspective of (1) organizational communication, (2) complexity and the capacity for change to emerge in the organization, and (3) the order(s) of change that are required to keep an organization fit in relation to its environment.

Assessing the fitness of an organization

Organizational fitness is examined three ways through a systems analysis of the feedback loop, a complex adaptive systems (CAS) analysis, and an order of change analysis. They are applied to the eight organizational patterns (Glor, 2001b), which are treated as organizational models. Two deductive analyses of organizational change are examined, then an empirical example of each organizational pattern is considered in terms of what each implies about fitness. All three methodologies employed are appropriate for use at different levels, a criterion for good methodologies identified by Dooley (2004: 5).

Analysis 1: Systems Analysis of the Feedback Loop (Deductive)

Glor considered the potential for the eight organizational patterns to change by conducting a systems analysis of the feedback loops in each of the patterns (Glor, 2001b) or types of systems. The feedback loop is analyzed in a different way here.

Evolutionary models treat organizations as systems. A systems analysis assumes an organization is a system, as are its coherent parts, and that they change through responses to feedback. In organizations feedback is information. In her original analysis, Glor used Capra's understanding of feedback, who in turn used Norbert Wiener's definition of feedback in cybernetic machines. According to Capra and Wiener, a feedback loop is "a circular arrangement of causally connected elements, in which an initial cause propagates around the links of the loop, so that each element has an effect on the next, until the last 'feeds back' the effect into the first element of the cycle. In this arrangement the first link ('input') is affected by the last ('output'), which results in self-regulation of the entire system" (Capra, 1996: 56). The cyberneticists distinguished self-balancing or negative feedback from self-reinforcing or positive feedback.

A causal influence from A to B is defined as positive if a change in A produces a change in B in the same direction, i.e. an increase of B if A increases and a decrease if A decreases. The causal link is defined as negative if B changes in the opposite direction, decreasing if A increases and increasing if A decreases. (Capra, 1996: 59).

In the closed cybernetic context, the character of the feedback loop is determined by the balance between positive and negative influences. Capra presented the feedback loop as if it was an electrical

current, that is as self-balancing (-) if it contained an odd number of negative links, and self-reinforcing (+) if it contained an even number of negative links (p. 60), regardless of how many positive or negative feedback links there were.

In an open system such as an organization, full of living, complexly interacting people, this may not be an accurate definition of self-balancing and self-reinforcing feedback loops. Although the influences may not be completely additive in a complex environment, feedback is likely to represent in some way the dynamic accumulation of influences to create self-balancing (negative) or self-reinforcing (positive) feedback.

Table 1: Systems Analysis - Reanalysis of the Feedback Loop for Organizational Change Patterns*

Change Pattern	Motivation	Culture	Challenge	ReAnalysis of Feedback Loop	Fit?
Imposed	Extrinsic -	Top-down -	Major -	- Self-Balancing (negative feedback)	No
Reactive	Extrinsic -	Top-down -	Minor +	- Self-Balancing (negative feedback)	No
Active	Extrinsic -	Bottom-up +	Minor +	+ Self-Reinforcing (positive feedback)	Yes
Buy-in	Intrinsic +	Top-down -	Minor +	+ Self-Reinforcing (positive feedback)	Yes
Proactive	Intrinsic +	Bottom-up +	Minor +	+ Self-Reinforcing (positive feedback)	Yes
Necessary	Extrinsic -	Bottom-up +	Major -	- Self-Balancing (negative feedback)	No
Transformational	Intrinsic +	Top-down -	Major -	- Self-Balancing (negative feedback)	No
Continuous	Intrinsic +	Bottom-up +	Major -	+ Self-Reinforcing (positive feedback)	Yes

This table is a reanalysis of Table 6 of Glor, Eleanor. 2001a. "Innovation Patterns." *The Innovation Journal: The Public Sector Innovation Journal*. Vol. 6(3) (July) <http://www.innovation.cc> under Peer-Reviewed Papers. A new definition of the nature of the feedback loop has been used. It is now treated as cumulative.

* Uses a methodology outlined by Frijof Capra, *The Web of Life: A New Synthesis of Mind and Matter*, London: HarperCollins, 1996, pp. 56-64.

+ = moves organization in equal direction, defined here as a steady state, not in the direction of change.

- = moves organization in opposite direction, defined here as in the direction of change.

Character of the feedback loop as defined by Capra (and Glor in 2001):

Self-balancing (-) if it contains an odd number of negative links.

Self-reinforcing (+) if it contains an even number of negative links.

Overall character of the feedback loop is determined by the balance of negative and positive links, similar to an electric circuit.

Modification:

Character of the feedback loop:

Self-balancing (negative feedback) if it contains 2 or 3 negative links.

Self-reinforcing (positive feedback) if it contains 2 or 3 positive links.

The overall character of the feedback loop is considered to be cumulative, not on-off.

A new analysis of the feedback loop in the eight organizational patterns is presented in Table 1. It treats the feedback loop as cumulative. If too few factors (0 or 1) supportive of change are present, the feedback loop is self-balancing. When feedback is self-balancing, the organization probably functions in a more simple manner and the change process is more likely to be linear. On the other hand, if enough factors are present to support change (2 or 3), the feedback loop becomes self-reinforcing. When feedback is self-reinforcing, the organization is likely to function in a complex manner, and the change process is probably complex.

While organizations functioning within the organization patterns identified will not necessarily respond in a linear manner to this feedback, a response to change becomes more and more likely as the quantity of the feedback grows. The character of the response is examined in the third analysis. For purposes of analysis, the feedback is treated as linear, in an on-off manner. No response can be expected in the patterns where negative feedback for change is received and a response or change can be expected when there is positive feedback. This analysis is conducted in Table 1.

Analysis 2: CAS Analysis (Deductive)

In a second deductive analysis of the eight organizational change patterns' capacity to adapt, Glor used a complex adaptive systems (CAS) methodology. The analysis is based on the work of a pioneer in the field of CAS, Stuart Kaufman. He hypothesized that CAS evolve to the edge of chaos (Kaufman, 1995: 91). The implications of CAS are (a) less complex patterns are more likely to be homeostatic (maintain stable patterns), and (b) more complex patterns are more likely to become chaotic or appear to be chaotic (have large cycles). Accordingly, the edge of chaos and chaos are the conditions under which the most change or adaptation occurs. The change itself is more adaptive (and hence the organization is more fit) at the edge of chaos than in chaos.

Using the measures of complexity identified by Rogers et. al. (2005)—variety, reactivity, and capacity for self-organized emergence, Glor scored the elements of complexity for each of the eight organizational change patterns.

Variety was measured by the number of ideas considered in planning a change and choosing an intervention, the variability of the ideas one from another, the proportion of staff involved in developing the ideas, and participation in heterogeneous internal and external networks, consultations and other community activities. Reactivity involved five factors: individual motivation, organizational culture, group (unit) support of change agents, management support of change agents, and communication. As opposed to networking, which is about ideas (objective and subjective content), communication was considered to be about process.

Capacity for self-organized emergence was assessed two ways, by measures of capacity to implement (ease of approval, ease of implementation) and measures of capacity to endure or institutionalize (ease of integration, likely fate of the change, social impact of change).

A summary of the results of this scoring is reproduced in Table 2 (from Glor, 2007, in press). A summing of the scores identifies each organizational pattern's capacity for change or adaptation. From these scores Glor developed a complexity or adaptability ranking for each pattern. The data from the summary of that analysis—Table 4 from that paper, Summary of the Capacity to Adapt/Change by Organizational Pattern (Glor, unpublished)—is reproduced as columns 1-6 of Table 2.

The scoring boundaries of organizational complexity from fixed/frozen to edge of chaos to chaos have been assigned more or less equally, based on the scoring of the examples. A fixed pattern thus has a score of 0 to 2.5, the edge of chaos occurs between a score of 2.6 and 3.9, and chaos at 4.0 and above.

From these scores, the system flexibility status, stability status, and direction of movement were derived for each pattern. The notions of system flexibility, stability status and direction of movement were taken from Kaufman’s (1995: chapter 4) modelling. Convergence is treated as being movement toward less change and divergence as movement toward more change. The organizational patterns were considered to be most fit at the edge of chaos, where they were able to change yet maintain coherence (Kaufman, 1995).

Table 2: Complex Adaptive Systems Analysis

Summary of the Capacity to Adapt/Change by Organizational Pattern

Organizational Pattern of Change	Overall Measure of Variety	Overall Measure of Reactivity	Overall Capacity for Self-Organized Emergence	Summed Capacity for Adaptation / Change Score	Complexity Ranking	System Flexibility	Stability Status	Direction of Movement	Comment	Fit?
Imposed	0.1	0.2	0.3	1.2	1	Fixed/frozen	O	Converging		No
Reactive	0	0	0.7	1.5	2	Fixed/frozen	O	Converging		No
Active	0.4	0.2	0	1.5	2	Fixed/frozen	O	Converging		No
Buy-in	0.25	0.2	0.5	2.2	3	Fixed/frozen	O	Converging		No
Pro-active	0.4	0.4	0.2	3	4	Edge of chaos	T	Neither converging nor diverging	CAS evolve to the edge of chaos	Yes
Necessary	0.6	0.6	0.4	3.6	5	Edge of chaos	T	Neither converging nor diverging	CAS evolve to the edge of chaos	Yes
Transformational	0.6	0.5	0.6	3.6	5	Edge of chaos	T	Neither converging nor diverging	CAS evolve to the edge of chaos	Yes
Continuous	0.9	1	0.9	5.6	6	Chaos	U	Diverging		No

Scoring (arbitrary): Fixed/frozen = 0-2.5, edge of chaos=2.5-3.9, chaos=4.0+.

Symbols: O= Ordered, T=Transitional, U= Unordered

This table is reorganized from ED Glor, *Assessing Organizational Capacity to Adapt*, E:CO, in press.

Source of concept: Kaufman, 1995: 80-86.

Kaufman (1995: 91) hypothesis: CAS evolve to the edge of chaos.

Direction of Movement as defined by Kaufman, 1995: 91 The CAS analysis focuses on the complexity of the internal and external environment (as represented in the interior environment). Because increased complexity leads to increased emergence or internally generated change, complexity is a measure of whether change is likely to occur in an organization.

Organizations do not require the same amount of coherence that a living being does, but they do require some. The minimum coherence for an organization is probably the capacity to deliver activities—to deliver a program, produce a product, organize operations (for example, deliver and keep to a budget, pay its employees, etc.). Distinctions in coherence or survival were assessed in the third, orders of change, analysis.

Analysis 3: Orders of Change Analysis (Inductive)

The previous two analyses were deductive, proceeding from premises through analysis to conclusions while considering deduced patterns of organizations. A third, inductive analysis, was conducted in order to consider what fitness and survival look like in real organizations functioning within Glor's eight organizational patterns.

As mentioned earlier, according to Aldrich and Rueff (2006: 4) organizations have three dimensions: they are socially constructed systems of human activities, boundary-maintaining and goal-directed (Aldrich and Rueff, 2006: 4). While Michaels saw organizational survival (presumably structural [boundary] survival) as the only relevant indicator of fitness, and therefore that an organization changing what it did was irrelevant, it is not crystal clear when an organization ceases to exist. This is especially true in the public sector where the programs/activities and principles of the organization take on more importance than they do in the private sector, and where organizations are so big that almost all organizations are sub-units of larger organizations.

An orders of change analysis allows for consideration of organizational integrity and continuation at three different levels, in keeping with Aldrich and Rueff's definition. Organizational capacity both to maintain and change was considered along these three dimensions: the impact of change on activities, the impact on structure, and the impact on identity (purpose).

The orders of change were thus defined as follows. First order change is concerned with the capacity to change activities, and includes both demonstrating capacity to change and activation or inhibition of change. Second order change is about the survival or collapse of the organizational structure at the level involved in the change (Dooley, 1997: 89). Death of an organization is defined at the unit level because large organizations and especially governments do not often die, but units do. The latter is the level at which Michaels considered survival. Third order change is concerned with continuity of purpose and related to the substantive activities of the organization—programming, relating to stakeholders and governors—and also to the purpose for which the organization existed. An order of change analysis is conducted in Table 3.

By doing an order of change analysis, the magnitude of change implied for the organization can be taken into account in deciding on organizational fitness. An insignificant change for the organization (a change to operations, for example) can thus be treated as a less important indication of fitness than,

for example, a change addressing organizational principles or survival. To acknowledge these distinctions, a positive response to a first order change is given a score of 1, a second order change is given more measures, and a third order change is given more measures and higher scores if the change is more important.

Fitness in the public sector was defined as having three orders of change—capacity to change; organizational survival, and the accomplishment of the organization’s social goals through the maintenance of programs, and principles, in other words, identity.

The eight examples of the eight patterns were analyzed in these terms. Overall, it was assumed that organizations that faced changes at all three levels—administration, infrastructure, and programming and policy changes, that is, that faced all three orders of change, also changed the most and therefore demonstrated the greatest fitness. This analysis was unable to distinguish whether organizations that did not change were not fit or had already changed sufficiently that they were already fit.

The analysis is thus constructed so that organizations that faced more significant—second and third order—changes received higher fitness scores. Accordingly, the differences discovered in fitness of the examples may not always be reflecting differences among the organizational patterns, but merely among the fundamentality of the examples. Whether the examples are equally good representations of their organizational patterns cannot be demonstrated on the basis of one example of each pattern, although the search for examples that were good fits with the pattern was wide-ranging, especially within the Government of Canada.

Comparison of the fitness of the eight organizational change patterns

Because all three analyses identified the fitness of each of the eight patterns, albeit in different ways, they can be compared. The capacity for change and adaptation and therefore fitness of the eight organizational change patterns are compared in Table 4.

In complex environments, fitness is defined, in the first, systems analysis as a self-reinforcing feedback loop and in the second, CAS analysis as the edge of chaos. In the third, orders of change analysis fitness is defined as successful change in any of the three orders of change, but each increasing order of change is an indication of greater fitness. In keeping with Michaels’ conclusion, structural change is treated as more important than changes in administration and mere activation to change, while change of purpose was considered even more important. An

**Table 3: Comparison of Fitness of Case Studies of Eight Organizational Patterns,
Based on Analysis of Three Orders of Change**

Org'n Pattern	First Order Change		Second Order Change			Third Order Change				Fitness	
	Capacity to Change?	Balance of Activation	Original Orgn Cont'd/Threat'd?	New Org/Struc Crt'd?	New Org Cont'd?	Program / Policy Change Cont's?	Old / New Princs Cont?	Focus of Change Cont's?	Time Period Covered	Total Org Fitness Score	Fit? & Rank
Imposed Literacy N.B.	Y 1	I-No infra-structure budget A-Program decentralized A-Program privatized to nonprofit org'ns A-De-professionalized teaching I-Reduced teachers' pay B=3-2=1	No/Yes 1 Deliberately dissipated. Infra-structure budget not fully passed on.	No 0	N/A 0	Y-offer literacy training 1	Public domain - N 0	Y - Privatize Y - Reduce costs Y - Improve results 2	3/.25	6.5	No 5th
Reactive Operating Budgets	Y 0.5	A-Increased flexibility I-Later- Increased control by pulling back some elements B=1-1=1	N/A N 0	No 0	N/A 0	Y 1	Incr'd flexy- Y Followed by Incr'd control -N 0	No 0	9/.5	2.5	No 2 nd
Active Customs Our Missing Children	N 0	A-Customs staff committed to watch for missing children I-Staff assumed additional work without compensation B=1-1=0	N/A N 0	No 0	N/A	Y 1	Y 1	Y 1	3/0.25	3.25	No 3 rd
Buy-in Missis-sauga Excellence	Y but isolated unit 1	A-Voluntary participation by a minority I-Did not reach critical mass B=1-1=0	No Yes 1	Yes 2	No 0	N 0	N 0	No 0	6/.5	4.5	No 4 th

Pro-active PPP Data- base	N 0	I-Could not find public sponsor I-Privatized to NPO I-Dependent on one individual, who left B=-3=0	N/A N 0	No Just a team 0	No 0	Y- 1	Free access- N Info share- Y Public- N .3	N 0	2/0	1.3	No 1 st
Necessar y Ship Repair Atlantic	N (indivi- duals) 0	A-Done outside official channels A-Relationships key I-Employees assumed extra work with fewer resources, without compensation A-Created unauthorized joint mgmt-union decision-making committees A-National Joint Council created, with mgmt-union representation (advisory). B=4-1=3	Yes Yes 2	Yes Joint mgmt-union com- mittees 2	No 0	N 0	Retain most jobs-Y Public- Y Joint mgmt-union cmtees -N 2	N 0	5/.5	9.5	Yes 7 th
Trans- forma- tional PCS	Y 1	A-Prov. Govt purchased 40% potash industry & created Potash Corporation of Sask, world's largest producer of potash A-Prov. Govt created Canpotex to market & distribute potash & control production with other producers A??-PCS privatized I-When PCS privatized, local control aspect lost I-when Canpotex privatized, lost production control. B=3-2=1	Yes Yes 2	Yes 2	Yes, but priva- tized 2	N - Privatize d 0	Local owner- ship-N Head office- Y Mktg- Y Contro l of mktg- Y 1.5	Y - Survival N- Joint decision- making Y-Grter control over industry 1	30/1	11.5	Yes 8 th
Contin- uous Health Promo	Y 1	A-High profile A-Big budgets A-Innovative for 20-30 years B=3	No No 0	No 0	No 0	Y- 1	Y 1	Y- H. Promo gives way to Preventi on 1	35/12	9	Yes 6 th

Ontogeny is the history of structural change (Dooley, 1997: 77).

Criteria for fitness in case study analyses:

First Order Change: Organization demonstrates a capacity to change activities. Second Order Change: Organization demonstrates it can continue despite threats, can create a new organization, can maintain a new organization. Third Order Change: Organization demonstrates it can maintain its identity by maintaining its principles while changing policy and keeping changes in place.

Scoring:

Organization Demonstrated Capacity to Change? Yes=1 No=0

Centre of Attraction (A), Inhibitions (I). Balance of Activation (B): A=1, I=0, B=Total

Original Organization Continued/ Threatened? Continued=1, Threatened=1

New Organization/Structure Created? Yes=2 No=0

New Organization Continued? Yes=1-3 No=0

Program/ Policy Change Continues? Yes=1 No=0

Old/New Principles Continue? Yes=1-2 No=0

Focus of Change Continues? Yes=1-2 No=0

Tie Period Covered Years/ Score

Fit? No = <7.5 Yes = >7.5 & Rank

example of change within each pattern was examined. This permitted comparison of the fitness of organizations derived by two deductive analyses and one inductive analysis.

Results

The fitness of the eight organizational change patterns, analyzed two different deductive ways, is presented in Table 1 and Table 2.

Feedback (Systems) Analysis (Deductive)

In the systems feedback analysis presented in Table 1, the organizational patterns were analyzed, treating extrinsic motivation, a top-down culture and a major challenge as creating negative feedback for change, and intrinsic motivation, a bottom-up culture and a minor challenge as creating positive feedback for change. The three feedback loops, based on these three types of factors, were considered cumulative, in that three of these factors were considered to produce more positive or negative feedback than one or two. According to this analysis, the patterns that produce the most negative feedback for change are the imposed, reactive, necessary and transformational patterns. The patterns that produce the most positive feedback for change are the proactive, active, buy-in and continuous organizational patterns. The results of the modified analysis redefines which of Glor's eight organization change patterns are self-balancing and which are self-reinforcing for six of the eight organizational patterns. The organizational patterns with negative feedback loops change less and are less adaptive and less fit. The organizational patterns with positive feedback loops change more, are more adaptive, and are more fit. According to the feedback analysis, the latter are the most fit organizational patterns.

Complex Adaptive Systems Analysis (Deductive)

According to the CAS analysis (the second deductive analysis), the least fit organizational patterns are the ones with low complexity, an inflexible system (fixed or frozen), ordered stability and converging direction of movement. The least fit patterns are imposed, reactive, active, and buy-in (Table 2). According to Kaufman, CAS evolve to the edge of chaos, in which state they are the most fit. The most fit patterns are complex, have transitional stability, and

Table 4: Comparison of Three Assessments of the Fitness of Eight Organizational Patterns

Change Pattern	Systems Analysis		CAS Analysis		Orders of Change Analysis				Sum of Fitness/ Rank
	Reanalysis of Feedback Loop	Fit for Change?	System Flexibility	Fit for Change?	Examples (Canadian)	Fate of Change/Organization	Total Fitness Score	Fit for Change? Rank	
Imposed	- Self-Balancing (negative feedback)	No	Fixed/frozen	No	Literacy New Brunswick, Gov't of N.B.	Literacy programming privatized/ privatized	7	No 5th	0
Reactive	- Self-Balancing (negative feedback)	No	Fixed/frozen	No	Operating Budgets, Govt of Canada (GOC)	Adopted/ no organization created	1.5	No 2 nd	0
Active	+ Self-Reinforcing (positive feedback)	Yes	Fixed/frozen	No	Our Missing Children, Canada Customs	Adopted/ No organization created	3	No 3 rd	1 1st
Buy-in	+ Self-Reinforcing (positive feedback)	Yes	Fixed/frozen	No	Mississauga Excellence, City of Mississauga, Ontario, Canada	Adopted, but focus changed over time from excellence to efficiency, cost-saving/ unit abolished	4	No 4 th	1 1st
Proactive	+ Self-Reinforcing (positive feedback)	Yes	Edge of chaos	Yes	Agriculture Canada Public-Private Interactive Database	Devolved to NPO/ privatized to NPO without funding: not clear would be maintained	1.3	No 1 st	2 2 nd
Necessary	- Self-Balancing (negative feedback)	No	Edge of chaos	Yes	Dpt. Of National Defense, Canada, Ship Repair Atlantic	Dubious: too difficult to maintain union-employer cooperation	8.6	Yes 7 th	2 2nd
Transformational	- Self-Balancing (negative feedback)	No	Edge of chaos	Yes	Saskatchewan government, Canada, purchased several American-owned potash mines, created Saskatchewan Potash	Enthusiastically adopted, but change of gov't led to privatization and change in one of its three purposes (local ownership, not local head offices, marketing of potash)	9.3	Yes 8 th	2 2 nd
Continuous	+ Self-Reinforcing (positive feedback)	Yes	Chaos	No 0	Health Promotion, Health Canada, GOC	Adopted, HP organization remained innovative for about 20 years, then major change in mandate; organization continued	7.5	Yes 6 th	2.0 2 nd

Scoring: Yes=1, No=0

Fate: Privatization of a government program is a loss to the organization, although the program continues. Privatization is considered a lack of fitness when the programming is distributed to several organizations, fit when it retains its organizational coherence.

neither converging nor diverging movement. They are the proactive, necessary, and transformational patterns. According to a CAS analysis, chaotic patterns are not fit. Their system flexibility is chaotic, their stability status unordered, and their direction of movement is diverging. The continuous change pattern is not, therefore, as fit as the other three fit patterns, according to the CAS analysis. It lacks self-emergent characteristics.

Case Studies (Inductive)

One case study of a change within each organizational pattern (described in more detail in Glor, 2001b), and the fitness of its organization while conducting the change, is presented in Table 3. A variety of adaptations is described, in terms of orders of change, types of change and level of change.

At the level of orders of change, some changes only involved first and some minor second order changes, including operating budgets, Our Missing Children, and the public-private partnership (PPP) database. These were all changes created within the Government of Canada (GOC). Operating budgets were centrally directed in response to departmental requests, while Missing Children and PPP avoided central involvement. Several organizations did not demonstrate the capacity to change (first order change) through these examples, including Customs, Agriculture and Department of National Defence. Conclusions about these organizations' fitness overall capacity to change cannot be drawn on the basis of one example.

Other change projects had second order issues but almost no third order change. Health Promotion, for example, continued as an organization (directorate), and did not face an ontological problems; at the same time, its focus changed somewhat, from largely health promotion to primarily disease prevention. At the same time, the health promotion and disease prevention approaches are similar in that they attempt to prevent disease, just in different ways.

Finally, four of the examples involved significant ontogeny (structural) issues, third order change. Literacy New Brunswick did not successfully create a new infrastructure to replace the one that was abolished, but rather forced non-profit organizations (NPOs) to self-organize to create and fund the necessary (and reduced) infrastructure. This was probably not a viable approach in the long term, but the federal government emerged as a new funder of the NPO-based programs, so the final outcome of the initial change was not played out. Mississauga Excellence had been created as a separate unit but eventually lost its focus and its structure. Two projects dealt successfully with third order change. Ship Repair Atlantic was threatened with privatization or, more likely, being closed down, but this was avoided. The Potash Corporation of Saskatchewan and Canpotex were both privatized and many of their principles were lost as principles, but some were retained in reality. According to this analysis (Table 3), the most fit organizations were Health Promotion (Continuous Change) (barely), Ship Repair Atlantic (Necessary Change), and Potash Corporation of Saskatchewan (Transformational Change).

The only ontological changes during the 1980s and 1990s included in our examples involved privatization or efforts in that direction (Literacy, Ship Repair, PCS). Both of the provincial changes examined involved structure (Literacy, PCS). The only new program created (federal literacy program) funded NPO programs in the non-government non-profit sector. There was almost no institution-

building within government through the changes examined. The exception was the creation of the small National Literacy Secretariat. As of April 2006, the federal government had announced the amalgamation of the National Literacy Secretariat with two other programs, the Office of Learning Technologies (OLT) and the Learning Initiatives Program (LIP), but this step was delayed because of an election.

In terms of types of change, there were five. The first type of change mostly addressed first order change and the capacity to address and change operations (Mississauga). The second type of change concerned second-order organization-wide changes to rules (operating budgets). The third type involved minor, informal changes to programs (Missing Children, PPP). A fourth type addressed second order changes to programs (HP). A fifth type concerned second order changes to principles (who should deliver literacy and repair ships, what objectives should production of potash serve) and third order infrastructure changes (Literacy, Ship Repair, PCS) (see Table 3).

Concerning levels of change, where changes involved sub-organizations, fitness was easier to determine than when the change involved organization-wide changes to rules (the way of doing operations), as it did with Mississauga Excellence and operating budgets. Fitness failure should presumably have meant the abolition of a government department, but this would have been highly unlikely, especially given the minor nature of the interventions introduced in some cases. As a result, the changes made did reflect a fit organization in the sense that it was able to change, but the statement requires caveats. In the case of operating budgets, a minor change required a systemic solution, often an inefficient solution in terms of peoples' time and effort. Mississauga Excellence required staff to become involved voluntarily. In the cases of Our Missing Children and Ship Repair, the changes were also made informally and cooperatively, thus saving systemic costs, but failing to improve the fitness of the organizations (departments of the GOC) by avoiding formal changes to them. Cases with higher total organizational fitness scores created several orders of change (Table 3).

Comparison of the Findings

The two sets of analytic fitness results are compared to the inductive results in Table 4.

Two organizational patterns (imposed, reactive) were found to be unfit in all three analyses, therefore both analytically and inductively. As a consequence, they were given an overall fitness score of zero. Two organizational patterns (active and buy-in change) were a little fit, in that one of three analyses showed them as fit, but they were mostly unfit. The other four patterns (proactive, necessary, transformational and continuous) were considered fit by two of three analyses. In summary, four patterns were found to be unfit and four were fit.

Of the four organizations that were found analytically to be unfit, all four were also found to be unfit in the case studies. Likewise, the necessary and transformational patterns were found to be fit both analytically and inductively. The results for the proactive and continuous patterns were mixed across types of analysis.

The inductive analyses were much richer than the deductive analyses in terms of the number and types of issues that could be addressed with the examples studied. At the same time, the inductive analyses were retrospective, while the deductive analyses had the advantage of being prospective.

Analysis and Discussion

Systems Analysis

Feedback is about communication, and is essential to change in an organization. The feedback loop provides information to the organization about whether change is needed.

The reanalysis of the feedback loops of the eight organizational patterns identified four patterns—imposed, reactive, necessary and transformational—that have self-balancing feedback loops (Table 1). They may function in a linear manner. They are presumably moving toward equilibrium, yet they are likely functioning within an environment that is increasingly complex. While certain functions within any organization might appropriately function in a linear manner—the finance functions, perhaps—they do not always do so. In an environment of scarcity, where political leaders were unwilling to take the decisions to abolish enough programs to bring the announced balanced budget into alignment, for example, I have seen irrational, yet functional, means used by finance departments to deal with this complex environment. Finance units have hidden the basis and reasons for allocation of budgets, for example. At the same time, such an approach is high risk and may lead to problems. Over time, organizations in unfit organizational patterns risk shrivelling and even dying. They use up flexibility, and have very limited capacity to change or adapt.

Four other patterns—active, proactive, buy-in, and continuous—had self-reinforcing feedback loops, and therefore capacity to change and adapt.

Complex adaptive systems analysis

As indicated in Table 2, three of those patterns—proactive, necessary and transformational—tend to evolve to and remain at the edge of chaos, and one pattern—continuous change—tends to exist in chaos. Organizations that function at the edge of chaos are defined by Kaufman (1995: 90-91) as transitional. They have the most capacity to adapt, while maintaining necessary functions. Because the direction of movement is neither converging nor diverging, the organization can function or cycle around the edge of chaos for some time. While doing so, the organization is highly adaptive and fit.

The last transitional pattern, the continuous change pattern, has the most capacity to change, but can become unordered because it is functioning in chaos. If the organization survives, as it exhausts its people and other resources, it is likely to evolve into a different pattern.

The feedback analysis, focused on communication, and CAS analyses, focused on complexity and capacity for change, did not agree on the fitness of the active, buy-in, necessary, transformational and continuous patterns. They did agree on the fitness of the imposed, reactive and proactive patterns. Because it found the continuous pattern to be functioning in chaos, the CAS analysis did not identify this pattern as fit, despite its active change.

What could explain these differences? The feedback loop analysis looks at three aspects of each organizational pattern—the overall influence of individual motivation, the social dynamics in the organization, especially hierarchy, and the magnitude of the challenge. A low magnitude challenge is considered a positive factor for change. The CAS analysis, on the other hand, considers four measures of variety, five of reactivity and five of self-organized emergence. The three feedback loop measures are subsumed under reactivity in the CAS analysis, so the CAS analysis is more comprehensive. At the same time, for an organization to survive it must have *both* good communication about the external

environment and its internal functioning and a capacity for change to emerge. For example, top-down management and control cannot assure all the change that needs to occur will occur in order for the organization to be fit.

Although the feedback analysis takes no direct account of the magnitude of change, it considers a minor challenge as positive feedback for change. This was the case in three of the four fit organizations identified with the feedback analysis—they faced a minor challenge. A minor challenge will likely only produce a small change. If substantial change is required, the feedback analysis could give the impression that the challenge is too big. Relying entirely on feedback loops for decision-making could lead an organization to delay action too long.

According to Kaufman (1995: 91), CAS evolve to the edge of chaos, where a balance between coherence and change is maintained. Both small and large change can occur there. Realistically, it is not a state that will last forever, but as with living organisms, organizations will self-organize to remain at the edge of chaos. This analysis suggests that emergence could produce a more fit organization than reliance on feedback and top-down decision making.

Case Studies Analysis

Organizational fitness is relative to an environment or context. The cases examined occurred in similar contexts in some ways, in dissimilar contexts in others. We discuss four aspects of similar and dissimilar context here. The contexts were largely alike in that all the cases were from Canadian governments and they were affected by and often occurred in reaction to a dominant ideology, but they were different in the historical periods and the magnitude of change involved.

In terms of similar contextual factors, all of the cases studied were from *Canadian governments*, albeit from three levels of Canadian government: municipal (1), provincial (2) and federal (5). These included the Mississauga city government, the provinces of New Brunswick and Saskatchewan, and the Government of Canada.

The examples were also similar in that they mostly occurred in the *same ideological context*. Within the public sector, in the context of the time, much change was of one kind and in one direction—a post-WW II shift to greater government involvement had given way to a post-1979 shift away from public programming, principles and delivery to private or non-profit organization programming, principles and delivery. This occurred across all four of the governments from which examples have been taken. Of the eight examples considered, ideology was a dominant issue for four of them (Literacy N.B., PPP, Ship Repair and PCS). In the cases of Literacy N.B., PPP and Ship Repair, privatization occurred or was considered largely for ideological reasons, with the expectation that non-profit or profit organizations were provide the services in a more efficient and more flexible manner. PCS was the exception, in that it was ideologically driven by the earlier ideology that government-run industries were fairer to workers and more likely to accomplish both economic and social objectives of the government. In four examples (Ship Repair, Missing Children, operating budgets and Mississauga Excellence), public servants voluntarily took on more work or created more flexible processes, thus leading to more efficient organizations. These were shifts toward the New Public Management (NPM), the public management approach of most western governments in the past 25 years. NPM has served the agenda of conservative governments: privatization, devolution and greater efficiency. The other example—Health Promotion—shifted the emphasis of its programming from health promotion to prevention (health promotion lost most of its advertising dollars, and new funds were provided for prevention programs). The prevention programs were focused on early childhood development for at-

risk children (especially aboriginal and poor children), and had just been demonstrated to be effective long-term interventions by the American Head Start Program. This shift was thus in keeping with the NPM and results-focussed.

The examples assessed are different in two important ways: the historical periods over which they were observed and the magnitude of change involved.

Three important *historical periods* had impacts on this set of eight cases: (1) the post-World War II demographic bulges called the “baby boom” and “generation X”, created by little family formation in North America during WW II, (2) the post-WW II social democratic wave in Europe and Canada, and (3) the conservative wave that began in 1979 in the UK and swept the English-speaking countries. A few examples of these effects on the projects reviewed are described below.

The baby boom created greater demands on government, for income support for low income individuals and families, for more education services and for jobs. Veterans and their families were considered the worthy needy because of the sacrifices they had made, and this support was forthcoming after World War II. These needs were defined as part of the collective good and were considered important. In a collective spirit, in the most consistently social democratic province in Canada, under a social democratic government, the Potash Corporation of Saskatchewan was created as a Crown corporation during the late 1970s to redistribute power from the potash corporations to the Saskatchewan people. The Saskatchewan government insisted on the purchase of 40% of its potash industry from American potash companies that could not contemplate forming partnerships with government (Burton, 1997). An ideological conflict was thus inherent in the change. At the same time, the baby boom sought to distinguish itself from its parents’ generation. One of the ways it did this was by using hallucinatory drugs. In the late 1960s the GOC set up a commission of inquiry into the recreational use of illegal drugs, and the whether the drugs should remain illegal. The Ledain Commission reported in 1972 (GOC, 1972). In 1972-3, most of the staff of the Commission of Inquiry into the Non-Medical Use of Drugs transferred into a new health promotion (HP) program of Health and Welfare Canada to create social engineering (an important stream of new learning in the universities at that time) programs to improve the health of the population (Glor, 2001b).

The second historical factor, the two oil supply and oil price shocks of the 1970s, destroyed the economic growth that had supported increasing public services in the developed world. Western governments moved into deficit financing.

Thirdly, neo (new)-conservative ideology and governments arguing that governments should not be important actors in society soon secured and retained power. They saw governments as too large and performing too many functions too poorly. What the public and governments considered fit shifted from government-run to non-profit or private-sector run, subject to markets. Neo-conservative governments cut (especially business) taxes, thus driving governments into deeper debt, then began to cut programs, especially communications and income support programs. In the context of shrinking government, operating budgets were introduced by the GOC in the late 1990s to permit government departments to transfer funds among staff and operating costs. This allowed some operating flexibility at a time of severe budget cuts (the GOC dealt with a deficit of one third over three years). In the same context, Mississauga Excellence was introduced to increase employee participation and buy-in for solving operating difficulties and saving money. Ship Repair Atlantic and Our Missing Children increased work without increasing compensation. The Agriculture Canada PPP interactive database was initiated and led by an executive who had been given notice of redundancy (lay-off).¹ During a

wave of privatization of government programs, Literacy New Brunswick and the Agriculture Canada database were privatized. Privatization or the closing down of Ship Repair Atlantic was seriously discussed every year, but was avoided through severe and repeated voluntary cost-saving in salary, operating and capital costs, and eventually to a shift to a more business-like model (Alternate Service Delivery).

As discussed in the Results section, the cases had differences in their *orders of change*. An attempt was made to overcome the magnitudes of change differences by using an order of change methodology, thus honouring any inherent links with orders of change. Using this methodology, organizations that dealt with the most change; that is, with all three orders of change and with the higher orders of change--were assessed as most fit. This scoring also privileged organizations that were changing ontogeny as being more fit. Magnitude of change was not the only difference. The cases also occurred during different historical periods. As identified in Table 3, the organizations were observed over approximately three different periods of time. Two of the projects were considered over the long term, 30-35 years. Unlike many organizations, Health Promotion and PCS survived during the whole 30-year period. Another group of changes were observed for 5-9 years, Ship Repair, Mississauga Excellence and Operating Budgets. These three examples involved unstable change, and Mississauga Excellence was showing signs of disappearing completely. A final group was observed for less time: Literacy New Brunswick, Our Missing Children and PPP were observed directly for less than five years. Literacy NB was superseded by a federal program and PPP was showing signs of weakness and disappearance, but at the end of the observation period Missing Children was not. The pattern of regularly shifting responsibility for literacy could be painted, however. The differences in time periods over which the cases were observed thus made a difference. In some cases, it was not possible to say for certain whether the projects and organizations observed in the short or even medium term survived. A longer term analysis was able to illuminate this question.

While the feedback and CAS analyses focused on internal processes, the order of change analysis made clear that change was occurring at much more fundamental levels in some cases than others. The reactive, buy-in and pro-active cases addressed first order, and, to a limited extent, second order changes. The continuous change case involved third order (program) change but not second order (structural) change. The imposed, active, necessary and transformational cases addressed first, especially second and also third order changes.

While the deductive analyses identified these changes, they did so in an ahistorical manner that did not take account of the fact that biological systems have a past (Prigogine and Stengers, 1979: 153). While a CAS analysis should not be ahistorical, concepts like organizational patterns are not usually treated as having a history. In real life they do have a history. Likewise, the order of change analysis in and of itself said nothing about why some organizations were facing third and especially second order changes. The question of why is linked to historical and ideological waves that determine starting conditions, responses to critical events and acceptable pathways for evolution. The current wave of ideologically-based changes initially emphasized second-order (structural) change, asserting that programs run by the non-profit and for-profit sectors were both more efficient and had better outcomes. More recently, they have emphasized policies and programs (third order change), indicating that social engineering (or social interventions generally) did not have a place in government programs.

Although the orders of change analysis suggests that organizations that conduct second and third order (more fundamental) change are more fit (and they certainly faced bigger challenges), all executives were functioning in line with what was considered fit at the political level. In other words, selection was at work, but unlike in nature, it was not passive—it was deliberate, conscious, unidirectional,

ideologically-based change.

While all three analyses were able to identify fitness, only the deductive analyses were generalizable. On the other hand, only the case study or inductive approach was able to identify how the contexts (country, ideological and historical contexts, and magnitude of change were discussed here) directly affected the changes. Thus, while the case studies had the disadvantage of being specific, not completely comparable, and not generalizable, they brought some issues to the table that the deductive analyses did not. There is therefore some advantage in using both deductive and inductive approaches to the study of the fitness of organizations.

Conclusion

We now return to the questions raised in the Introduction.

How can the fitness of organizations be identified?

This paper has suggested three ways that the fitness of organizations can be identified. The three methods for doing so—systemic feedback analysis, complex adaptive systems analysis and orders of change analysis—were able to distinguish the fitness of the eight organizational patterns in their changing environments (Table 4). Among the three analyses, fitness ranks could be assigned, from 0 to 2 (Table 4). Based on this analysis, it seems likely that different organizational patterns have different potentials for survival of their capacity to change, and of their programming, principles and organizational structures.

The three different analyses emphasized different aspects of fitness,. The feedback analysis was revealing about communication in the organizations, the CAS analysis about the organizational context, and the orders of change analysis about the magnitude and nature of change. The deductive analyses were able to look ahead in ways that the inductive analyses were not.

Based on the case studies (inductive analysis), fitness was found to be bound by communication within the organization, by its complexity, and by its context (just as for organisms). Ideology, historical periods and magnitude of change were important contextual factors for organizational fitness. The effect of country of origin could not be addressed because all the examples came from one country; moreover, so many factors were already at work that adding differences across countries would have complicated the analysis far too much.

Although each method brought out valuable information, they each had weaknesses as well. If substantial change is needed, the feedback analysis could give the false impression of a more fit organization than is warranted. Inductive analyses provide far more rich information, but can only be done retrospectively, and are specific to one organization. Nonetheless, some generalities were identified. If a prospective understanding of fitness is sought, an effective deductive analysis is required. Of the methods explored in this paper, the CAS method seemed the best, particularly since it could distinguish too little change, a fit amount of change, and too much change. That fitness in the future can be predicted on the basis of present fitness is not a given, however.

How does the fitness of the eight organizational change patterns compare?

Because the organizational patterns were assessed in each of the three types of analyses, they can be compared. All three analyses found the imposed and reactive change patterns were unfit. Two agreed that the active and buy-in patterns were unfit.

All three analyses identified the proactive, necessary, transformational and continuous change patterns as quite but not fully fit (two of three assessments were positive). According to the analyses, the necessary and transformational patterns were limited in their fitness by problems with communication, while the proactive pattern had trouble with its organizational capacity to change and the continuous pattern with too much complexity.

The analyses were not unanimous about any fit organizations, implying that—for this set of eight patterns and examples—lack of fitness may be easier to detect or, perhaps, even more likely than fitness.

These findings beg some additional questions. First, are the more fit organizations actually more likely to survive? Survival was examined here at the level of operations, programs, principles and structure. Two of the case studies—Health Promotion and Potash Corporation—examined organizations that remained fit and survived over long periods of time. In their cases, being fit at one point in time did predict being fit at a future point. They were the sixth and eighth most fit organizations, of eight, but the seventh most fit organization—Ship Repair—while it survived, some substantial challenges mean its survival may still be at risk. Further study is required of whether any of the three methods used here to identify fitness could be used to predict survival of organizations over time.

Other authors have found prediction a perilous exercise; for example, Peters and Waterman's excellent organizations (Peters and Waterman, 1982) did not have a very good survival record.² Perhaps this is because fitness is more a capacity to conduct certain processes and therefore to change, in a specific context, than it is a question of a quality or characteristic such as excellence. The three analyses conducted in this paper considered a process (communication), a characteristic (complexity) that permits a process to emerge (self-organized change), and examples. The question of processes versus traits still deserves more study.

A second question for further investigation is what is the nature of evolution in organizations? For example, could organizational patterns be considered the evolutionary equivalent in organizations of species in living organisms?

About the Author

Eleanor Glor has worked for three levels of Canadian government. She is the Editor-in-Chief of *The Innovation Journal: The Public Sector Innovation Journal* (www.innovation.cc). In recent years her interest in public sector innovation has turned to public sector organizations as complex environments. In this issue of *The Innovation Journal* she publishes both a book and an article that employing this concept. She also has articles in press with *Journal of Public Affairs* and *E:CO* on complexity and organizational change.

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