

Managing the Complicated vs. the Complex

By John M. Kamensky

Understanding the difference between a complicated problem and a complex one is important for today's leaders. They require different strategies and tools that are largely not interchangeable. Sometimes a problem will morph from one state to the other—either from complicated to complex, or vice versa—so you'll need to be ready to adapt your strategies and tools accordingly.

So what are the differences? A recent *Harvard Business Review* article by Gokce Sargut and Rita Gunther McGrath offers these distinctions:

"... the main difference between complicated and complex systems is that with the former, one can usually predict outcomes by knowing the starting conditions. In a complex system, the same starting conditions can produce different outcomes, depending on interactions of the elements in the system."

For example, building a highway is complicated, but managing urban traffic congestion is complex. Likewise, building a state-of-the-art air traffic control center is a complicated challenge in executing a project, while directing air traffic is complex, involving in-the-moment problem-solving.

The Complicated

Basically, a complicated problem is predictable and linear in nature. There is a clear beginning, middle, and end, with both variation and repetitiveness involved. With complicated problems, it is possible to identify and model the relationship between the parts, for example by using logic models. Furthermore, the relationships among the parts can be reduced to clear, predictable interactions. For example, building an aircraft engine is complicated, but if done right, the inputs and results are highly predictable and repeatable.

Those organizations, programs, and projects that tend to be complicated in nature typically rely on organization charts and chains of command, and the leaders hold formal



positions of authority. The kinds of management tools typically used for complicated organizations and projects include project management software, PERT flow charts, Lean Six Sigma, Activity-Based Costing, and logic models. Project management relies on documentation and specification. Success mainly depends on the execution of a plan or process.

The Complex

In contrast, a complex problem possesses sufficient intricacy that behavior cannot be predicted via linear relationships; such problems are also marked by a high degree of self-organizing behavior. This occurs in areas as diverse as recovery from Hurricane Katrina and the implementation of health care reform legislation.

Author Jeffrey O'Brien says: "'Complex' is a synonym for 'unpredictable'—or at least not easily predictable." In complex systems, he notes, "interactions are not linear, but emergent." He goes on to observe: "We can't untangle complex systems in our minds, and we can't intuit our way



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to a better-working world.” He says that computers can help, but “they must be augmented with perception, reasoning, cognition, and intuition.”

Sargut and McGrath say that there are three properties that determine the complexity of an environment: the number of potentially interacting elements, the interdependent connections among those elements, and the degree of diversity among those elements. Other academics, such as Dr. Goktug Morcol of Pennsylvania State University, say that complex issues cannot be reduced to merely “rules and tools.” He says they need to be seen as a set of activities and relationships that constitute a social system that reciprocates, adapts, and reproduces over time. The key is to understand how the players are integrated. Like O’Brien, Morcol says this is the phenomenon called “emergence.”

Emergence, Morcol says, is “a system that emerges from the relationships of policy actors” and that “the properties of the emergent system are more than a simple sum of the effects of their behaviors.” His analogy, using biology, is that life is an emergent phenomenon—it arises from the properties of individual molecules—but life is not able to be reduced to the individual molecules, it only exists when they are combined.

Morcol says that a set of analytics tools has evolved to measure and explain emergence in public administration systems. These include social network analyses, agent-based simulations, and qualitative case studies. Other strategies and tools for understanding or managing complex issues include risk management tools, market-based incentives, frontline empowerment, a focus on capabilities-based budgeting and planning (instead of the traditional

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“requirements-based” approach), using a balanced scorecard, an emphasis on transparency, real-time performance data; and PerformanceStat review meetings.

Dr. Louise Comfort of the University of Pittsburgh says that the key to fostering successful emergence and complex behaviors is to increase transparency—the ability of participants to share relevant information. Notably, this may be one of the supporting rationales for the Obama administration’s Open Government Initiative.

Coping with Complexity

Working in a complex environment that focuses on solving big challenges—such as traffic congestion or food safety—often means learning to live with a high degree of ambiguity and uncertainty. Sargut and McGrath have also identified three coping mechanisms that can provide leaders and managers with some sense of control amidst what they might consider chaos. These include improved forecasting methods, better risk mitigation strategies, and an increased ability to make tradeoffs with less-than-perfect information.

Improved forecasting methods. According to Sargut and McGrath, leaders and managers can take several steps to increase their predictive abilities in a complex environment:

- First, stop using forecasting tools that assume phenomena are truly independent or that averages or medians can be extrapolated to entire populations.
- Second, start using modeling tools that simulate the behavior of a system.
- Third, use three types of predictive information. Divide the data you use among three buckets: lagging data, current data, and leading data. Too much from any one bucket may create unwanted bias.

Better risk mitigation strategies. Managers need to undertake better risk management when facing a complex environment:

- Start by limiting or even eliminating the expectation of accurate predictions.
- Decouple parts of a larger system so they are not so interdependent and build in redundancy to reduce the chance of large-scale failures.
- Get comfortable with using storytelling and counterfactuals. Stories can give great insight because the storyteller’s reflections are not limited by available data.
- Look at the same data through different professional analytic lenses (e.g., the view of an economist vs. a finance analyst vs. a lawyer). Triangulation compensates for the limits of any single approach.

In sum, Sargut and McGrath believe that leaders who combine soft forms of analyses, such as storytelling, with hard quantitative analyses will find their combination to be an extremely powerful way of making sense of complex systems.

Making smarter trade-off decisions. Making trade-offs in complex systems is more problematic, but two strategies can help. First, ensure your management team provides diversity of thought. This may make it more difficult to reach decisions quickly, but it generally improves the quality of longer-term decisions. Second, be willing to invest in incremental, small investments in new projects or approaches. Sargut and McGrath say that this means: “you manage failure by containing costs, not by eliminating risks.”

Leading in the Midst of Complexity

Once you’ve figured out that your problem or issue is complex, the next challenge involves understanding how to lead in such an environment. Author Jeffrey O’Brien says: “Making the world work better is about untangling and managing complexity,” adding: “Change is easy. It happens by itself ... Progress, on the other hand ... is deliberate and difficult. But it’s not random.”

O’Brien offers a five-part approach for untangling a complex situation so leaders can begin addressing it: seeing, mapping, understanding, believing, and acting. He says we can master complex systems by following a discernible path:

Acquire the tools to see the bigger picture. Every phenomenon is a set of data points ready to be captured, says O’Brien. Developing the tools to collect the data, such as building a telescope to see the universe, is the first step.



Use visual maps. Having data doesn't create meaning in and of itself, especially if it is a large amount of data. You need to organize data to create meaning, such as with a map of the solar system. O'Brien notes: "However, to be useful, any map must present data selectively ... The power to map is the power to define ... [W]ithout context, data is just noise. To be useful, it must be organized. That's precisely what maps do. Maps tell us where we are." Good visualization tools allow you to step back when looking at complex problems, and they give you a chance to create clarity.

Create a model that provides understanding. A map may tell you where you are, but it doesn't tell you where you need to be going. To anticipate the future, you need to create a model or conceptual framework that can describe and anticipate complex behaviors, such as the laws governing astrophysics and rocket propulsion. The goal in private industry, for example, is to model customer behavior well enough to make predictions in real time and anticipate future behaviors.

Believe that the model will work. Having an optimistic belief—or creating a common vision—is about inspiring the confidence among stakeholders that progress is possible, as when the United States sent three astronauts to the moon and back. This often requires a bold leader willing to take risks.

Take decisive action. A leader needs to enable his or her organization's forward thinkers to design, build, adapt, optimize, and automate whatever complex system is being addressed. An example of this is the assembling of the Apollo 11 team of scientists and engineers. The key, notes O'Brien, is that "Complex systems aren't static. They react to our interventions."

Managing in a Complex Environment

Managing in a complex environment, according to Yves Morieux in another recent *Harvard Business Review* article, is more successful if the manager applies six rules that Morieux developed when studying successful corporations operating in a complex environment. These rules likely apply in the public sector as well.

What do successful organizations do? Morieux says that they adhere to the following six rules. Notably, these rules closely parallel some of the principles applied by the Clinton-Gore National Partnership for Reinventing Government in the 1990s through its Reinvention Labs.

1. Improve understanding of what coworkers do. People have to really understand each other's work and they can learn it only by observing and interacting. "The man-



ager's job is to make sure that such learning takes place. Without this shared understanding, people will blame problems on other people's lack of intelligence or skills, not on the sources and constraints of the organization."

- 2. Reinforce the people who are the integrators.** "Conflicts between front and back offices are often inherent. Back offices typically need to standardize processes and work, and front offices have to accommodate the needs of individual customers." The response should be to empower line individuals or groups to play that integrative role instead of creating coordination processes and layers. This is one way of differentiating the complicated part of a program from the complex.
- 3. Expand the amount of power available.** People with the least power tend to shoulder the burden of cooperation and get the least credit, so organizations should "... create new power bases, by giving individuals new responsibilities for issues that matter to others and to the firm's performance." At the federal level, Vice President Gore encouraged executives to give employees "permission slips" to act on their own. This is one approach to create a "flexible" organization.

4. **Increase the need for reciprocity.** “A good way to spur productive cooperation is to expand the responsibilities of integrators beyond activities over which they have direct control ... Removing resources is a good way to make people more dependent on, and more cooperative with, one another, because without such buffers, their actions have a greater impact on one another’s effectiveness. Eliminating internal monopolies ... increases the possibility for reciprocal action and impels cooperation ...” After all, “ ... the multiplication of corporate requirements ... is arguably a transfer up the hierarchy of certain goals and accountabilities that should remain nearer the bottom of the organization.”
5. **Make employees feel “the shadow of the future.”** “People are more likely to feel the shadow of the future if you bring the future closer.” For example, reduce the lead times on projects or assign managers to “down-stream” work (e.g., put product design engineers in charge of after-sales service of new products and make them responsible for the warranty budget).
6. **Hold accountable the uncooperative.** A company modified its reward system by deciding that once a unit told other units it had a problem, the units that failed to cooperate in solving the problem would be held responsible for the delay. In the federal government, President Clinton shifted the burden of proof for waivers from internally imposed administrative rules from the requestor to the granter of waivers.

Morieux concludes, noting: “Smart rules allow companies to manage complexity not by prescribing specific behaviors but by creating a context within which optimal behaviors occur



... companies following smart rules are highly efficient in terms of the resources they use, because problems are solved entirely by leveraging, through cooperation, the skills and ingenuity of employees.”

But smart rules are not enough. Leaders in today’s world first need to be able to discern whether the challenges they face involve complicated programs or initiatives, or whether they are more closely involved with a complex challenge. Because these two sets of challenges require different strategies and tools—and because they involve different governance and accountability approaches—it becomes vitally important for leaders to be reflective about the context of the challenges they face so they can choose wisely. ■