Reflections

The SoL Journal
on Knowledge, Learning, and Change

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society for SoL
organizational learning

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C. Sherry Immediato

Over the years, I've often been asked to give examples of learning organizations. Sometimes, people want to know if their favorite brand gets the SoL seal of approval. Other times, behind this request, I hear an additional question: Is it really possible to change our habits, practices, and culture? In this issue, we share three examples where the tools and methods associated with organizational learning disciplines have had a significant impact beyond their initial users.

Many organizations recognize breakdowns in collective intelligence and seek to address them; few face stakes as high as the U.S. Defense Intelligence Agency. In "Speaking Truth to Power," Adrian Wolfberg and Nancy Dixon show how they used a capacity-building initiative to research the nature of the communications issues the agency was up against. By looking systematically at left-hand column cases from a cohort of analysts, they were able not only to coach the participants individually to improve their ability to share knowledge, but also to develop a number of systemic interventions to shift the DIA's shared culture.

Is a school a learning organization by definition? Not necessarily. In this issue, Tracy Benson from the Waters Foundation shares her experience in developing schools as true learning systems. We first met in 1992 when a few inspired teachers and administrators decided that educating the next generation meant nurturing systems citizens. Now, thousands have been influenced by the evolution of these early initiatives. From my perspective, the commitment of educators to embody in their own work the principles and practices they want to share with their students has made all the difference. The question now is how to take this work to scale – a challenge that Tracy reflects on with us!

While Climate Interactive has always had lofty aspirations, its recent successes on the world stage offer a fabulous example of going to scale. Inspired to support government representatives in thinking systemically about their commitments to reducing greenhouse gas emissions, the Climate Interactive team produced sophisticated simulations to play out the consequences of such commitments. In the process, they realized that all of us would benefit from a big-picture view of the dynamics of climate change. Project managers Drew Jones and Elizabeth Swain have succeeded in creating an accurate and engaging free "sim" to educate an even wider audience about the impact of policy on climate goals and the choices before all of us.

Finally, the book excerpt from *Action Trumps Everything: Creating What You Want in an Uncertain World* features the work of my dear friend and colleague Charlie Kiefer and graduate school advisor Len Schlesinger. While their inspiration is academic research on the thinking and habits of entrepreneurs, they have grounded the conclusions in a usable approach. My big takeaway is the importance of making it affordable to fail. By intentionally framing low-risk experiments, you can either rapidly build positive momentum or quickly learn, refine, and try again.

With this issue, we complete 10 years of the publication of *Reflections*, and we're considering a variety of improvements as we go forward. As Janice Molloy assumes the role of managing editor, I'd like to welcome her and take this opportunity to again thank founding editor Ed Schein for his vision for this publication, as well as Karen Ayas and Nina Kruschwitz who followed him. We know from your notes that *Reflections* has made a difference in your work and organizations. Please let us know if you'd like to be part of the journal's future as an editorial advisor or contributor – we intend to continue the tradition of creating space for reflection.

With gratitude,

C. Sherry Immediato
Publisher

Speaking Truth to Power: Nurturing a Reflective Culture at the U.S. Defense Intelligence Agency
Adrian Wolfberg and Nancy M. Dixon

As information moves upward through management levels, how does an organization ensure that what reaches the top is accurate? The Defense Intelligence Agency struggled with this question following the 2001 terrorist attacks against the United States. As a result, the Agency identified building and communicating knowledge as a core objective in its 2003 strategic plan. In this article, Adrian "Zeke" Wolfberg, director of the DIA's newly established Knowledge Lab, tells the story of how the Lab set the stage for culture change at the Agency using approaches such as Chris Argyris's left-hand/right-hand column activity for recognizing counterproductive conversational habits.

Educating the Next Generation of Systems Thinkers: An Interview with Tracy Benson
Tracy Benson and Sherry Immediato

For 20 years, pockets of school systems across the U.S. have been gaining traction in preparing students to take on tomorrow's complex challenges. Educators in these districts have found that the tools of systems thinking and system dynamics give them a way to engage reluctant learners, boost academic achievement, and foster a generation of "systems citizens." The Waters Foundation, a private charitable foundation founded in 1957 by Jim and Faith Waters, has been a moving force behind this effort. Today, the organization's Systems Thinking in Schools (STIS) Project is applying lessons learned to scale up its efforts within local communities and around the world. In this interview with *Reflections* publisher Sherry Immediato, STIS program coordinator Tracy Benson shares the project's learning process, strategy for reaching new audiences, and plans for taking the work to scale.

Climate Interactive: "Sims" for Improving Our Thinking About Addressing Climate Change
Andrew Jones and Elizabeth Sawin

While real-time learning is the most durable feature of learning organizations, some issues require "practice fields" or simulations because the phenomena are complex, have long time lags, and have high-stakes consequences. In 2009, at the international meetings on climate change in Copenhagen, Climate Interactive provided negotiators with just this kind of a practice field to gauge the impact of different proposals. As people began to experiment with the simulations, it became clear that the audience of would-be users was enormous – well beyond the small pool of official country representatives. In this article, simulation architects Drew Jones and Elizabeth Sawin share the Climate Interactive story and their key learnings in creating a living microworld – freely available to anyone with internet access.

Action Trumps Everything: Act Your Way into a New Way of Thinking
Charles F. Kiefer and Leonard A. Schlesinger, with Paul B. Brown

The premise behind *Action Trumps Everything* is simple: Our most important learning is through experience. In this compelling discussion, Charlie Kiefer (Peter Senge's original creative partner and Innovation Associates founder) and Len Schlesinger (president of the entrepreneurially centered Babson College) use serial entrepreneurs as our teachers. In their book, they document that those who successfully launch multiple businesses are not huge risk takers or extraordinary visionaries; rather, successful entrepreneurs focus on the creative process. They experiment unceasingly. They act their way into a new way of thinking, creating in the face of uncertainty. The good news is, so can you – by mastering what the authors call "CreAction."

Speaking Truth to Power: Nurturing a Reflective Culture at the U.S. Defense Intelligence Agency

ADRIAN WOLFBERG AND NANCY M. DIXON

As information moves upward through management levels, how does an organization ensure that what reaches the top is accurate? The Defense Intelligence Agency struggled with this question following the 2001 terrorist attacks against the United States. As a result, the Agency identified building and communicating knowledge as a core objective in its 2003 strategic plan. In this article, Adrian "Zeke" Wolfberg, director of the DIA's newly established Knowledge Lab, tells the story of how the Lab set the stage for culture change at the Agency using approaches such as Chris Argyris's left-hand/right-hand column activity for recognizing counterproductive conversational habits.

Introduction

Adrian Wolfberg

Nancy M. Dixon

Following the 2001 terrorist attacks against the World Trade Center and the Pentagon, the intelligence community in Washington, D.C., was bombarded with criticisms, the most serious of which focused on the apparent lack of coordination and communication among its various agencies. In 2003, the Defense Intelligence Agency (DIA) undertook its first institutional attempt to address the communication issue by including it in its strategic plan. As a long-time Agency analyst and recent graduate of the National War College, I was recruited to lead this effort.

In approaching this challenge, I saw both a broader need and a fresh opportunity for the Agency. From my perspective, people working at the DIA would have to learn how to change their behavior before they could become more collaborative. This would require nothing less than a culture shift for the organization, a shift away from its control-based environment toward becoming a knowledge-based one.

Creation of the DIA Knowledge Lab

No one at the DIA disagreed that the organization needed to be more collaborative. Still off balance from the harsh criticism directed at it from all sides following the terrorist attacks, the Agency's director and senior leaders initiated and actively supported my plan to improve the DIA's execution of its primary task – ensuring the security of the United States.

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I understood that effecting such a change was going to be an exceedingly difficult job and that signs of progress would be slow to surface. The DIA had no model for designing a collaborative culture. It would have to learn new ways of thinking and behaving. It would have to learn how to learn, a challenge that was included as an objective in our post-9/11 strategic plan. These shifts would contribute to the overarching objective of creating a knowledge-based culture.

The DIA had no model for designing a collaboration culture.

What would change rather dramatically was the process that we would use to get there. I knew that no level of technology could fix the Agency's lack of collaboration. The problem was far too complex and deeply rooted, and it was characterized by a combination of systemic issues: our lack of familiarity with the principles and behaviors associated with working as a team; our counter-collaborative nature, evident in our existing organizational structure; and the individual nature of intelligence work that kept us isolated in our respective silos of responsibility.

In 2004, the senior leadership of the DIA sanctioned a research project whose purpose was to identify organizations that had succeeded in changing their behavior to the extent that their cultures were also changed. We wanted to understand how those organizations learned and what specific factors enabled them to do so.

Based on our extensive research, we identified two critical success factors for our own culture-change initiative. The first was that the initiative would have to be carried out with a small team of employees whose only job for a specified period of time (three months in our case) would be to learn how to bring about change. The second condition was that the team would report directly to the headquarters level. Without this direct reporting line to the DIA's top command, there was little chance that the initiative would be taken seriously enough to eventually introduce its principles and learning to the broader organization.

We also identified a third critical success factor, although it was not apparent or suggested in our research. We believed that in order to optimize our chances of success, we would have to avoid the "zero-sum factor." The zero-sum factor is present to some extent in all systems, but it is particularly engrained in government agencies. When something new is introduced in one part of a system, it necessarily "disturbs" and impacts some other part of that system. Further, this disturbance and impact is often negative or perceived as negative. The result is a zero-sum game, in which gain or positive change in one entity is achieved at the expense of another.

To minimize the likelihood of a zero-sum outcome for this project, we determined that the change team would have no physical home, that it would require little or no funding, and that no additional management or oversight personnel would be assigned to it. I would assume the management oversight role as part of my job. The third critical success factor, then, was that at no time during the course of the project would we request additional resources of any kind from any part of the Agency.

Once we identified the parameters within which the project would operate, we created a small organizational capability that would be known as the "DIA Knowledge Lab." Its purpose was not to *train* DIA employees. Its purpose was to create a psychologically safe space that allowed employees to discover their own solutions to the most fundamental social capital challenges, leading to a new kind of organizational knowledge that could be used to modify the Agency's uncollaborative behavior.

The Knowledge Lab in Action

In early 2005, the DIA director formally established the Knowledge Lab. As the Lab's founder, I decided that its initial effort would focus on the Agency's knowledge-flow problem, which had been revealed during an earlier initiative in which I was also involved. That initiative was an in-depth review of the DIA's intelligence analysis performance in 2003 during the planning for Operation IRAQI FREEDOM. One of the key findings of that review was the great difficulty the Agency had in moving accurate knowledge up through the chain of command. Analysts were very sensitive to the number of reviews that their assessments had to pass through before they were accepted, and many found themselves adjusting their assessments to increase their chances of successfully navigating the many gates that were part of the DIA's standard process.

> **One of the key findings was the great difficulty the Agency had in moving accurate knowledge up through the chain of command.**

Communication Dynamics

Modifying deeply engrained behaviors such as the arduous process of moving knowledge up through the chain of command was a daunting task, and I knew I would need additional help. Nancy Dixon, an independent researcher and communication expert, was recommended to me by academic contacts. We discussed the project and its objectives and decided to work together. Based on the behavioral challenges I identified, Nancy developed an intervention technique designed to engage Agency employees in real-life experiences in which they would be able to clearly see what was happening to work-related knowledge – and why – as it made its way up the chain of command. We called this technique "Critical Discourse."

Critical Discourse was based on the work of Chris Argyris. Argyris found that employees at all organizational levels learn relatively quickly how they are *expected* to act and interact in certain situations, and they do so because the behaviors are engrained in the culture of the organization. It's just how things are. Eventually, these patterns of behavior become a natural part of an employee's day-to-day interactions, thus reinforcing the culture that spawned them.

When employees encountered potentially embarrassing or confrontational situations, they instinctively took actions to save face, regain control, and maximize the impact of their particular point of view.

In the course of our project at the DIA, we saw the same set of behaviors that Argyris predicted. When employees encountered potentially embarrassing or confrontational situations, they instinctively took actions to save face, regain control, and maximize the impact of their particular point of view. And they did so by using the same conversational tactics that Argyris identified in his research:

- Asserting their own views without revealing the reasoning behind them
- Discouraging inquiry into their own reasoning
- Minimizing or avoiding any inquiry into another person's point of view
- Asking leading questions to convince others that their own point of view is the correct one

- Responding and acting on untested assumptions – usually negative – about the motives behind the other person's actions

When Nancy first conducted her Critical Discourse seminars at the DIA in 2005, participation was on a volunteer basis. The result was that in each seminar we had groups of people who didn't know each other and who hadn't worked together. The significance of this is that, when they returned to their respective positions, they had little if any opportunity to put into practice the techniques they had learned. After conducting the second and third seminars, we realized that we had a flawed design and that to accurately assess the true benefits of the intervention technique, we would have to test it with an intact team in which participants would be fully committed to the process from beginning to end.

Nancy and I went back to the drawing board and designed a framework in which Critical Discourse would be the key mechanism for learning new behavior that would interrupt and change the dysfunctional internal dynamics that were currently in play. We called this framework "Fresh Look."

Fresh Look: Leveraging the Opportunity for Change

While Nancy and I were refining the Critical Discourse intervention that we would use as the main vehicle for shifting the organization's counterproductive behavior, the Agency was simultaneously experimenting with other ways to improve interpersonal and interagency collaboration. Prior to 9/11, the Agency relied almost exclusively on hardware and software technology as the way of bringing people and information together. After 9/11, however, decision makers looked to policy in addition to technology as a means of encouraging greater collaboration. But policy and technology were not enough.

Because I strongly believe that human factors impact every situation, I was encouraged when I learned that a few key Agency leaders were about to test a new approach for improving collaboration that would involve employees directly. The experiment focused on creating an environment in which employees' workspaces would be physically closer together than was the DIA's accepted standard. By 2005, the DIA had completed a renovation of the entire seventh floor in our main building, known as Building 6000, with the intent to let form follow function.

The renovated space had curved interior walls made of see-through glass instead of the original wood and steel walls, many large meeting spaces, and no individual cubicles. It was a dramatic change, and DIA's senior leadership wanted to kick off the completed renovation with a collaboration-related initiative. This was just the kind of opportunity I wanted for testing the Critical Discourse intervention that Nancy Dixon and I had been working on. The Agency's senior leaders agreed to sponsor a pilot project, which was to become known as "Fresh Look."

The Fresh Look Team

The Fresh Look team consisted of 12 employees who were "contributed" by their supervisors. Most were analysts, with the exception of one visualization technologist and one collection specialist. None of them knew each other. There were two criteria for being selected. One was that each person on the team needed to have sufficient expertise to contribute to resolving the issue. The other was that, in the eyes of their supervisors, these individuals were not rigid in their thinking and were open to new possibilities.

I personally presented the Fresh Look project to each supervisor who would be contributing a team member. I described it as a way to empower employees, bring out the best in them, and shed new light on old problems. Both supervisors and participants came to the project with the expectation that each team member's unique knowledge would be tapped and that members would have the opportunity to explore new approaches, technology, and techniques that would benefit their home offices when they returned at the end of the pilot.

The Fresh Look team worked on a real-world intelligence issue, the "content" of the experiment. At the same time, the group participated in three Critical Discourse workshops and received individual coaching on interpersonal skills, the "process" component of the experiment. The Fresh Look group, at first a collection of strangers, soon became an intact team.

Nevertheless, at the beginning, no matter what we as experiment facilitators said or promised or safeguarded, the team maintained behavioral patterns typical of a hierarchical, siloed organization. We wanted the team to be free from imposed structure, to let knowledge creation drive structure, but instead we found that the embedded regime of structure was driving knowledge creation. At some point, we realized that the team was in danger of failing to create new ground and decided that we should apply the Critical Discourse technique more deeply. By doing so, we could

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help team members communicate and share information based on knowledge that they would discover during the process and not be trapped in the structure we were trying to overhaul. In a real way, Critical Discourse saved Fresh Look.

> **At the beginning, the team maintained behavioral patterns typical of a hierarchical, siloed organization.**

The Fresh Look team participated in Critical Discourse seminars as an ongoing part of their team program. Each seminar required team members to write up cases about communication problems they experienced prior to or during their participation in Fresh Look. They highlighted interactions that were preventing them and their coworkers from sharing knowledge that was critical for the team to succeed.
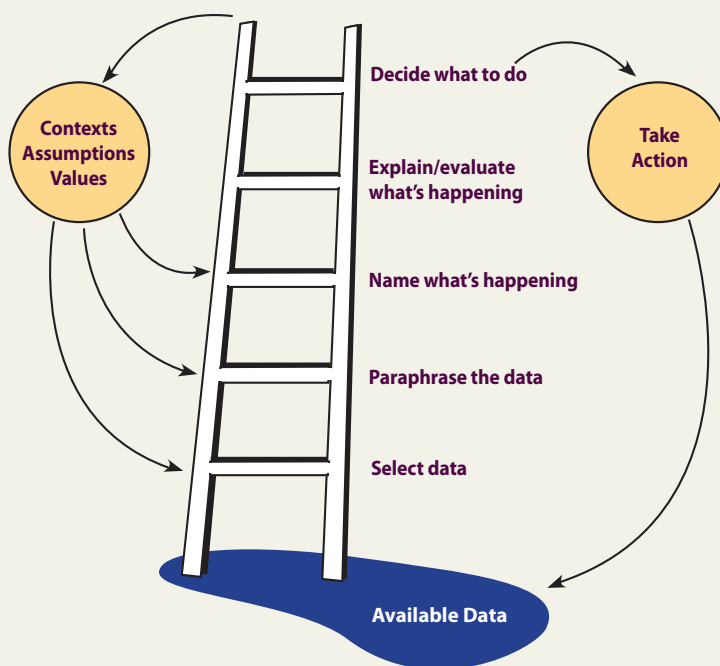
The process of gaining awareness of one's own negative patterns can be frustrating and embarrassing, an experience that some team members

would have preferred not to participate in. Through analysis of their cases, however, they began to see the counterproductive impact of their actions on others. They learned to recognize damaging conversational tactics and began to point them out to each other. As the Fresh Look

Ladder of Inference

The "ladder of inference," another tool pioneered by business theorist Chris Argyris, illustrates how and why we leap to knee-jerk conclusions in our encounters with others – and gives guidance for climbing back down. In a nutshell, from our observations, we unconsciously and instantaneously select data, based on our cultural norms, background, and other factors. We then add meaning, make assumptions, and draw conclusions – often incomplete or erroneous – about why other people are behaving the way they are. Finally, we take action. From our interpretations of the data, our actions make perfect sense to us, but they may not correspond to the other person's "reality." When two emotionally charged perspectives conflict, the situation can easily spin out of control.

Contexts
Assumptions
Values

Decide what to do

Explain/evaluate
what's happening

Name what's happening

Paraphrase the data

Select data

Take
Action

Available Data

Reprinted with permission from "Beyond Beer Diplomacy: Climbing Down the Ladder of Inference" by Janice Molloy (Leverage Points Blog, July 30, 2009).

team members practiced their new skills, they became more effective at listening carefully and critically to what others said. They were better able to understand what the speaker really meant by his or her words, giving each other a chance to speculate and question without the fear of retribution   or ridicule for asking what they might have otherwise thought was a "dumb question."

> **The process of gaining awareness of one's own negative patterns can be frustrating and embarrassing.**

To help team members become aware of specific factors that prevented them from engaging in constructive, candid conversation, Nancy and I instructed them to recreate a difficult or unsettling workplace exchange, preferably one that took place with a coworker from their respective home offices. The group used Chris Argyris's left-hand/right-hand column activity. In this activity, each participant divides a piece of paper into two columns. In the right-hand column, they transcribe a dialogue as it occurred. In the left-hand column, they document what they were thinking but not saying during that conversation. They then compare the left-hand column (their internal dialogue) with the right-hand column (their external dialogue) and look for counterproductive or self-defeating patterns.

Roger's Case

Below is the reconstructed case of a Fresh Look team member, whom we will call Roger. This case is similar to the more than 150 cases that Nancy collected at DIA over a three-year period. Roger's case includes a stage-setting introduction, the left-hand/right-hand column dialogue, and a brief retrospective reflection.

1. My Case: The Review Meeting

I walked into the room, ready to defend a year's worth of analysis that had led to some significant findings – findings I hoped would get a fair hearing and maybe even lead to a change in government policy. I am an intelligence analyst who has been studying the prospects for peace between two longtime rival nations for well over a year. In my written report, I argued that the leader of one of the two countries had changed his mind and was ready to make compromises on a contentious issue on which his nation had historically held a deeply entrenched position. I argued that this new willingness had come about because of changes this leader had experienced at a deep personal level that would lead to a reinterpretation of recent political events. I concluded that this leader was seeing the world differently than he had a year ago and that he would make different choices now.

The review process meant a face-to-face meeting during which I was to defend my findings. When I entered the room, I saw three very senior analysts seated behind a long table, with a single chair for me facing what looked like a tribunal. A copy of my report lay closed in front of each reviewer, who had supposedly read it – I say supposedly, because I'm skeptical that reviewers always read every word of every report.

Senior analysts are supposed to make sure that what moved through their part of the quality process was accurate and complete. I was there to get the report past this step in the process so that it could reach the policymakers who had only a slim window of opportunity to bring about a historic peace. But being junior to this imposing body, I wanted to accomplish this without damage to my own career. I had heard enough stories to know that reviewers had the potential to stall my career at DIA if I angered them and, as much as I wanted this report to make a difference, I did not want it at the cost of my own future.

After a few pleasantries, one of the senior reviewers, August, who had himself followed these two rival countries over a period of 20 years and certainly thought he knew more about the situation than this junior analyst sitting in front of him, raised the first concern he had with my findings. Here's our exchange:

2. Roger's Left-Hand/Right-Hand Columns

What I thought or felt but didn't say	What August and I said
1. There's more than enough evidence to make these assertions, not to mention the current course of action by the leadership.	*August:* I don't think you have enough evidence to go on to make such bold statements in a product. There's not going to be a peace agreement tomorrow.
2. What August doesn't understand is that the personal side of this conflict has changed – but he's not open to that idea.	*Me:* I know there won't be an agreement tomorrow. I'm just saying this is a unique situation given the leadership calculations on both sides, and if talks last long enough, the sides might be able to achieve peace through attrition.
3. Here we go again. Why can't he be proactive instead of automatically assuming things will go south?	*August:* I've seen this before. We should put a time cap on how long we think these talks will last. Besides, the conflict usually heats up around this time of year anyway.
4. At this point I don't know what to say. He's not going to see it my way, and if I argue more I might make myself look bad. I've got to pick my battles.	*Me:* All I'm saying is that I think the leadership calculations may have changed. Talks wouldn't have even lasted this long if their intentions weren't different now.
5. Now I've compromised my argument by saying "may have," even though the evidence is clear, and he's getting irritated. I'd better back off.	*August:* Well, we saw the same leadership in the same situation two years ago shock the world, so don't be so quick to take their word for it.
6. He must think I'm an amateur.	*Me:* Well, I didn't think I was just taking their word for it, but maybe I can try to soften the language in the product so it sounds less certain.

3. Roger's Reflection

Coming out of this meeting, I felt disappointed in myself that I had not summed up the evidence in a more articulate manner. And I was afraid that my attempts to not argue with a highly respected senior analyst had actually backfired on me, and that the other senior analysts now perceived me as lacking the ability to present my own position. I walked away thinking, "There's no way to win: if you push, you insult them; if you don't, they think you're incompetent!"

We discussed my case during the Critical Discourse workshop, and my peers were able to help me see my conversation with August in a way I had not thought about it before.

Reflection: *My seniors define their role as "error detectors."*

New Learning: The senior analysts in this review meeting felt accountable for the quality of the information being packaged, and primarily saw their responsibility as identifying and pointing out weaknesses and discrepancies in the reports I produced. August stated his criticisms as facts rather than as issues that were open to discussion and interpretation. For example, he told me, "You don't have enough evidence to go on to make such bold statements in this product." In criticizing me in this way, August saw himself as schooling me, teaching me caution about what I took for evidence. August saw himself as having been successful because he was able to detect and point out errors in my assessment.

Reflection: *I might be as closed-minded as my seniors are.*

New Learning: I jumped to the conclusion that August was closed-minded when I interpreted his criticism as sounding to me as if he did not want to be challenged. My thinking was, "What he doesn't understand is that the personal side of this conflict has changed, but he's not open to that idea." I came to this perception about August based on the tone of his remark. That perception resonated with my preexisting view that "it is difficult to challenge the assumptions of the old guard who are set in their ways." After thinking about the incident, I realized that I was closed to the idea that August might not be closed.

Reflection: *I sometimes back down unnecessarily.*

New Learning: When I heard August's strongly stated criticisms, I responded with tentative words such as "they might be able" and "I'm just saying." As August continued to make critical comments during the review meeting, I essentially gave up and decided to cut my losses, thinking, "He's getting irritated. I'd better back off." My hesitancy and reluctance to push my view came from the assumption that August was closed to new thinking and could not be influenced, no matter how persuasive the argument. I chose to pick my battles.

Reflection: *My seniors are sometimes condescending.*

New Learning: I realized that August was offended when I persisted because he made nasty comments about my competence in order to win his point. For example, August said, "Don't be so quick to take their word for it." That comment (1) implied that I did not do a thorough job of analysis but rather took the short cut of "taking their word for it" and (2) chided me for doing so as though it were a proven fact. August was putting me down but in a way that maintained a facade of civility. It refocused the review session from the content of the report to a personal attack, and I responded to the personal attack rather than focusing on the content issues.

Reflection: *Historical experiences*

New Learning: August used his past experience to validate his opinions, saying, "I've seen this before" and "We saw the same leadership in the same situation two years ago." I interpreted these statements as August not wanting to be questioned. I realize now that I did not give August a chance to explain how he used his past experience to come

to his conclusion. He might have been right or wrong, but I really prevented myself from discovering his logic.

Reflection: *We were not asking questions of each other.*

New Learning: Neither August nor I asked questions. Although we stated our opinions and positions, we did not ask why we held those positions. For example, when August said, "Don't be so quick to take their word for it," I should have tried to find out what he had seen in the report that indicated I was "taking their word for it." There might have been some important evidence from which I could have learned, but I didn't ask the question and I interpreted the "putdown" only as, "He must think I'm an amateur," reacting to the slam at my competence, not the potential substance of August's critique. Nor did August, when he claimed that I "did not have enough evidence to make such bold statements," ask me what support I might have had for any specific "bold statement" in the report, which might have led him to construct a more informed opinion.

My Perspective as Fresh Team Day-to-Day Sponsor

Seeing cases such as Roger's, I quickly began to understand the critical role that language and conversation play in everything we do. Earlier in my career as an analyst, I had taken conversation for granted, placing a higher value on thinking and writing. Now my understanding had flip-flopped. I began to see knowledge creation as a social phenomenon with language as the medium of exchange. If the language was "broken," then knowledge and learning would also be broken. Recognizing this has led me to a new understanding of collaboration. It is the successful use and correct interpretation of words and conversation that allow two or more minds to share and organize information using a common language. Common language leads us to deeper understanding and the discovery of new knowledge.

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The conversation that Roger described illustrates a problem that I call "speaking truth to power." One of the ironies revealed in his case is that because of my own day-to-day choice of language, I also often leave much knowledge undiscovered. One way to minimize this is to view conversation as a "harvesting" of other minds, something from which we can reap the benefits of a better understanding of what is meant and of a more accurate engagement in conversation.

> **I began to see knowledge creation as a social phenomenon with language as the medium of exchange.**

What We Have Learned So Far

Through the Fresh Look project, with the use of Critical Discourse, the Defense Intelligence Agency has embarked on a path of "learning how to learn" and has laid the foundation for our shift toward a culture of improvement. Chief among these learnings was an understanding of the social nature of knowledge. We found that attending to the "people piece" was a critical success factor for creating a learning organization at DIA. We could no longer take for granted the most basic elements of conversation – teamwork, trust, a common vocabulary, shared goals and assumptions. Nor could we assume that we always had a psychologically safe space in which to operate. If we are to realize and capitalize on the full potential of cognitively diverse teams, each of these elements of conversation needs to be identified and explicitly addressed.
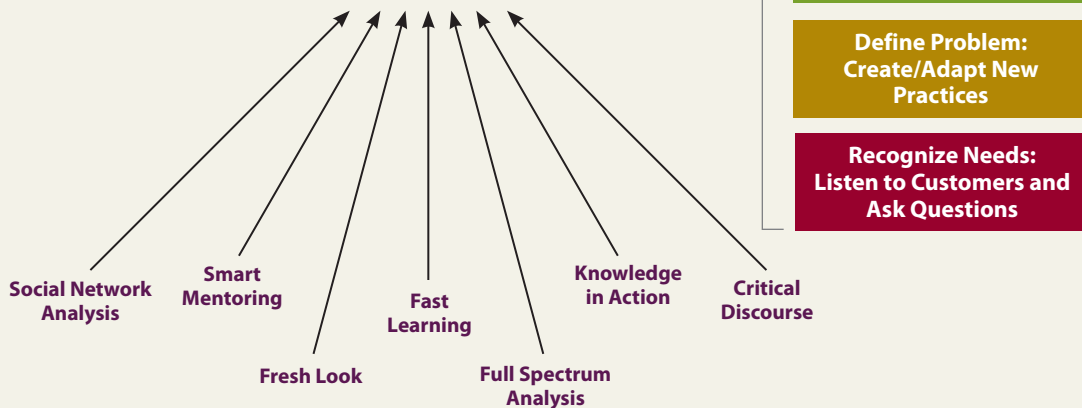
While testing targeted Knowledge Lab intervention techniques, we frequently discovered and built upon unanticipated side benefits. For example, we discovered that, when introduced at the beginning of a project, the use of Critical Discourse combined with team goal-setting sessions accelerated and augmented the team-building process.

Knowledge Lab at Work

The Knowledge Lab gathers new practices from different sectors – government, academia, and business – and adapts them to their own needs.

Some of the Knowledge Lab's Practices

- Social Network Analysis
- Smart Mentoring
- Fresh Look
- Fast Learning
- Full Spectrum Analysis
- Knowledge in Action
- Critical Discourse

Raise Awareness

Test and Assess through Pilot Projects

Define Problem: Create/Adapt New Practices

Recognize Needs: Listen to Customers and Ask Questions

Applying Critical Discourse as a routine part of our team meetings kept us aware that we all had room for improvement and reminded us to think about our left-hand columns as we were conversing. Because we were all learning this new skill at the same time, we also had the psychologically safe space that we needed to reflect openly and candidly on our own and others' need for improvement.

Over the past six years, we have also incorporated and tailored Fresh Look's approach to resolving existing and ongoing complex issues. We refer to these ongoing efforts as "Full Spectrum Analysis," which the DIA considers fundamental in how we go about addressing conflicts and emerging challenges.

We launched the Knowledge Lab in 2005 as a means of engaging in purposeful targeted innovation. At that time, few people in the Agency understood the relevance of our work to the intelligence mission. As the Knowledge Lab's capabilities have matured, the internal demand for our services has risen. People within the DIA now recognize that the intelligence mission requires gathering and analyzing two kinds of knowledge:

traditional knowledge about threats to the security of the country and subjective knowledge about how we operate among ourselves. Employees now value the process of discovering how DIA actually goes about doing its job and appreciate that the Fresh Look effort has provided them with a set of entirely new tools. Gradually, the DIA is coming to understand that what we can know about the world is only as good as what we know about ourselves.

Shaping the Future

The process of learning to be a knowledge-based culture has been about our willingness to probe and uncover the complexity of the DIA's internal organizational life. It has also been about creating a new, shared language through which we can more successfully communicate complex issues. If we were to have any chance of becoming a knowledge-based culture, we had to create an internal demand and appreciation for reflection, particularly self-reflection. It is our ability to reflect and our continued willingness to work at improving that ability that has set us on a path toward becoming a collaborative, knowledge-based organization.

Our ability to reflect and our continued willingness to work at improving that ability has set us on a path toward becoming a collaborative, knowledge-based organization.

The Knowledge Lab project, which started out by addressing the needs of a small group of frontline employees, has steadily progressed through levels of management to the highest levels of leadership at the DIA. As our new way of learning has worked its way up through the organization, the complexity of the issues that challenge us has also grown.

Successfully resolving these increasingly difficult matters of security is critical to the future of the DIA and to our reputation in the intelligence community. The way in which we choose to go about resolving them, however, is important not only to increasing our traditional knowledge base but to maintaining and improving our organizational health.

While our effort to transform the DIA culture has had a positive impact, it has come at a cost. Sharing and dispersing what we have learned through our long and bumpy journey has been the most difficult part of this project to date, and I believe that our greatest challenge going forward will be in institutionalizing what we have learned.

The journey continues. ∎

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ABOUT THE AUTHORS

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Educating the Next Generation of Systems Thinkers: An Interview with Tracy Benson

TRACY BENSON AND C. SHERRY IMMEDIATO

For 20 years, pockets of school systems across the U.S. have been gaining traction in preparing students to take on tomorrow's complex challenges. Educators in these districts have found that the tools of systems thinking and system dynamics give them a way to engage reluctant learners, boost academic achievement, and foster a generation of "systems citizens." The Waters Foundation, a private charitable foundation founded in 1957 by Jim and Faith Waters, has been a moving force behind this effort. Today, the organization's Systems Thinking in Schools (STIS) Project is applying lessons learned to scale up its efforts within local communities and around the world. In this interview with *Reflections* **publisher Sherry Immediato, STIS program coordinator Tracy Benson shares the project's learning process, strategy for reaching new audiences, and plans for taking the work to scale.**

Tracy Benson

C. Sherry Immediato

Sherry Immediato: When the Systems Thinking in Schools Project began more than 20 years ago, what was the master plan? What expectations and timetable did the Waters Foundation have for outcomes?

Tracy Benson: The journey of this work differs from most educational grants, in that the process has been free flowing, organic, and entrepreneurial. At first, we didn't know what we didn't know. Despite this underdeveloped plan, we had full support from the Waters Foundation for a long time to learn, develop, evolve, and see what we could make happen. People including Mary Scheetz, Frank Draper, and Joan Yates were instrumental in developing and nurturing the application in schools of Peter Senge's *The Fifth Discipline* and Jay Forrester and Gordon Brown's work on system dynamics.

The Waters Foundation grant money provided us with time for learning and collaboration. In pre-K–12, teachers don't generally have time for learning. So having the funding to adjust school schedules to free up teachers for allocated learning time was important.

We recently created a timeline of the development of the Waters Foundation's systems thinking program. Looking back, we can identify different phases. The Exploration phase began in 1988 when Dr. Gordon Brown, professor emeritus and retired Dean of Engineering from MIT, walked onto the campus of Orange Grove Middle School in Tucson, Arizona. Gordon was convinced that systems thinking and system dynamics could change the way students and teachers thought about learning. Following Gordon's lead, the

Waters Foundation launched its Systems Thinking and Dynamic Modeling Partnerships in 1989.

Science teachers Frank Draper and Mark Swanson began using computer simulations so their students could better understand the systems they were studying. As teachers in other subjects saw the potential of systems thinking and system dynamics, the number and variety of systems lessons grew. Later, the first Waters Foundation grant focused on the Catalina Foothills School District with two goals: to build teachers' capacity for enhancing student thinking and to provide the staff with tools to improve the school's organization and culture.

> **This Experimentation phase involved figuring out whether systems thinking fit in all subject areas, age groups, and school settings.**

During the second phase, the Waters Foundation supported programs in 14 sites across the country that involved teachers, administrators, and students. Representatives from the sites met periodically, visited each other's schools, and shared resources to learn together. This Experimentation phase involved figuring out whether systems thinking fit in all subject areas, age groups, and school settings, including rural, urban, suburban, charter, private, public, and so on. The teams tested different ways of bringing a systems thinking approach about in K–12 education.

The next phase was commonly referred to as the Development and Dissemination phase. In 2004, the 14 sites were consolidated into five project centers responsible for professional development and outreach in their local areas. Several years later, the Systems Thinking in Schools Project was founded with initiatives in three main geographical locations: Tucson, AZ; Portland, OR; and St. Louis,

MO. During this time, the work of the STIS Project also spread to international sites such as Singapore, Holland, China, and India.

Learning Process

Immediato: If you didn't have a master plan, what kind of learning process did you follow? Many organizations have this question, given that most of the issues that people care about are likely to take a relatively organic path. How do you know where the path is?

Benson: Jim Waters uses a term that we've embraced called "successive approximation," where we try something that we think is our best course of action and then assess the results. We collect a lot of information. We have indicators of success, and we match current reality to our desired outcomes and look for leverage to minimize the gap between the two. As we progress, we continue to identify gaps, and in that way we try to improve. We consider "successive approximation" one of our "habits of systems thinking" (Figure 1).

We are open to learning from failures. Jim and Faith Waters celebrate our failures as much as our successes. It has been helpful to have funders and supporters who accept that kind of learning process. For instance, we learned that when an administrator alone becomes enthusiastic about this work and then goes back to a school or district and says, "This is what we are going to do," that top-down approach hasn't been too successful. The bottom-up approach, where a teacher tries to introduce the tools without a supportive leader, also has not gained traction in spreading the work. So today we really operate from the middle, with both top-down and bottom-up approaches coming together.

Immediato: In addition to helping others build capacity in systems thinking, have you explicitly applied the disciplines of organizational learning – systems thinking, team learning, shared vision, personal mastery, and mental models – in your own work?

We operate from the middle, with both top-down and bottom-up approaches coming together.

Benson: We use a whole cadre of tools, from the five disciplines to the three-legged stool of core learning capabilities to what we call the "back screen and front screen." We've also used specific systems thinking and system dynamics tools in looking at, for instance, the feedback loops that we see in building aspiration among adults and students. We ask ourselves, if we are after some reinforcing growth, what we can do to help fuel that dynamic?

We often use stocks and flows. We have think-tank meetings where we look at the kind of accumulation we want to see grow, the things we want to see drain, and the flows that are going to help make that process happen.

People often ask, "How can you help us get the results you've achieved?" We know through experience that you achieve results by providing a foundation of a common language, the habits of systems thinking as a framework, visual tools, and practical experience, and you connect these to people's prior learning.

When we do a four- or five-day workshop for teachers, we ask participants to initially not even think about how they might introduce this work in their classrooms. The goal is for them to develop a system thinking capacity. We gradually develop the connections, saying, "Now what might this look like in your classroom?" At the same time, we introduce the idea that this approach is not just an instructional strategy; it's a way to look at your school, your community, and the culture of your learning environment.

We try to build this multiple capacity simultaneously and give ongoing support. Mainly, we create collaborative structures where people meet on a regular basis. They share their experiences, successes, and challenges in working with students and adults. We create a reflective, transparent, trusting, structured environment. The sites that have been able to sustain the effort have used a combination of these approaches.

The majority of our efforts in the early years were at the school level, but we're beginning to bring

FIGURE 1 **Habits of a Systems Thinker**
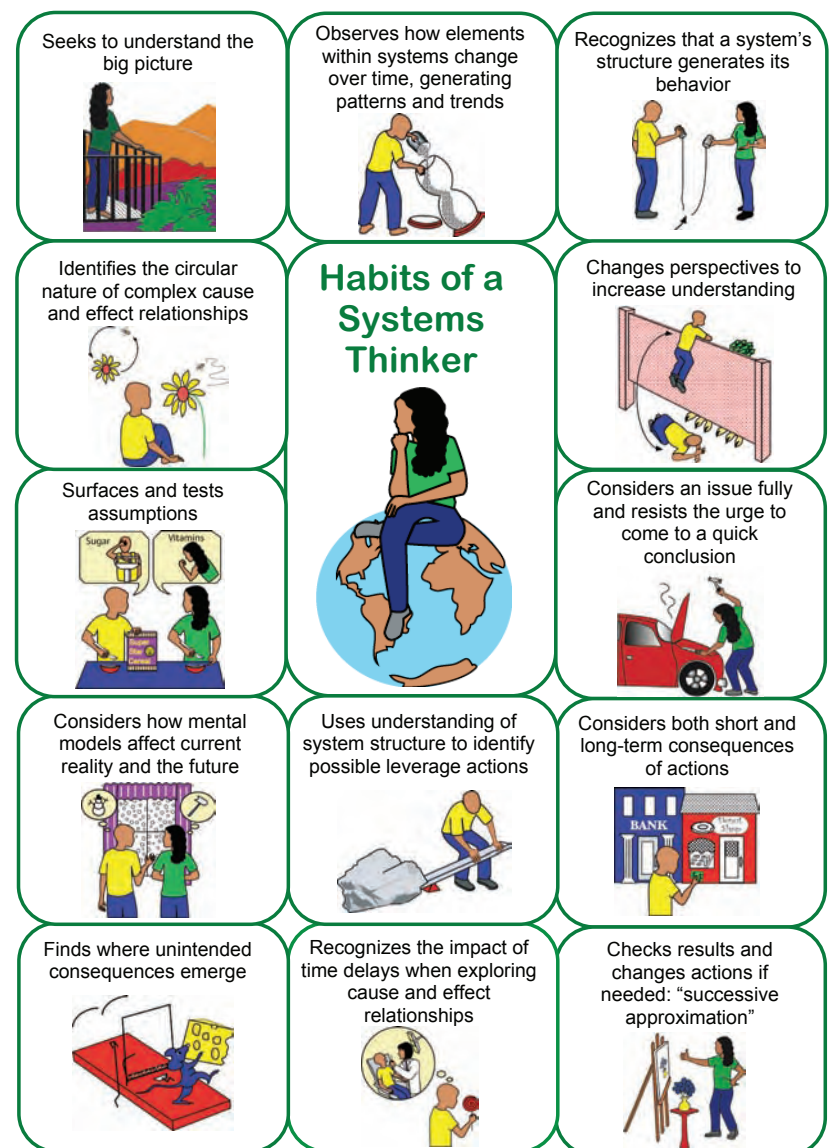
The Waters Foundation has identified 13 habits that systems thinkers use to develop awareness of a situation; increase understanding; and plan and take effective action.

people together at the district level. For example, Mary Scheetz, former principal and current St. Louis STIS coordinator, is now a district-level assistant superintendent. In her district, she has been able to fully integrate systems thinking habits and strategies into instructional practice, district and school leadership, and youth empowerment. When diverse communities of practice or professional learning communities come together with a common language, common concepts, and dynamic set of tools, people from multiple sites are better able to learn together and talk about their challenges, often saying, "I have that same issue. How can I help you and how can you help me?"

Spreading the Word

Immediato: In 2005, the Office of the Pima County School Superintendent formally embraced the Systems Thinking in Schools Project as a communitywide initiative. How have you spread interest throughout the schools in the Greater Tucson area?

Benson: Our main marketing strategies have been word of mouth, high-quality professional development, and follow-up support. We talk about the infection model in terms of spreading interest in this work. How do we develop a "healthy germ," so to speak, that is rich and worthwhile, and has energy for creating positive "infection"? As we increase

Fostering understanding of dynamic systems in a complex world
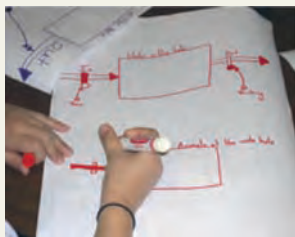
Providing visual tools and learning opportunities that support educational standards and 21st century skills

Systems Thinking in Schools: A Waters Foundation Project

Systems thinking is a worldview, a perspective of seeing and understanding systems as wholes rather than as collections of parts. A whole is a web of interconnections that creates emerging patterns.

Mission
To increase the capacity of educators to deliver student academic and lifetime benefits through the effective application of systems thinking concepts, habits, and tools in classroom instruction and school improvement.

Systems Thinking
What is systems thinking? Some have described and defined systems thinking within specific contexts such as business, education, and government. Others have focused on the use of specific processes and tools as defining elements of systems thinking. One common thread in defining systems thinking seems to be a focus on a holistic, "big picture" view of how systems function, seeing beyond the details of individual trees to the forest as a whole.

Benefits of a Systems Thinking Learning Environment
In a student-centered systems thinking classroom, teachers are the facilitators of thinking and learning. Children are immersed in practice fields rich in relevant problem-solving, interdisciplinary connections, thought-provoking dialogue, and opportunities for in-depth analysis and synthesis. The Waters Foundation's Systems Thinking in Schools Project is focused on supporting teachers in their ability to create such desirable learning environments for children.

the number of people with exposure to these ideas, and those people share and exchange that desirable germ with others, then maybe infection will ensue. We look at the structures we need to have in place to increase contact and impact.

Immediato: What draws the people who are being "infected"?

Benson: Within our own community right now, people are responding to the outcomes we've accomplished through systems thinking. Yesterday I met with 14 high school principals. In the past, we've had difficulty gaining entrée to high schools.

But these principals were eager to learn, not because they have extra time or money but because they are facing significant challenges as school leaders.
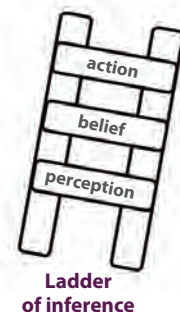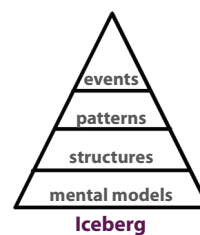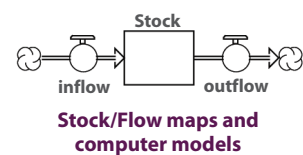
Many of their schools are in danger of underperformance, and the principals are struggling to find ways to transform their schools' cultures and support students in achieving academic success. These principals can't work any harder than they already are. So the benefits of thinking systemically about programs and practices that may help them get desirable results give them a reason for engaging in this kind of learning.

A systems thinking learning environment is motivating and engaging for even the most reluctant learner. Teachers report that the visual nature of the systems thinking tools enables students to organize and express their thinking. The tools help motivate those children who tend to be reluctant to fully engage in learning activities.

Standards-based education and systems thinking approaches can complement one another. The benefits of a systems thinking approach are not limited, though, to the achievement of specific, curricular learning standards. In a keynote address delivered to educators in July 2002, Dr. Barry Richmond, long-time friend, mentor, and colleague of those involved with systems thinking in schools, coined the term "systems citizen." Systems citizens view themselves as members of a global community. They strive to understand the complexities of today's worldly systems and have the capability to face problems with an informed capacity to make a positive difference.

Schools across the United States and throughout the world are actively pursuing the advantages of integrating systems thinking in classrooms and schools. The benefits of such approaches are both immediate to student learning and long-lasting as a systems citizenry is developed. Building a systems thinking capacity in learners of all ages is a worthy investment in the future as educators prepare the young people of today so they are ready to solve the problems of tomorrow.

Examples of Systems Thinking Tools

Behavior-over-time graphs

Stock/Flow maps and computer models

Iceberg
- events
- patterns
- structures
- mental models

Ladder of inference
- action
- belief
- perception

Causal loops

Connection circles

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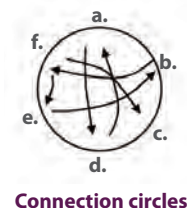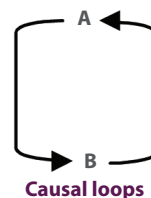
We're seeing the same thing with classroom teachers. They ask, "How do I engage unmotivated students who are not being successful?" One way to increase engagement is by tapping into the relevance and purposefulness of what students want and expect in the classroom. When students can see connections between seemingly different systems and represent those similarities with the visual tools of systems thinking, interdisciplinary learning and relevance emerge. For example,

When students can see connections between seemingly different systems, interdisciplinary learning and relevance emerge.

when reading about power struggles and violence in the book *The Outsiders,* students investigated the concept of escalation. They then applied the "Escalation" archetype to their study of World War II in social studies. The students helped their teachers see the connection and were excited to facilitate this cross-curricular learning. As kids become more engaged, their efficacy and level of achievement grow, creating this wonderful reinforcing loop in the classroom.

Results and Learnings

Immediato: What results are you getting from this work and what are you learning about those results?

Benson: The clearest results are benefits to children. A number of educators have shown that systems thinking increases student engagement, the level of conversation in the classroom, students' ability to read and bring meaning to the texts that they read, and their ability to communicate their understanding of learning across the curriculum.

Our demonstration sites tend to do well on standardized tests, but we don't necessarily attribute test success to exposure to systems thinking, because student achievement is much more com-

plex. But we also see students transferring their learning in school to relevant issues outside of school. For example, an eighth-grade student named Jacob, who was challenged with kidney disease, used the "Shifting the Burden" archetype to advocate his case for a kidney transplant to his medical team. His loops tell a compelling story of the debilitating side effects of dialysis and the long-term ramifications of this symptomatic fix. Jacob not only successfully received his transplant, but is now serving as a youth spokesperson and advocate for those with juvenile kidney disease.

We have found that the benefits to children and adults are far more significant, profound, and long-lasting than we even imagined. We hear from young adults who learned and used systems thinking language, tools, and thinking skills in their middle school studies about the impact that this learning has had on them as adults, as people in the workplace, and as parents. Our team senses that we are making a difference in a lot of different places. When he was in eighth grade, a student named Andy explained how deeply listening to others' perspectives was important because, "Actually, you may even learn that you could be wrong in your thinking." Andy later took this important lesson to his government work involving U.S.–Chinese negotiations (see this and other examples in …*that School in Tucson, www.clexchange.org*).

We've also learned something completely unexpected: that kindergarteners and first graders can draw loops and use some of the systems thinking tools to clarify and communicate their thinking. This behavior defies Piaget's stages of development to a degree.

Immediato: So you're finding that the tipping point for the spread of this work isn't because of the money; it's because of the outcomes?

Benson: Yes. Because of the growth and sustainability of the work in places like Tucson, our program has become more self-funding. Outside funding has actually decreased over time. Although our

resources have gone down, interest in our work is going up.

Scaling Up

Immediato: The Waters Foundation has tried to scale up before, with mixed results. How is the past informing you as you move forward?

Benson: The scaling-up issue is an exciting challenge. How does one do that, especially when it's not a program or a well-defined innovation but rather the ways people think, talk, and relate to one another and make decisions? So scaling up that kind of innovation makes for a complex conversation and complex planning.

We've learned that it is hard to talk people into believing and investing time in learning without seeing. So we have much better examples than in the past. We have best practice models, lessons, and applications within a wide variety of contexts. Our bank of student work in terms of loops, stocks and flows, icebergs, and the ladder of inference has really grown. There is something for everyone, so people who are curious can say, "*Now* that makes sense to me. How can I get involved?"

It's taken a long time, but we've significantly improved our ability to teach and develop capacity in adults and kids in a school setting. Previously, most of the theories and tools around systems thinking were written for a select audience of users and practitioners, mainly adults in business or large organizations. We have done a pretty good job of figuring out how to build capacity with people who have no clue about what this approach involves.

> **Kindergarteners and first graders can use systems thinking tools to clarify and communicate their thinking.**

Now is the perfect time for this work to spread more broadly. We are ready to help people build their capacity and figure out what works best in the context of where they live and work. Our approach isn't a set recipe for application, but rather a flexible framework that effectively addresses the needs of all kinds of students and school settings. We have a process and a learning sequence that

help build that foundation of skill and capability. People can learn from the schools that have overcome huge challenges using this approach.

We're also branching outside of school boundaries with a wider reach into the community. If you look at the system of education and you ignore the early childhood years, then you're really off base. We've been working with the United Way of Tucson and Southern Arizona on a grant that is funded by First Things First, Arizona's early childhood initiative. Seven partner agencies provide early childhood education services, and the goal is to create an early childhood professional development and education system. As part of this grant to improve teacher education and early childhood services and learning environments for young children in Southern Arizona, United Way leaders Naomi Karp and LaVonne Douville invited Sheri Marlin and me, on behalf of the Waters Foundation, to be systems thinking consultants.

The grant has enabled the United Way to develop seven communities of practice around improving early childhood teacher education, including the community college, which provides instruction to aspiring early childhood educators; the University of Arizona, which is developing an early childhood education master's program; childcare centers; and a professional association that focuses on high-quality early childhood professional development. Each community of practice is led by a coordinator who is a locally recognized expert in early childhood teacher education.

The seven communities of practice have brought together teachers, community leaders, researchers, and policymakers and have provided capacity-building workshops in three areas: systems thinking, coaching, and DAP (Developmentally Appropriate Practices). The idea was that if the coordinators of these communities of practice had skills in these three areas, they would be able to see the interdependencies among the wide variety of service providers and entities that support early childhood education. By doing so, it would become possible to start solving deeply entrenched problems that continue to depress the quality of early childhood teacher education, lead to poor-quality early learning environments, and negatively impact young children's outcomes.

© THINKSTOCK

One outcome of this process is that representatives from our local community college's early education faculty are in conversation with the University of Arizona's College of Education faculty. They are building a formal pathway for early childhood education graduates from the community college to be shepherded into an early childhood education bachelor's degree program at the university. These programs have never collaborated this intentionally before. So that initiative is exciting.

We're now in year two of this effort, and it's beginning to get lots of attention. A group in the Phoenix area is intrigued by the model, so they visited Tucson to learn about it. We're going to North Carolina in May to share the model at the Smart Start Conference.

In this second year, we're working not just with the community of practice coordinators but also with practitioners and taking systems thinking deeper into the organizations. As these initiatives grow and feed into one another, our goal is to have an impact on the larger community. And as the children affected by these programs grow and become leaders, they will make Tucson a better place to live. That's one of my passions.

> **As the children affected by these programs become leaders, they will make Tucson a better place to live.**

Immediato: What do you think the Waters Foundation's role will be going forward with the early childhood initiative?

Benson: We're everything from capacity builders to thought partners, and we are contributing to the visioning process, too. As the group as a whole moves forward and develops new plans, we've become kind of a dream team. We push one another, in a nice way. So formally, we're service providers. But we've become colleagues in the effort to bring value to programs that serve young children.

Camp Snowball

Immediato: This summer, the Waters Foundation is running a program called "Camp Snowball." Would you say something about how you see this experiment as flowing from the work that you have been doing and where you hope it will lead?

Benson: Camp Snowball will be a five-day learning experience for school- and community-based teams from around the world. Students and adults will have the opportunity to learn side by side. One of those five days will be a learning festival that will showcase best practices and innovative examples of systems thinking and education for sustainability work.

The showcased work will be not only from Tucson and other Waters Foundation sites but also from SoL Education Partnership schools and programs from other countries. People will sign up for learning cohorts. If they are brand new to this work, they will probably go into the systems thinking level one cohort. If they have had training in those skills already, they will go into level two. We also have a system dynamics computer modeling strand, an education for sustainability strand, and a leadership strand.

People who try to learn and implement this work by themselves really struggle. Learning with and from others works best. So we're encouraging

people to attend in teams. Team members will separate based on what strand is best for each individual, but they will have opportunities throughout the week to share what they learn with each other.

As the teams scale things up in their own communities, the little rivulets will turn into rivers, and the flow will be hard to stop.

Toward the end, teams will create an implementation plan for their own context, based on best practices. They will leave with tools and resources that they can easily use back home to engage others, including activities, slide decks, videos, and instructional modules. We're designing follow-up structures, such as a web-based platform, regional face-to-face gatherings, conference calls, and access to an online learning community. Our

goal is that as the teams scale things up in their own communities, the little rivulets will turn into rivers, and the flow will be hard to stop.

Our vision is to build a critical mass that has the capacity to shape the future of schools and communities, using the skills that they're bringing to the conference plus additional skills and capabilities that they'll learn there. The ultimate vision is – and these are my words – to transform education and make schools, in all different settings, much better places for kids to be and to learn how to navigate an unknown future.

I'm in schools almost every single day, and I see how much work we have to do. I believe we have to rethink how we're "doing" school. Fortunately, we have some amazing examples of what it can be. So we want to grow the best practices that we've seen develop and evolve – and systems thinking is a key part of this approach. ∎

ABOUT THE AUTHORS

Tracy Benson, Ed.D., is the program coordinator of the Waters Foundation's Systems Thinking in Schools Project in Tucson, Arizona. She conducts training and coaching sessions, consults with schools and school districts, and facilitates system thinking professional learning experiences for educators at the local, regional, national, and international levels. *t.benson@waterfoundation.org*

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Climate Interactive:
"Sims" for Improving Our Thinking About Addressing Climate Change

ANDREW JONES AND ELIZABETH SAWIN

While real-time learning is the most durable feature of learning organizations, some issues require "practice fields" or simulations because the phenomena are complex, have long time lags, and have high-stakes consequences. In 2009, at the international meetings on climate change in Copenhagen, Climate Interactive provided negotiators with just this kind of a practice field to gauge the impact of different proposals. As people began to experiment with the simulations, it became clear that the audience of would-be users was enormous – well beyond the small pool of official country representatives. In this article, simulation architects Drew Jones and Elizabeth Sawin share the Climate Interactive story and their key learnings in creating a living microworld – freely available to anyone with internet access.

Andrew Jones

Elizabeth Sawin

How strong does a UN climate agreement need to be to protect the world's climate? How could the world transform its energy systems toward security and resilience? Given the urgent challenges of climate change, questions like these hold the keys to our future, and policymakers, businesses, and global citizens need ways to find timely and accurate answers. Climate Interactive is addressing this need by bringing together a community of modelers, scientists, writers, designers, corporations, and foundations to create, share, and use credible models, accessible simulations, and other media to improve the way leaders and citizens around the world think about climate and energy.

We're building "sims" (short for simulations) that are easy for climate analysts, communicators, and leaders to use and that provide immediate feedback, so users can see the results of different scenarios on atmospheric carbon levels and temperature. Our purpose is to get these sims and insights into the world as accessible products that can be tweaked, enhanced, translated, distributed, and used to create change around the world.

This work has changed policy, investments, and actions. One of our sims, C-ROADS, is being used directly in the United Nations' ongoing climate negotiations. The United States Department of State has used the C-ROADS simulator to understand the climate impacts of various country-level proposals and to share that understanding with other parties to the UN. Deputy Special Envoy Jonathan Pershing presented the C-ROADS analysis at UN meetings in Bonn and Copenhagen. And a team at Tsinghua University in Beijing has translated the sim into Chinese for use by government leaders.

Why Sims?

Responding to climate change requires all of us to think carefully about the future within a broad, complex, and interdependent context. One of the things we know about climate is that the economic, atmospheric, and social systems that drive it defy most human intuition. And because the worst-case outcomes of climate change are so disastrous, we need ways to understand the impacts of possible courses of action without waiting for those impacts to arrive. Simulation models are very good at helping with each of these challenges.

Don't such climate simulations already exist? Not really, at least not simple, quick simulations that use the best available science and serve as practical additions to real-time policy discussions. Most existing energy and climate models are extremely complex, take too long to run, and can't be used by non-scientists.

Our approach is to do two things:
1. Create Simulations. With project partners, including Ventana Systems and MIT, we are building a set of simulators with engaging interfaces and compelling output displays. These sims allow learners to deepen their understanding of climate dynamics step by step, from the most rudimentary "carbon accounting" to progressively more complex explorations of strategic options for reducing emissions and their likely effects. C-ROADS – an

acronym for Climate Rapid Overview and Decision Support – is our full-scale, system dynamics simulation. Designed for decision makers, it is easily used by non-modelers and runs in less than 0.1 seconds on a laptop (Figure 1).

2. Enable a Broader Community to Create, Extend, and Share Simulations. Climate Interactive has built a platform to enable simulation use and sharing. We gather, document, post, and promote various climate simulations, videos, online learning tools, and role-playing policy exercises for use by other modelers and leaders.

Taking these steps means that our work can be adapted for use by corporate leaders, green investors, UN negotiators, or high school science classes in multiple languages and levels of scientific complexity. We hope to tap into the creativity and collective intelligence of many people around the world to improve our simulation interfaces and extend their impact through videos, podcasts, essays, and other media.

A Common Platform

One vision of our work is that all of the parties to climate decision making will be able to work together based on a shared understanding of how the physical parts of the climate system function. More than enough areas of disagreement and diverging interests exist on issues like historical responsibility for climate change and the fairest ways to share the burden of reducing emissions, so it is unfortunate when different ways of seeing the physics of the climate lead to controversy and misunderstanding as well. While we would never claim that C-ROADS is a perfect reflection of the real climate system (we'd argue that no model could be), the model is based on accepted climate science, and the user can easily change all of the inputs. If negotiating parties were to use a tool like C-ROADS, we believe that they would at least start from a common understanding of the key physical dynamics and limits of the climate. We hope that with people in a few key countries and many analysts who support UN negotiating teams experimenting with C-ROADS, the simulation can

C-ROADS

C-ROADS is a policymaker-oriented climate simulation that:
- Uses MIT-based technology
- Is designed for decision makers, not just scientists
- Runs in less than 0.1 seconds
- Is scientifically reviewed (committee chaired by Dr. Bob Watson, former head of the IPCC; committee members included Klaus Hasselmann and Stephen Schneider)
- Reproduces the response properties of state-of-the-art three-dimensional climate models very well
- Is flexible and adaptable to current policy questions
- Makes all equations available for use and open to scrutiny

help make climate negotiations more productive and more effective over the long run.

Climate Scoreboard

Just as decision makers and negotiators need ways to assess the proposals toward creating a global climate treaty, advocacy groups and citizens around the world also want to know how close current proposals bring the world to climate goals. With this need in mind, our team tracks the various proposals under consideration in the climate treaty process and reports our estimate of how close current proposals come to realizing climate goals via the Climate Scoreboard (Figure 2). We scan UNFCCC submissions and news sources from around the world to collect a list of what we call "current proposals" – possible scenarios for reducing greenhouse gas emissions by UNFCCC parties. We share our compilation and calculate the expected long-term impacts (in terms of GHG concentration, temperature increase, and sea-level rise) if those proposals were to be fully implemented. We then share the results via our webpage, Twitter, and partnerships with NGOs. We have also created an embeddable online widget that people can incorporate in their blogs and websites and that automatically updates when proposals in the treaty process change.

We believe that widely sharing the Climate Scoreboard – along with the C-ROADS simulator – can contribute to progress in climate negotiations. Without something like the Scoreboard to provide a reality check, negotiations too easily focus on the political challenge of dividing up the climate change effort, without really asking if the proposed effort is large enough in the first place.

What We've Learned

Our successes with C-ROADS and the Climate Scoreboard have grown out of the past 10–15 years of work by Sustainability Institute, MIT/Sloan, the Society for Organizational Learning, and Ventana Systems to use system dynamics modeling and systems thinking to create a more sustainable world. These efforts have had an impact in commodity systems, urban growth, agriculture, forestry,

FIGURE 1 **C-ROADS Control Panel**
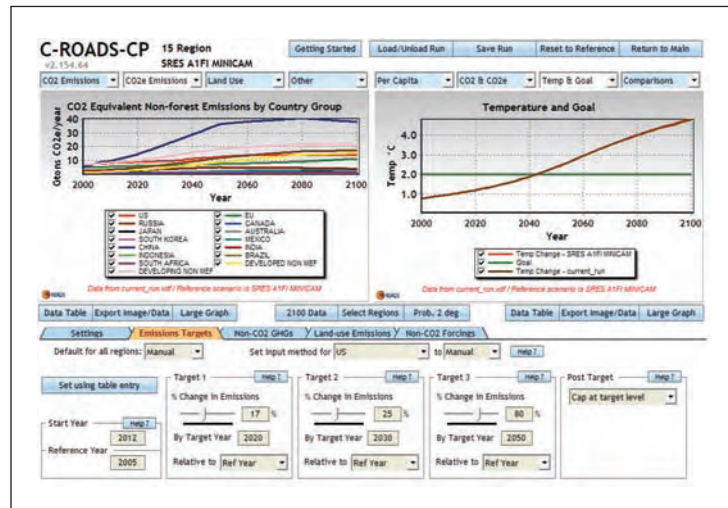
The C-ROADS simulation is designed to help climate analysts improve their understanding of how various proposals will impact climate outcomes. Model users determine the path of net greenhouse gas (GHG) emissions at the country or regional level through 2100. The model calculates the path of atmospheric CO_2 and other GHG concentrations, global mean surface temperature, and sea level rise resulting from these emissions.

FIGURE 2 **Climate Scoreboard**

In the Climate Scoreboard, the yellow "business-as-usual" line represents the estimated global temperature increase in 2100 if greenhouse gas emissions are not reduced. The blue "proposals" line represents the estimated global temperature increase in 2100 if the current proposals were enacted. The shaded blue curve shows the uncertainty in the climate system's response to emissions. C-ROADS is used to calculate the position of the blue line. When proposals change, we update our analysis, and the position of the blue shifts. The green "goals" line represents the goal of limiting the temperature increase to 1.5°–2.0°C

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diabetes, energy, and manufacturing. Several key lessons have emerged from our more recent climate and energy work, lessons that shed light on what it takes to ensure that simulations and systems diagrams lead to results, not just interesting insights.

Lesson #1: *Iterate your simulation rapidly to meet user needs.*

We've learned to think like a software company, not a scientist. Even though we *are* scientists, we have found great value in testing our simulations with real decision makers, hearing their disappointments, and quickly improving the sim. These beta testers would point out the many gaps between our simulation and how the *real* conversation was being framed, measured, and captured (we heard "We don't think about it that way" and "That doesn't help us" hundreds of times). We would then stay up late adjusting our sim for a presentation the next day or week. Given that Tom Fiddaman started this model in 1993 as his Ph.D. thesis, we likely have created approximately 500 versions of the simulation over the years.

Lesson #2: *Convert your simulation into multiple forms to reach diverse audiences.*

In past projects, we aimed toward a single model

with a single interface that we used to engage diverse users, learners, and leaders. At least partly due to the diverse nature of our intended audience (e.g., government, business, nongovernmental organizations, citizens, youth), through open source–style sharing, we and our partners have adapted C-ROADS into approximately a dozen forms, including:

- A technical version created in modeling software for our own analysis
- A freestanding version for climate analysts
- A simplified online version for anyone in the world via Forio Business Simulation – "C-Learn"
- A shareable widget (the "Climate Scoreboard") and three other online tools that deliver core insights
- A simulation embedded in two "touch table" science museum exhibits
- An iPhone/iPad version – "Climate Pathways"
- A "Mock UN" role-playing game now led by 10 facilitators in the U.S. and Europe – "World Climate"

We have been surprised by the need for and power of such liberal adaptation of the model – people truly require a sim that is customized to the questions they have and the way they learn. Negotiators and citizens may care about the same

question – do the current proposals add up to enough emissions reductions? – but they need the information in quite different forms.

Lesson #3: *Focus on delivering insights that improve mental models.*

We've also learned that there are times when we need to think like a scientist, not a software company. For the past decade, our team has kept a list of the top 10 or so misunderstandings of climate dynamics held by decision makers and citizens. For example, as John Sterman and Linda Booth Sweeney proved in a study, most people incorrectly believe that stabilizing emissions of CO_2 would lead to a stabilization of the climate (in fact, it would merely cause the climate to deteriorate less rapidly). Thus, we have designed all our simulations with the goal of helping users improve their mental models or understanding of how the system behaves over time.

Notice how this lesson contrasts with our Lesson #1: Here, we are advocating that change agents who use simulations not just respond to user demands, but actively guide the conversation in the direction of insights that will lead to actions that improve system performance. We have found that when we tilt the simulation too far toward ensuring that users have certain insights, decision makers see it as being merely an academic exercise. When

we too closely mirror decision makers' current thinking, we don't leave enough room for discovery of new policy options. Balancing Lessons #1 and #3 and navigating the trade-offs between them continues to be an area of learning and exploration for our team, and is more of an art than a science.

Lesson #4: *Make sure the simulation evolves in step with developments in the real world.*

C-ROADS will likely never become a finished product. As climate scientists improve our understanding of how the atmosphere, oceans, and biosphere interact and how greenhouse gas emissions influence the planet, we continually improve and add to the equations in the simulation. And, as the conversation within the international climate treaty dialogue changes, our team finds itself adding new policy scenarios and building new model structure to explore opportunities for transforming the energy system toward renewable energy.

C-ROADS and the Climate Scorecard have proven to be effective tools in aiding policymakers and building shared understanding of the magnitude of the challenges we face and the relative effectiveness of different proposed interventions. By sharing them more widely, we hope to help all of us – from ordinary citizens to climate treaty negotiators – understand and accomplish the actions that can help stabilize the climate system. ∎

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Act Your Way into a New Way of Thinking

CHARLES F. KIEFER AND LEONARD A. SCHLESINGER, WITH PAUL B. BROWN

The premise behind *Action Trumps Everything* is simple: Our most important learning is through experience. In this compelling discussion, Charlie Kiefer (Peter Senge's original creative partner and Innovation Associates founder) and Len Schlesinger (president of the entrepreneurially centered Babson College) use serial entrepreneurs as our teachers. In their book, they document that those who successfully launch multiple businesses are not huge risk takers or extraordinary visionaries; rather, successful entrepreneurs focus on the creative process. They experiment unceasingly. They act their way into a new way of thinking, creating in the face of uncertainty. The good news is, so can you – by mastering what the authors call "CreAction."
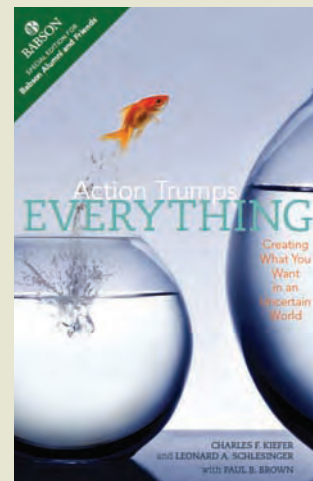
Charles Kiefer

Leonard Schlesinger

Paul Brown

Today's economic situation – record-high unemployment, sluggish consumer spending, and the fact that most of us feel like we are in a rut, working progressively harder just to stay in place – makes many of us uncomfortable, anxious, and often disheartened. We think, "Things are not going to return to normal. It's going to be like this forever." And yet, history is filled with countless examples of dramatic shifts away from situations that were very disheartening: The American colonists took on the British Empire and won; we moved from an agrarian society to an industrial one; and we would be hard pressed to find anyone today who routinely commutes by horse, so we know that specific events and circumstances do change.

Adapted from *Action Trumps Everything: Creating What You Want in an Uncertain World* (Innovation Associates, 2010)

By Charles F. Kiefer and Leonard A. Schlesinger, with Paul B. Brown

www.actiontrumpseverything.com

What does not change, however, is the uncertainty that is causing all these unusual conditions. And uncertainty will not only remain but will also increase.

Entrepreneurs, we have discovered, are the best example we have of people who deal well in conditions of uncertainty. That isn't surprising. There are few things more uncertain than starting a new venture.

The Difference Between CreAction and the Kind of Reasoning We Are Used To: Prediction

What we have found is that entrepreneurs employ two kinds of reasoning – Prediction and what we have dubbed CreAction – in dealing with the unknown.

Before we go any further, we want to stress that neither way of thinking is superior to the other. And in fact you need both if you are going to be as successful as possible. But while both approaches are valuable, most of us are less familiar with CreAction, and thus by default we lapse into overuse of Prediction. That's a key reason we want to stop here and look at both in detail.

Prediction Reasoning

Prediction is the kind of thinking we have all been trained to do since kindergarten. It is a pattern of thinking and acting based on the assumption that the future is going to be similar to the present and the immediate past. It involves inferring and extrapolating from what has come before and acting based on what you think the future is going to be like.

Treating an uncertain world as if it were predictable only gets you into trouble.

When we use Prediction in business (or business classes) or just in life in general, we begin with a goal in mind – we want to create a new and better widget or a unique service or a new neighborhood recreation center – with a given set of means. ("Here are the resources we have – the money, people, time, etc. – available to us to build that widget, create that service, or make that new building happen.") Then with both the goal and the resources identified, we set off to identify the optimal – fastest, cheapest, most efficient, etc. – path to achieving our objective. The make-vs.-buy decision in production, or choosing the target with the highest potential return in marketing, or creating a portfolio with the lowest risk in finance,

or even hiring the best person to run the local rec center are all examples of problems that call for the use of Prediction. And, as we've said, this is the stuff we are familiar with: deductive logic, rules of thumb, and mathematical models.

If you can't predict the future – and it seems increasingly you can't – action trumps thinking.

CreAction

CreAction, however, does not necessarily begin with a specific goal. (You know you want to leave your job and go off on your own, but you have absolutely no idea what company you want to start.) It is driven by desire and action, and is based on the means, or resources, we have at hand.

Entrepreneurs are the best example we have of people who deal well in conditions of uncertainty.

When you go about making a list of those resources, it looks like this:

- Who am I?
- What do I know?
- What resources do I have at hand?
- Who do I know that I can collaborate or share the risk with?

CreAction allows you to take smart steps into an unknowable future in order to discover and/or invent that future as you go. In other words, you are going to create the world going forward (hence the name). Your goals emerge over time from your insights and aspirations, from the people that you partner with, and through what you learn by taking action.

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Let's look at the way people who employ CreAction use it in practice. But before we do, let's make a point that is probably obvious. As we discuss the differences between CreAction and Prediction, we will draw clear, bright lines. And that can make it sound as if you would use one form of reasoning exclusively in one situation, and the other when faced with something else. The fact is people reciprocate between the two often in solving the same problem.

For example, imagine you see an attractive someone across the room. Based on the animated way they are chatting with friends, you predict they would be an interesting person to get to know. You could stay in the Prediction mode and spend a lot of time trying to figure out the perfect opening line, or you could just take action by walking over, saying hi, and seeing what happens. One more quick example to make the point. You're hungry and so head down to the supermarket to buy some potato chips. As you walk there, you discover they have closed the road off for a parade that you had forgotten about, and so you need to detour around the block. Halfway around you see your favorite pasta shop. Pasta, yum! And so you satisfy your hunger not by having a snack of potato chips, as you originally intended, but by having a lunch of pasta primavera.

How Do You See the Future?

The fundamental difference between CreAction and Prediction boils down to the way you think about the future. Prediction is based on the premise that *to the extent that we can predict the future, we can control it*. That's why both academics and businesspeople spend enormous amounts of brainpower and resources developing predictive models, creating algorithms, and planning scenarios. Those who employ CreAction take an entirely different mental posture: *To the extent that we can make the future through our actions, we don't need to predict it*. Table 1, "Contrasting Prediction and CreAction," summarizes the fundamental differences between Prediction thinkers and CreAction thinkers. How do you see the future?

> **CreAction allows you to take smart steps into an unknowable future in order to discover and/or invent that future as you go.**

Scaling Some Very High Heights: A Guide for Managers on the Ground

How do most large organizations innovate? Typically, they will add simple product line extensions and move into adjacent markets. That is, they will innovate in predictable ways because they want to be able to

TABLE 1 **Contrasting Prediction and CreAction**

	Prediction	CreAction
View of the Future	The future is a continuation of the past and can be reasonably predicted. Goals are achieved by extrapolating from the past and positioning yourself to catch the wave. Accuracy of prediction is paramount.	The future is contingent on human action. Unpredictability itself is seen as a resource. Goals are achieved by doing the doable and continually transforming current realities into new and unforeseen possibilities.
Basis for Commitment and Action	**Goals.** Clarity of goals drives resource acquisition and management. What means do I need to assemble to achieve these goals?	**Means at hand.** What effects can I create with the means I have?
	Think a lot. Act once the logic is fully in place to achieve the end. The next step is based on the previous thought.	**Start acting as soon as you can,** as soon as it's logical to take the next step. The next step is based on the new reality, which results from your action.
	Should. Do what you ought to do based on what's "best." Goals determine sub-goals and actions. Thorough analysis precedes action. Time and/or other resources are invested in upfront information gathering.	**Want (and can).** Do what you want and are able to do, which is not necessarily "best." Your desires, means, and the actual commitments of others form the sub-goals. Actions and interactions with others precede and drive the process of CreAction. Creative energies focus on building a venture with virtually no resources invested.
Attitude Toward Investment and Risk	**Expected return.** Calculate upside potential and pursue the (risk-adjusted) best opportunity. Risk management involves the careful avoidance of failure.	**Affordable loss.** Calculate downside potential and invest no more than you want or can afford to lose. Risk management involves keeping failures small and having them happen early, and then learning from them for future success. Each stakeholder invests only what he or she can afford to or is willing to lose.
Dealing with the Unexpected	**Bring plan back on track.**	**Redesign plan** and even, sometimes, your desires in order to profit from surprises.
Attitude Toward Others	**Competition.** Constrain task relationships with customers and suppliers to what is necessary. The likelihood of delivering on your targets dictates whom to bring on board.	**Partnership.** Build your market together with customers, suppliers, and even prospective competitors. The people who come on board help determine the goals and shape of the venture and its market.
Underlying Logic	**To the extent we can predict the future, we can control it.**	**To the extent we can create the future, we do not need to predict it.**

Developed by Sarasvathy, Schlesinger, Kiefer, and Brown

predict unpredictable things and, at the very least, avoid making mistakes. But research tells us that they are not generally thrilled with the success of these simple efforts. The conclusion? Results from innovatively thinking "outside the box" are still widely unsatisfactory among established companies.

Unknowability

Large organizations face futures of varying knowability. At one end of the spectrum are companies that have "pretty predictable" futures; the tools they currently have give them competitive advantage over companies that don't have the same tools. At the

other end, companies are facing situations that are completely unknowable. Yet, they still apply the same Prediction tools despite the undeniable fact that in such settings not only are these tools ineffective, they carry greater cost in at least two ways. First, applying the wrong tool – Prediction – to a situation wastes both time and resources. Second, applying Prediction's standards of success to CreAction just doesn't make sense.

> ## Results from innovatively thinking "outside the box" are still widely unsatisfactory among established companies.

Here's an example of the disconnect that can result from using a traditional Prediction tool – return on investment requirement. Let's suppose that new products at MegaGalactic must produce a 15% return on investment (ROI) and generate at least $25 million in additional revenue. Here's the reasoning. "CreAction is unpredictable; we'd better require a 25% ROI and at least $50 million in sales. Hmmm, now that I think about it, I'm not sure that even that's enough. Let's add a safety margin and make sure it exceeds 30%." Eventually, you get to the point where the hurdle rate is so high that the new product – no matter how promising – is never going to be approved.

The takeaway? A thought process that is logical, rational, and a smart thing to do in a predictable universe gets unconsciously and habitually carried over and applied to an area where things are unpredictable. Not surprisingly, the results are far from ideal.

What Do You Do?
One path to introducing CreAction into large organizations is to keep it completely self-contained. In other words, you sequester your efforts to deal with, or capitalize on, the "unknowable." You can do that by creating a wholly separate organization with different rules, processes, design, etc.

It is a good approach as far as it goes. You set up a little unit on the side and completely protect it from the parent. But this has, of course, its own problems. Just to rattle off a few:

- How do you reintegrate the ideas/products/ services the unit develops back into the parent company?
- Who is going to run this unit? (Obviously, someone steeped in Prediction won't be a good fit, and even the most creative corporate citizens are unconsciously wedded to Prediction.)
- How will the performance of the entity be evaluated? (See our earlier discussion about unrealistic hurdle rates.)

Closely related to the sequestered concept is limiting the employment of CreAction to certain specific activities, such as pilot projects. But neither approach is a real, permanent solution because the parent company itself needs to operate, at least some of the time, in the face of unknowability. You may be able to relegate certain aspects of the business landscape to a separate unit, but not all of it. Reality is not that convenient.

A Learning Option
So what do you need to do to make an organization hospitable to CreAction? People talk all the time about how changing an organizational culture is difficult, but embedding CreAction makes that look like a walk in the park. You aren't just changing the culture, but also the company's systems, processes, procedures, goals – the whole shebang. You can't just "order up" this kind of thinking to permeate the entire organization (even if such an order were a good idea, which it probably is not).

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Well, if that won't work, what will? The way we classically think about organization change would argue that the way to introduce anything new is to:

1. Determine where you want to be – in this case, a company that uses CreAction when appropriate.
2. Determine how close the company is to the goal. (Answer: "Not very.")
3. Chart a course between where you want to be (a company that uses CreAction) and where you are now (one that does not).
4. Put in place rewards systems, support, and training that would allow that change to happen.
5. Add metrics that will chart the progress toward the goal, and identify when things are getting off course.
6. Do remedial work as necessary until you achieve your objective.

Sounds familiar, doesn't it? It should. It's perfect Prediction. You could go this route, but quite frankly,

we don't think you would like the end result very much. First, experience and research has shown that trying to change things like culture or decision-making processes with a process like this is labored at best, and often flat out fails. While the analogy is clichéd by this point, it is also true: organizations, like the human body, tend to reject foreign bodies inserted into them. And, as we have seen, CreAction is about as foreign as you can get when it comes to the way established companies do business.

Second, the process we outlined above could take months, or maybe years.

> **CreAction is about as foreign as you can get when it comes to the way established companies do business.**

Third, by going down this path, you run the risk of undermining the Prediction skills within your organization. That would be a huge mistake. Even though the universe grows seemingly more unpredictable by the minute, there is – and always will be – a huge number of things that are predictable, and you don't want to weaken or eliminate a superior skill (Prediction) that the organization has, one that is effective under the right circumstances.

It is clear to us that the historical approach is not the way to go here. If you want to introduce CreAction successfully, you are going to need to take a different approach, a CreActive one!

Not Top-down but Bottom-up
Fortunately, we believe there is a way to introduce CreAction without replacing any of the existing structures or procedures that work well in predictable

situations. It's possible, because experience has shown that *everyone is capable of entrepreneurial thought*; every one of us has the ability to operate in situations of uncertainty.

So, the secret is not to introduce CreAction from the top of the organization down – i.e., with the CEO (or superintendent or minister) saying, "From this day forward, we will add CreAction to the way the company addresses problems and opportunities." Rather, it is to have it become part of the organization from the bottom up, with individual employees using this alternative form of thinking as the situation warrants.

> **There is a way to introduce CreAction without replacing any of the existing structures or procedures that work well in predictable situations.**

Let's pause a moment to underscore both points. First, CreAction doesn't replace Prediction; it's an additional tool. Second, introducing it in the manner we suggest doesn't require an organization to change its existing systems. Rather, the change process begins with employees asking themselves, when confronted with a problem, "Does it make sense to use CreAction in this case?"

Alone, you can't convince your company to create a new structure, but you can perhaps persuade it to attack a problem from an unusual angle. ("Hey, can we think about it a different way, boss?") That you can do, especially if what you follow up with is a way to save the company money or operate more efficiently. You can't change the fact that there are cubicles and an existing culture and ways of doing things. But "smart is smart," and we're talking about you offering up an

additional way of viewing problems. You'll never get in real trouble for doing that, especially if you do it gently by saying, "Can we think about this differently?" This is the first kind of learning that has to take place to introduce CreAction into the organization.

The second kind is an *organizational* learning. After the idea of CreAction has started to take hold, you need to come up with an answer to the question, "How do we build this capacity within our firm in a way that is consistent with our strategy?" There is no "one size fits all" recipe for this. We're dealing with something that is essentially a creative act, and consequently each organization has to handle it in its own unique way. If the company looks to adopt somebody else's version, it's because it's leaning right back into predictive thinking: "If I imitate them somehow, it will be good for me." Imitation will probably not be very successful. Despite what they teach you in business school, no two organizations are exactly the same.

The Why, When, and Where of CreAction in Organizations

Why? Success with "out of the box" innovation is spotty at best. This is an alternative that has worked well for people who must deal with uncertainty every day: entrepreneurs. (Nothing is more uncertain than trying to create something that has never existed before.)

When? In situations when predictive methods just don't make a lot of sense

Where? Product/service innovation, business model innovation, and perhaps, ultimately, across the entire organization

So how do you induce organizational learning about CreAction? The task is actually simpler than you might think. Encourage people to:

1. Regain their natural capacity for CreAction. This is easy. As we have seen throughout, this is the way we figured things out before we went to school.

2. Employ the use of CreAction in settings that are inhospitable to Prediction. This looks easy as well. It requires four things:
   - Learn to recognize when a particular setting has a high degree of essential unknowability, and thus the use of CreAction is appropriate (and Prediction is not).
   - As an alternative to "more study," develop a compelling next step with acceptably low affordable loss. (The easiest way to do that? Ask what will get you furthest in the shortest time, with the least resources at risk.)

> **We're dealing with something that is essentially a creative act, and consequently each organization has to handle it in its own unique way.**

- Develop the capacity to enroll whatever sponsors, enablers, and approvers may be required. (It is especially important to develop the ability to describe CreAction to those who are unfamiliar with it, and explain why it is an appropriate approach.)
- Develop the personal desire and commitment to do the three steps above. ∎

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