Turbulence, Innovation, and Leadership:
Adapting to Change in the 21st Century

Professors Steven Goldsmith and Jerry Mechling
Harvard Kennedy School of Government

August 2008

"There is nothing permanent except change." -- Heraclitus, 540-486 B.C.

Heraclitus had it right: change is the only constant. Nevertheless, change is clearly handled better in some settings than others.

Governments, for example, have historically focused more on continuity and less on change. Until recently, this may have been appropriate.

Over the past half century, however, organizational environments, including those for governments, have become quite different. Environments that used to be stable are becoming increasingly turbulent. This paper offers a framework for assessing turbulence and builds on this framework to develop effective leadership responses.

As turbulence (i.e., the rate of change in the external environment) increases, we argue that appropriate responses are not to be found in hierarchical "channels" so much as in peer-to-peer networks both inside and outside the organization. To find and implement effective responses, leaders need to become more active, adaptive, and partner-oriented in their approach to innovation.
Let's start with fundamentals. Individuals -- the building blocks of organizations and societies -- function as open systems. They interact with their environments. They survive through responding to changing conditions. When they can, they repeat what has worked in the past, getting more efficient at previously learned routines. In addition, they work -- at least some -- at learning new ways to respond, especially when existing routines fail. For the individual, long-term success requires adaptive development of new capacities. When the "horseless carriage" became popular, many carriage-makers needed to learn a new trade.

Similar learning is required for the institutional open systems formed as individuals aggregate into organizations and entire societies. The fundamental learning for institutions is how to gain from specialization and scale. Specialization takes advantage of differences in the skills and interests of individuals; it also supports learning via repetition. Scale works for tasks where bigger is better, such as warehousing and defense. Putting the two together creates efficiencies in a wide variety of public and private endeavors such as education, tax collection, policing, health care, etc.

When work is divided up within a group, however, we need to coordinate specialties and distribute the collectively-produced results. Much of this is handled through self-organization as individuals interact and trade with each other. Markets, which make trading more efficient, are important tools of coordination and are famously responsive to changes in supply (production capabilities) and/or demand (what people want).

But markets and voluntary trades aren't typically enough for good coordination and change. Results can suffer if consensus takes too long (battlefield decisions) or if "spillovers" benefit some at the expense of others (environmental pollution).

Therefore, most groups also require authoritative leadership and governance, i.e., an ability to coordinate forcibly in the absence of adequate voluntary consensus. We use such authority both within organizations ("the management") and societies ("the government"). When authority works well scarce resources are allocated efficiently, results are shared equitably and decisions are made that -- while often controversial -- are broadly accepted as legitimate (in the interest of the organization or society as a whole).

In this context, our question for this paper is: As organizational environments become more turbulent, how should we respond in terms of institutional innovation and the leadership -- authoritative and otherwise -- required to make it successful?

Our general answer is that greater turbulence requires increasing and different kinds of adaptive effort and leadership. More specifically, based on the frequency and size of steps taken from the status quo, we illustrate in Figure 1 below four levels of
environmental change/turbulence (from stable, to evolutionary, to revolutionary, to turbulent). These are matched to four approaches to innovation and leadership (from traditional, to active, to adaptive, and to partner-oriented).

What is the essence of these categories?

1. **Stable environments**. These require infrequent and incremental adaptation, with relatively small investments in innovation. Searching for new ways of working can be organized much like other tasks: i.e., through specialized groups that report through established channels of authority. *This could be called "traditional" innovation.* Some effort -- but not much -- is needed to look for new ways of doing things. Leaders make most of the significant decisions by assigning responsibilities for recommending innovations and then approving or disapproving the subsequent recommendations.

2. **Evolutionary environments**. These require small but frequent innovations and a significant innovations budget. In addition to analysis by research groups, *the search for new methods needs to include operating personnel* since many more people and perspectives are needed for the innovations process. Decision-making can nevertheless be bottom-up, participatory,, and consensus-driven. While most activities stay within the status quo, there are, nevertheless, more innovations attempted than in stable environments. In addition, in evolutionary environments more decisions to innovate are made lower down in an effort not to overload the hierarchy. *This pattern could be called "active" innovation.* Leaders need to prod their organizations to search and respond more aggressively to new ways of doing things.

3. **Revolutionary (crisis-driven) environments**. These require large and disruptive but infrequent innovations. Because of the disruption, implementation and leadership need to
be organized differently than for evolutionary changes. Those involved in change must be protected by leaders from powerful opponents especially including those within the status quo. Revolutionary changes must often be driven more from the top down. They require both active and adaptive work, i.e., searching further "outside the box" and committing to innovation before "final" solutions can be known. Fundamental change requires continuous learning and adjustment, not one-shot implementation.

4. Turbulent (constantly changing) environments. These require changes that are both large and frequent. Extended turbulence -- as takes place, for example, in markets for high technology -- exacts a severe toll from organizations that can't adapt. Success requires the rapid assembly of new capabilities, and institutions often can't succeed by themselves. With collaboration as a critical skill, flexible coordination is often made possible via computer networks. This approach could be called "partner-oriented" or networked innovation.

* * *

As the pace of change increases and becomes turbulent, the approaches to adaptation must be different. Historically, business environments have been the most turbulent. Recently, however, governments -- driven by demographics, science, and the penetration of computer networks into all sorts of economic, social, and political interactions -- have also been confronted with the need to cope with a faster-changing world.

Below we explore how to respond to these trends. How can we assess turbulence? As it grows, how can we decide how much to invest in innovation? As we invest more, how can we provide the leadership required for success?

Innovation in Stable Environments

How do you know you're in a stable environment?

It may be impossible to place your environment precisely on a "stability/turbulence scale." Still, working to assess your position will be useful. Your institution participates in a chain of activities flowing from inputs (labor, technology, funding) to operations (design, production, delivery) to outputs (quantity, quality) and ultimately to outcomes (the results of primary importance to society). From evidence including observer perceptions, what can be said about rates of change in your environment? In stable environments, things change relatively slowly; lists of best practices and top performers don't vary much from year to year.

Historically, many governments have lived in stable environments. The economy grows nicely, the population base changes slowly and is basically satisfied, and governmental systems such as the schools are working. Governments in these settings aren't required to make frequent moves beyond the status quo. When they do, the steps are small.
This doesn't mean that citizens are always happy. While citizens may be seeking stable goals such as security, a strong economy, a sense that their group is being treated fairly, they may, over time, lose faith that their government is honest or competent. In fact, since the 1960s, there has been a global loss of trust in government and in those in authority. ⁸

Despite such dissatisfaction, the public will not reliably support serious change. Something new is fine, of course, if it works. But it's dangerous for leaders and perhaps for society when it doesn't. The public pays more attention to failure than success.

This suggests that "traditional" government environments have been stable. For perhaps 15 to 30% of governments, the stance towards innovation remains "slow and easy." Let someone else be the pioneer.

**In a stable environment, how much should you invest in innovation?**

Governments -- especially national governments -- often support basic research (where benefits are hard to predict and may not be captured by those doing the work). Beyond basic research (which itself is dwindling), governments don't invest much in applied research or operations-oriented innovation.⁹

While reliable data is unavailable, it seems fair to suggest that innovations in stable environments rarely receive more than 1% - 2% of the annual budget. Governments budget for programs based on what they have done previously, with little allocated for innovation. Often, however, significant spending CAN be directed to innovation. Agencies often try a variety of new things out as informal and unbudgeted experiments.¹⁰

**In a stable environment, how should you organize and lead innovation?**

In stable environments, innovations can be organized like other work, i.e., via specialists coordinated through pre-defined processes and hierarchy. The budget to some extent can be organized as a search for new ideas. Technology and operations managers and staff can participate in these searches, as can political appointees.

When attractive innovations are identified, proposals can be developed "through channels." The role for senior leaders is to design those channels and make the most significant implementation decisions. For example, think of a police department upgrading their PCs; these decisions are typically allocated to the technology staff and brought to senior leaders only if they create some unexpected disruption in daily operations.

**Innovation in Evolutionary Environments**

**How do you know you're in an evolutionary environment?**

Evolutionary environments are a step up in demands for change. As elsewhere, benchmarks are useful for assessment. Compared to stable settings, environmental forces and value chain indicators show greater variability. Lists of best performers and good practice are more volatile. If, for example, a disruptive new technology such as the
internet is sweeping across the value chain (i.e., suppliers and partners as well as the government itself), then demands for change will increase.

Given advances in science and technology, "evolutionary" has become the standard government environment. With perhaps 15-30% of governments in "stable" conditions, the next 40-50% may need a noticeable bump up in their pace of innovation.

Common markers of evolutionary environments are elections where "time for a change" is the winner's theme. For example, having mobilized a constituency to respond to threatening macro-economic forces, incoming leaders may see change as a front-burner priority. Even "innovative" governments, however, typically pursue change via small and therefore more feasible steps.

**In an evolutionary environment, how much should you invest in innovation?**

A serious effort for evolutionary change requires many projects and a budget of perhaps 5% of the total resources. Projects involve frontline and middle managers as well as staff. Attention is shifted away from daily operations to support pro-active and future-oriented problem solving.

Given that governments rarely make their investments in innovation visible, it's hard to say how large an "evolutionary" portfolio needs to be. With technology projects, research suggests that the resources involved may be 8-9 times larger than those directly budgeted. These higher costs lie in problem-solving, training, and adjustments by middle and frontline managers, not in the contracts required for technology specialists. So evolutionary investments may claim considerable resources, even if "out of pocket" expenditures are low.

**In an evolutionary environment, how should you organize and lead innovation?**

Evolutionary change is addressed by the Total Quality Management movement. In this movement, analysis proceeds bottom-up, and consensus-oriented teams look for continuous improvement. No single innovation is disruptive; however, a portfolio of small but rapidly implemented innovations moves the institution up the innovation curve.

For evolutionary innovation, leaders *make innovation a higher-priority, more active concern*. For that to happen, they must be willing to disturb their often self-satisfied organizations, making it clear that the status quo is inadequate. Leaders push innovation, allocating resources and incentives to make things happen. Successful innovations are moved from hunches into evidence-based analysis and then into disciplined implementation.

Senior leaders make the change process far more active than in stable environments. They create a culture tolerant of essential risks.

In evolutionary environments, however, senior leaders are typically still not driving individual projects, many of which can be handled at lower levels. Think, for example, about a police department that has already implemented a CompStat system. Once the
department has learned to use the system, it continues to require substantial analysis and innovation at middle and front-line levels. This takes substantial resources and support, but doesn't require that the senior leaders make all the adaptive decisions.

**Innovation in Revolutionary (Crisis-Driven) Environments**

**How do you know you're in a revolutionary environment?**

Take a look outside. Is your scene being changed dramatically by macro forces such as population shifts, economic boom or bust, tax revolts, looming unfunded costs, aging population and infrastructure, etc.? Truly revolutionary and transformative conditions create a "burning platform" with people demanding action. With sufficiently aggressive demands, incremental change will no longer be adequate.

Revolutionary changes, however, are large and risky. They are not band-aids. They don't involve crawling faster up an innovation curve so much as leaping from one curve to another. Anxieties come with the territory. Organizational life feels like musical chairs, with many afraid of losing their jobs once the music stops.

Compared to corporations, governments rarely undergo revolutionary transformation. In recent years, however, governments have been facing transformational pressures in defense, homeland security, and budgeting, and in changes driven by outsourcing and "shared services" (finance, HR, IT, etc.).

**In a revolutionary environment, how much should you invest in innovation?**

For crisis-induced transformation, initiatives are larger, taking perhaps 5-10 years and 20% of the institution's budget. Much revolutionary change, of course, takes place as an entrepreneurial start-up rather than a revolution within an existing organization. In either case, huge amounts of effort and attention are required.

**In a crisis driven environment, how should you organize and lead innovation?**

What's essential is up-front and sustained leadership to support those working on innovation. Revolutionary environments demand the "don't automate, obliterate" approach recommended by Michael Hammer and others in the reengineering movement of the 1990s. These threaten the status quo, so counter-attacks are common. Leaders must stay alert to the pressure cooker of change. They must keep the heat high enough to cook but release pressure as necessary to keep things from blowing up.

Several approaches are available for protecting change until it can protect itself:

- **R&D units.** These are incubators for ideas "outside the box." The work of DARPA, for example, was critical in developing TCP/IP, which subsequently ushered in the Internet and the web.

- **Entrepreneurial start-ups.** These also develop new approaches in dedicated environments. They attract like-minded revolutionaries. Their small size and
independence facilitate responsiveness. The governmental equivalent of the start-up is the new program, project or -- sometimes -- an entirely new agency.

- **Reengineering projects.** Traditional reengineering -- bringing transformational change to existing organizations -- is extremely difficult but may be required. Reengineering implements new workflows within and across existing procedures and units.

- **Outsourcing change.** In some cases transformation can be outsourced to take advantage of settings where the incentives for success are better.

With any of the above, a key is recognizing when problems are adaptive rather than pre-programmed and technical. To transform, learning must take place at many levels. This involves coping with failures. Top elected officials must insure that leadership for change is owned at the top. Department leaders, even those chosen by change-committed elected officials, famously become captive to bureaucracies wedded to tradition and existing procedures.

In policing, for example, consider CompStat as a revolutionary change. Compstat requires holding the chain of command accountable for evidence-based analysis and problem-solving. Serious implementations of these objectives are all-consuming and hugely impact police culture and operations.

**Innovation in Turbulent (Constant-Change) Environments**

**How do you know you're in a constant change environment?**

A turbulent world calls for disruptive change on a continuous basis. Survival requires transformation after transformation. Adaptability becomes at least as important as the execution of previously-learned routines.

Where do we find turbulent environments? Often we find them in the technology products sector. For high-tech firms, half of this year’s revenues are likely to come from products and services not even invented five years ago. Change at a similar pace will be required for the future. In such settings, innovation is clearly a strategic necessity. Innovation remains a priority even if other operations must be cut back.

Governments haven’t been designed for this kind of turbulence. Now, however, betting on stability has become less attractive. Climate change and other forces are pushing jobs to new places, severely challenging old models for service and taxation. Crises -- whether from terrorism, natural disaster, food and energy shortages, or job disruptions -- are occurring more frequently. While government turbulence is not at the level of high tech turbulence, governments clearly need a much greater capacity for adaptation.

**In a turbulent environment, how much should you invest in innovation?**

While the data for guidance here is scarce, it is clear that the effort to survive extended turbulence will be huge. Aggressive external intelligence and experimentation will be essential. Perhaps as much as 20% of the budget may be needed for innovation.
To stay relevant, governments need to remove barriers to information sharing and collaboration, create project teams, and/or decentralize for flexible collaboration with outsiders. The entire value chain must be changed. This means, for example, change throughout all health care, not just an individual hospital; all lifelong education, not just an individual school; and all international trade, not just an individual customs agency. Adaptive learning must engage entire communities of practice, not just individual practitioners and institutions.

In a turbulent environment, how should you organize and lead innovation?

As turbulence increases, more effort is required to keep up, with more of the good answers found farther away from the hierarchical channels of routine operations. Networked relationships become essential. New skills will be required for negotiation, contract management, coaching and the like. Public officials will need less focus on the control of public employees and more on the control of public values—equity, fairness, and access. Leaders will influence results predominately through networks rather than hierarchies.

In turbulent settings, governments can not solve problems on their own. Nor can they succeed by simply getting out of the way of the private sector. Unending challenges require agile and collaborative leadership. We need not only top-down "reengineering," but transformational change through massive collaboration.

What's different about the 21st Century?

Governmental change in the Information Age must become faster, broader, and deeper. Demands for change come from aging populations, complex global value chains, and increased interdependency. Tools for change include phenomenal growth in scientific knowledge. The net is becoming pervasive. Half the world owns a cell phone.

Digital technologies have catalyzed many recent changes -- positive and negative alike. They now support economic, social, and political interactions at a global scale. They offer new abilities to find knowledge and people. They make innovation necessary, and increasingly available via global dissemination as well as local invention.

The precise future for our networked world is unclear. Recent disruptive technologies such as autos, electricity and television took roughly 50 years to morph society's institutions. Digital internetworking, which was born with the Arpanet in the 1960s is not yet 50. Many think that its major impacts are yet to come.

As these impacts come, governments must take more frequent and more aggressive steps away from the status quo, modifying how they respond to meet their missions. To succeed, leaders must become more active, adaptive, and partner-oriented, developing new skills for new roles. Table 1 below summarizes what will be required.
Governments have long been built for stability. But the 21st century is demanding much greater adaptability to change. To stay relevant, governments must invest more in innovation, and leaders must be more active, adaptive, and partner-oriented in their quest for innovation.

1 This work was sponsored by IBM's Institute for Electronic Government. The authors would especially like to thank Teresa Cader, Martha Parker, and Amy Ramsay for their contributions.


---

Table 1: *Environmental Turbulence, Innovative Responses, and Required Leadership*

<table>
<thead>
<tr>
<th>TURBULENCE</th>
<th>RESPONSES: Steps from status quo</th>
<th>LEADERSHIP: Key characteristic Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turbulent</strong></td>
<td><strong>Large, frequent steps</strong></td>
<td><strong>Partner-oriented:</strong> Design and negotiate network for continued transformative learning</td>
</tr>
<tr>
<td>radical/ongoing</td>
<td>Ongoing broad search; networked implementation</td>
<td></td>
</tr>
<tr>
<td><strong>Revolutionary</strong></td>
<td><strong>Large, infrequent steps</strong></td>
<td><strong>Adaptive:</strong> Design direction and process for transformative learning; protect innovators</td>
</tr>
<tr>
<td>radical, one-time</td>
<td>Sporadic broad search; top-down protection</td>
<td></td>
</tr>
<tr>
<td><strong>Evolutionary</strong></td>
<td><strong>Small frequent steps</strong></td>
<td><strong>Active:</strong> Design processes for proactive search; decide exceptions</td>
</tr>
<tr>
<td>more rapid change</td>
<td>Extensive narrow search; bottom-up collaboration</td>
<td></td>
</tr>
<tr>
<td><strong>Stable</strong></td>
<td><strong>Small infrequent steps</strong></td>
<td><strong>Traditional:</strong> Design process, decide exceptions</td>
</tr>
<tr>
<td>slowest change</td>
<td>Limited narrow search; hierarchical implementation</td>
<td></td>
</tr>
</tbody>
</table>

---

* * * * *

* Tables adapted from [www.systemdynamics.org/conferences/1998/PROCEED/00053.PDF](http://www.systemdynamics.org/conferences/1998/PROCEED/00053.PDF) by Booz-Allen & Hamilton and the Open Systems Initiative. The authors would especially like to thank Theresa Cader, Martha Parker, and Amy Ramsay for their contributions.


12 See, among many works on TQM ideas, one of those of the the founder of the movement: W. Edwards Deming. Out of Crisis. MIT Press, 1986.

13 CompStat is a multilayered approach using Geographic Information Systems and available data to map crime patterns and analyze problems which might lead to crime reduction, quality of life improvement, and personnel and resource management; much emphasis is given to engaging local commanders in analyzing crime problems and holding them responsible for improving police performance.


There are several interesting historical accounts about the development of the Advanced Research Projects Agency NETwork funded by the U.S. Advanced Research Projects Agency (ARPA). The software was developed by Bolt, Beranek and Newman (BBN). For more history, see [http://www.isoc.org/internet/history/brief.shtml](http://www.isoc.org/internet/history/brief.shtml).