ANALYTICAL ACTIVISM

A NEW APPROACH TO SOLVING THE SUSTAINABILITY PROBLEM
AND OTHER DIFFICULT ACTIVIST PROBLEMS

By Jack Harich and a very small group of innovators
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A Thwink.org project

The 8 simulation models used in this book are available at Thwink.org. The models and their approximate location in the book are:

1. The Basic Structure of Process Revolutions, page 174
2. The Memetic Evolution of Solutions to Difficult Problems, page 182
3. The Dueling Loops of the Political Powerplace
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   3.2 The Basic Dueling Loops, page 30
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4. The Transformation of Classic Activism to Analytical Activism, page 231
5. How Critical Thresholds Behave (A minor educational model), page 247
The Pre-publication First Edition

This copy of Analytical Activism is a limited edition before the real book is published. It would help greatly if you could share your opinions about it with us.

Your feedback will directly improve the quality of the book. We need careful readers who can put themselves in the shoes of environmentalists at the local, national, and international level. Think like a decision maker. As you read, we would appreciate it if you would ask yourself these questions:

1. Does the book present a clear argument I can follow easily? If no, why not?
2. Do I agree with the central argument that I and the organizations I work with need to switch to Analytical Activism, or something like it, as our chief tool to help solve the sustainability problem?
3. What are the key things that caused me to agree or disagree?
4. Is the book so well written that after reading it I want to go out and tell others about it?
5. How can the book be improved in general, to be the best possible precipitating event?
6. If you stopped reading the book or lost interest, where did we lose you? Why?

You can take notes as you go and send them to Thwink when done, or you can call us up and discuss the above questions, or both. Don’t worry about typos and the small stuff. We appreciate hearing about that, but it is the bigger picture that matters. Don’t be shy about telling us the book is loaded with problems. It probably is.

This book is engineered to be the precipitating event shown in the diagram on page 198. The precipitating event is the sudden appearance of logical proof that Analytical Activism is much better than the present problem solving process the environmental movement is using, which is Classic Activism. Basically Classic Activism is an intuitive approach with no defined process, while Analytical Activism is an analytical approach with a defined process that is continuously improved. The difference is comparable to science before and after invention of the Scientific Method, which caused the productivity of scientists to soar a hundredfold.

The precipitating event consists of publication of this book, the Thwink.org website, and other related activities. The strategy is that a well engineered first event will kick off a chain of additional events which will ultimately lead to the successful transformation of the environmental movement from Classic to Analytical Activism. This is necessary, because Classic Activism is only capable of solving easy sustainability subproblems, like local pollution and conservation parks. It cannot solve difficult ones, such as climate change, global deforestation, the abnormally high species extinction rate, global topsoil loss, many types of large-scale pollution, and so on.

Your feedback will help us create a better precipitating event. Thanks for reading the book, and we look forward to hearing from you.

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Cover photograph by the author on October 3, 2002 from a ridgeline near the top of La Dent Parrachee in Parc National de la Vanoise, France.
Part 1. How the Environmental Movement Can Find Its Way Again

As the Death of Environmentalism memo confirmed in October 2004, the environmental movement has failed to solve the sustainability problem. Therefore it must either step aside or reinvent itself so that it is capable of solving the problem. Part one explores how it may be able to do the latter.

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Part 2. First Things First: Solving the Transformation Problem

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A Note of Caution & the Right Tools for the Job
At Thwink.org, as well as in this book, we think like scientists. Every assertion we make is a hypothesis that could be overturned tomorrow. The pages you are about to read contain many novel hypotheses. While these seem to have withstood the test of logical proof, using a number of analytical tools, few have undergone the acid test of real world experimentation. No one knows how many will survive. But rather than couch every assertion with a "maybe," a "this suggests," or a "probably," and so on, we have elected to only occasionally stress that all the conclusions in the book are merely examples and pointers to a new way of thwinking. None should be interpreted as the analysis or the solution, because the strategy of this book is not to solve the problem, but to introduce the right tools for the job. This book contains example after example of how to use several key tools. How they are actually applied and how the problem is ultimately solved is up to you.
“No scene from prehistory is quite so vivid as that of the mortal struggles of great beasts in the tar pits. In the mind’s eye one sees dinosaurs, mammoths, and saber toothed tigers struggling against the grip of the tar. The fiercer the struggle, the more entangling the tar, and no beast is so strong or so skillful but that he ultimately sinks.

“Human system engineering has over the past few decades been such a tar pit, and many great and powerful teams of problem solvers have thrashed violently in it. Most have emerged with plausible solutions—few have actually worked. Large and small, massive and wiry, team after team has become entangled in the tar. No one thing seems to cause the difficulty—any particular paw can be pulled away. But the accumulation of simultaneous and interacting factors brings slower and slower motion. Everyone seems to have been surprised by the stickiness of the problem, and it is hard to discern the nature of it. But we must try to understand it if we are to solve it.”

The above is from The Mythical Man Month, by Fred Brooks, 1975, pages 2 and 4. The mural of the La Brea tar pits is by C. R. Knight. The quoted text is the opening to the first chapter. The first two sentences in the second paragraph contain three small changes, so that the pitfalls of software engineering become the pitfalls of human system engineering.

Here are the original first two sentences of the second paragraph, with what was changed in bold. Notice how close the analogy was even before the changes:

“Large-system programming has over the past few decades been such a tar pit, and many great and powerful teams of problem solvers have thrashed violently in it. Most have emerged with running systems—few have met goals, schedules, and budgets.”

Fred Brooks was the manager of the largest software engineering project of all time: the IBM 360 operating system, which ultimately consumed over 5,000 person years. It was IBM’s greatest single success, allowing it to dominate the computer industry for decades. Incidentally, Brooks’ advice on how to avoid the tar pits was so insightful that The Mythical Man Month went on to become the best selling software engineering book of all time.
**Introduction to the New Paradigm**

The goal of the modern environmental movement is to change the course of civilization to one that is environmentally sustainable. In the early stages of the movement, the 1960s, 70s, and some of the 80s, this goal looked attainable, as problem after problem was solved. Clean air and water acts were passed in nation after nation. Pollution was fought as if it was a demon. Governments became so committed to environmentalism that most industrialized nations created an environmental agency, charged with the task of preserving and protecting the nation’s environment forever. An international agency to encourage environmental stewardship at the global level, the United Nations Environmental Programme, was created as a result of the Stockholm Conference of 1972.

In the beginning these efforts worked. Law after law was passed at the national level to solve problem after problem. At the international level, treaty after treaty brought nations together to preserve and protect the biosphere as a unified whole. The air, the rivers, the oceans, even the land became cleaner. Dramatic success was the norm. Visions of victory danced through the heads of those who sought to make it all happen.

But starting in the 1980s something changed, and that vision was soon shattered. Environmentalists are now waking up to the sober realization that they were not solving the total problem—what the Club of Rome calls the complete problematique. Instead, they were only solving the easy problems first, by picking the low hanging fruit. The hard problems, such as climate change, topsoil loss, natural resource depletion, deforestation, and abnormally high rates of species extinction, remain as unsolved as ever.

Then in 2001, when the George W. Bush administration ascended to power in the United States, things grew even worse. The sole remaining economic and military superpower was now fiercely opposed to solving environmental problems of all types. It began moving aggressively to undermine and even reverse much of the progress that had been made, sending many in the environmental movement into an apoplexy of helpless doom and gloom.

What went wrong? How can the environmental movement find its way again? How can it become capable of overcoming the wall of change resistance that has appeared to solving the sustainability problem, and break the deadlock?

**The Five Invisible Traps**

Like the mighty beasts that could not escape the tar pits once the first paw went in, the environmental movement is stuck. It cannot pull itself free from its present strongly held paradigm, the one it is using to solve the sustainability problem. The reason this has occurred is environmentalists have fallen into not one but five invisible traps.

**Trap 1** – The first trap is the unconscious assumption that the normal processes (and the many tools that go with them) we use to solve everyday problems, either at home or at work, also work on this problem. But because the global environmental sustainability problem is actually what’s known as a complex social system problem, this assumption leads to attempting to solve the problem with the wrong process, which fails. Simple processes will not solve complex problems.

**Trap 2** – The second trap is that because of the wrong process, there is little realization that the change resistance or social side of the problem is the crux. Instead, problem solvers are pounding away furiously at the technical side. In others words, they are solving the wrong problem.

**Trap 3** – This leads to the third trap. As a result of the blind spot of not seeing that the social side of the problem is the crux, there has been no deep analysis of why there is such stiff, prolonged resistance to adopting a solution. Lack of such an analysis has led to failure to uncover the existence of the fundamental social structure that lies at the heart of the social side of the problem. This invisible structure has a name: The Dueling Loops of the Political Powerplace. And it has an exploiter: the New Dominant Life Form, more commonly known as the modern corporation and its allies. This structure appears to be the reason for such strong change resistance.

**Trap 4** – The fourth trap is that if you can’t see structures like this, then you can’t see where to “push” on the system to solve the problem. Instead, you must make educated guesses, which causes the most intuitively attractive system points to be pushed. But this is a trap, because those ever-so-attractive points are low leverage points. Environmentalists simply do not have the force (numbers, money, and influence) to make pushing on low leverage points work. They must find the system’s high leverage points and push there instead.
Trap 5 – Finally, pulling the beast even deeper into the tar pit is the fifth and biggest trap of them all. The same characteristics of problems that make them attract attention first also make them easier to solve, like local pollution. This creates the seductive illusion that the right process is being used, because the process works at first. Then when it begins to fail on the more difficult problems, such as climate change, it is not at all obvious what went wrong. The natural reaction is to try the same thing all the harder, which is the same way the dinosaurs, mammoths, and saber toothed tigers reacted. For them, and for even the mightiest of environmentalists, the end result is always the same. The fiercer the struggle, the more entangling the tar, and no beast is so strong or so skillful but that he ultimately sinks.

There is, however, a better way.

That better way is human system engineering, using the process of Analytical Activism. Understanding what Analytical Activism is and why it’s a better way begins with this line of reasoning:

As overwhelming and insolvable as the global environmental sustainability problem may appear, it is certainly no more difficult than the problems that physicists, chemists, and other scientists have been tackling and solving for centuries. So why not take the same approach that has worked so well for science?

The Starting Premise

We start with the premise that it is possible to take an analytical approach to the global environmental sustainability problem and solve it, if it is still solvable. Analytical means the use of analysis to accomplish something. We do this constantly. We analyze the day before us, and make a plan to achieve our various objectives. We receive a request from a friend or a colleague to do something, and we analyze how to best accomplish it.

But the analysis must fit the problem to be solved. If it’s an easy problem, then our everyday approach will work. On the other hand, if it’s a difficult problem then our normal approach will probably fail. This is the perfect setup for the fifth trap, which is the stickiest of them all. This is the:

Solving the Easy Problems First Trap

Without realizing it, the environmental movement has fallen into an invisible trap. The trap occurs because the same characteristics of problems that make them attract attention first also make them easier to solve.

For example, river pollution is a local problem with immediate consequences. The problem attracts attention because river pollution can lead fairly quickly to illness due to drinking contaminated water. The problem is usually relatively easy to solve, because it is so local the guilty parties are easily identified and there is jurisdiction to force them to comply with regulations to not pollute. Another feature making this an easy problem is the consequences are so immediate that cause and effect is easily proven, causing a strong reaction to solve the problem now.

At the other end of the spectrum lie the problems that are global and long term. For example, greenhouse gas emissions are a global problem with long term consequences. This problem did not attract much attention at first because the consequences were so distant. But when it finally did attract attention, it was much more difficult to solve because the offending parties were so diffuse and there was often no jurisdiction to make them comply with preferred solutions. In addition, how much of the problem was caused by human interference was hard to determine. This made it much more difficult to persuade decision makers to take action.

Because the easy problems attracted attention first, successes on easy problems started piling up, causing problem solvers to be lulled into a false sense of “I’m using the right process.” This quickly led to psychological dependence on traditional problem solving approaches for everything, because they seemed to be working just fine, as they always had. This dependence created a huge blind spot, because problems solvers became so biased toward what was working well that they subconsciously assumed that other approaches didn’t even exist.

This explains why, as the difficult problems began to demand attention and solutions started to fail, it was not at all obvious what was really happening. This caused the natural reaction of trying to improve the wrong process, or trying to improve the wrong solution, instead of changing to the right process. The result was inability to solve the difficult problems, as well as a growing sense of frustration, desperation, anger, and finally despair.

Thus it was because of The Easy Problems First Trap that the easy problems of the 1960s, 70s, and some of 80s yielded quickly to traditional problem solving methods. But the more difficult ones that came later did not.

The reason they did not is difficult problems are fundamentally different from easy problems. They belong to a class of problems known as complex social system problems. These problems, because they are so hideously complex, are difficult to analyze. They also behave counterintuitively, meaning what looks true probably isn’t. Thus what looks like a surefire solution
is usually not, and when that solution fails, what to try next is anybody’s guess.

Fortunately there is a tried and true approach to solving difficult problems that works. It has the finest pedigree possible, because it is based on the only known method that does work—reliably. It is the approach that the environmental movement must embrace with a passion bordering on obsession, if it is to have any rational hope of solving the difficult problems it now faces. This approach is:

**The Analytical Method**

This is easily derived from the Scientific Method, which consists of these steps:

1. Observe a phenomenon that has no good explanation.
2. Formulate a hypothesis.
3. Design an experiment(s) to test the hypothesis.
4. Perform the experiment(s).
5. Accept, reject, or modify the hypothesis.

These five simple steps have worked spectacularly well for another group of problem solvers, scientists, for over three centuries now. With only a slight refinement they can serve just as well for the modern environmental movement. These steps have proven to be so foolproof and productive, if followed correctly, that we should tamper with them as little as possible.

Environmentalists do not run around in white coats observing subtle phenomenon and formulating esoteric hypotheses. They solve real, pressing problems. Thus they need a slightly different process, one that would look about like this:

1. Identify the problem to solve.
2. Choose an appropriate process.
3. Use the process to hypothesize analysis or solution elements.
4. Design an experiment(s) to test the hypothesis.
5. Perform the experiment(s).
6. Accept, reject, or modify the hypothesis.
7. Repeat steps 3, 4, 5, and 6 until the hypothesis is accepted.
8. Implement the solution.
9. Continuously improve the process as opportunities arise.

Executing the process leads to building a knowledge pyramid (see page 272) tall and sound enough to solve the problem. Each building block in the pyramid is a productive hypothesis. The process provides the driving questions/goals leading to generation of a steady stream of high quality hypotheses. A high quality hypothesis is one with a high probability of being true and highly useful in building the pyramid. The solution may be implemented gradually as you go or all at once. The former is preferred for earlier evolutionary feedback.

A process is a repeatable series of steps to achieve a goal. For example, doctors have a standard procedure for diagnosing many types of illnesses, starting with the symptoms. Other examples of processes are a constitution, Robert’s Rules of Order, the method of long division, and the Scientific Method. All are much better and more predictable ways of achieving a goal than no process or the wrong process.

Notice what has happened here. The Analytical Method says don’t identify a problem and then rush in and solve it. It says that after you have picked a problem to solve, the next step is to pick a process that matches the problem. As a fly fisherman would say, you “match the hatch.”

Is this what environmental organizations are doing today? Of course not. You can walk in the door of almost all of them, and if you ask “What process are you using to achieve your mission?” you are likely to get the
most quizzical, mortified look imaginable. Or they may ask “What do you mean?”

Some will say they are following a process. It probably does not have a name. Instead, they will say “We are following standard business practices. We set objectives, organize projects, make budgets, and do whatever it takes. We use CPM and PERT and spreadsheets when we have to. And…."

However, when you interrupt and ask “Is it written down? Is everyone trained in the process and following it? Is the process being continuously improved? Is the process engineered to optimize the organization’s current needs?” you are going to get that quizzical look, if not shown the door. This is because they really don’t have a true process, but they think they do. This is very common, both in non-profit and for-profit businesses.

But if they had a real process, such as the Analytical Method, they would be saying yes to all of these questions. And they would be achieving their objectives, probably so well they could then set even higher ones. That is the potential of the Analytical Method when followed properly.

This brings us to the definition of the title of this book: Analytical Activism is the use of the Analytical Method to achieve activist goals.

The Two Problems

This book is one long application of the Analytical Method, for the sole purpose of helping the environmental movement, as well as other equally worthy movements, find its way again. To do this the book applies the method to two problems: (1) How to transform the environmental movement to Analytical Activism, which is the transformation problem, and (2) How to solve the global environmental sustainability problem, which is the main problem.

Part one illustrates how the Analytical Method is fully capable of solving the main problem if applied correctly. But that will never happen unless the transformation problem is solved, which I believe is the greater challenge. Part two deals with the details of solving the transformation problem. Building on that, part three provides the practical examples needed to get started on solving the main problem. Thus this book is less a story about the sustainability problem, and more about the new way of thinking required to solve it, and how we environmentalists as a unified whole can quickly and successfully change to this new way of thinking.

This book presents many tools and abstractions for solving the two problems. One of the most productive is:

The Importance of Being Able to See Social Structure

Imagine a powerful, pervasive force that affects everything you do, and everything everyone else does too. It cannot be easily detected with the five senses, so it is for all practical purposes invisible. But yet its influence on the behavior of the world we live in is so strong it cannot be ignored. It must be explained.

One such invisible force was gravity. In 1687 Sir Isaac Newton published the Principia Mathematica, with its three laws of motion and the law of universal gravitation. Suddenly all was light. While still invisible, gravity was now a known force that affects the behavior of our world in a predictable manner.

Newton worked in the realm of the physical sciences. Environmental activists work primarily in a different realm: the social sciences. The social world is populated not with bodies in motion or at rest, but with people. The social world is also affected by a large, pervasive force that, like gravity, is not easily detected. But detect it and explain how it works we must, or it
will continue to thwart our attempts to develop reliable knowledge about how the world of people works. The powerful, invisible, pervasive forces that dominate the behavior of the social world are the result of social structures. A social structure consists of the feedback loops that arise from the nodes and relationships present in the human decision making portion of a system. Feedback loops are what give a social structure its characteristic behavior. An example of a feedback loop is shown below:

This social structure consists of a single reinforcing loop, called Love of Learning. It may be the single most important loop in the educational system. As each node increases, it causes the next node to also increase. In this manner the loop goes round and round, increasing in strength with each cycle, as you go through a lifetime of education. If the loop is well established in your home, community, school, and employer, then your love of learning will grow and grow to as high as you care to soar.

Next, let’s demonstrate the importance of being able to see social structure.

Imagine two groups of educators sitting around trying to come up with a plan to improve an educational system. One has the above social structure to work with and has been trained on how to use it and find additional loops. The other group has no such structure or training. If all else is equal, which group will come up with the most effective plan? Now here’s the real question: Which group is more likely to come up with a breakthrough?

Once the structure of a particular social world is known, all is light. You can now see why that world behaves the way it does, and how, if you make a structural change here and there, that world is likely to respond. This is because the many relationships between cause and effect are now predictable, including the behavior of the system as an emergent whole.

Computer simulation models of social structures are the central product of the field of system dynamics. The application of the principles of system dynamics allows problem solvers to walk up to a complex social system problem, find and analyze its dynamic structure, develop a solution, and implement that solution—all with a speed, efficiency, and high quality that was impossible before.

The “Dueling Loops” simulation model presented Part One is a social structure. It explains why such strong resistance to adopting a solution to the sustainability problem is present. Once this structure was built the rest was easy. The low and high leverage points became blindingly obvious. The sample solution almost built itself by logically growing from the high leverage points and the thorough understanding of the system the model allowed. Such rapid, efficient progress from problem identification to a high quality solution hypothesis would have been impossible without the ability to see the structure of the problem.

You will know you can see social structures when your thinking or modeling begins to hinge on how memetic infection drives a social system’s key feedback loops. A meme is a mental belief or behavior that was learned from others. Memes evolve just like genes do. Because all learned behavior is memetic, and solving the main problem and the transformation problem both require gigantic amounts of new learned behavior, modeling the memetic infection involved takes us right to the heart of these problems.

It follows that the transformation problem boils down to one critical change: How can we transform the environmental movement so that it can now see these invisible social structures, which are as real as gravity, and so finally see social problems clearly for the first time?

Once you’ve read most of this book, your view of the sustainability problem and how to solve it may change radically. If so, this is good news, because it means you have grasped:

The New Paradigm

The central strategy of this book is to paint a new paradigm. If the environmental movement comes to accept this new viewpoint of their world, environmentalists will be able to solve the global environmental sustainability problem, because their efforts will be more productive by an order of magnitude. This holds for all types of environmentalists: grassroots activists, scholars, corporate managers, politicians, and many more.

The new paradigm consists of five sequential insights. Each builds on those before it and becomes successively more valuable. This crescendo leads up to the fifth and final insight, which is the knockout punch that actually solves the problem. The new paradigm is:

1. The process must fit the problem.
2. The social side of the problem is the crux.

3. The phenomenon of strong, prolonged, successful solution adoption resistance clearly exists. Therefore there must be an invisible social structure that is the fundamental cause of that phenomenon.

4. A satisfying hypothesis for this structure is The Dueling Loops of the Political Powerplace and its current exploitation by the New Dominant Life Form.

5. There is a high leverage point in this structure that has never been tried.

These are large and unconventional abstractions. They are not easy to comprehend. But once they click your world will change, because now it will be obvious what must be done to solve the problem at the strategic level.

Let’s examine the new paradigm one insight at a time:

1. The process must fit the problem – This is because low process efficiency (defined as the ratio of input to desired output) is the main reason the modern environmental movement is unable to solve the global environmental sustainability problem. This has occurred because the movement has settled into the comfortable illusion that its current process, Classic Activism (described in detail starting on page 34), is just as capable of solving difficult problems as easy ones. It follows that the movement must switch to a process with high process efficiency if it is to achieve its mission. Seen from this viewpoint, the sustainability problem is really a process efficiency problem.

That the process must fit the problem is 90% of the new paradigm. The right process would quickly show:

2. The social side of the problem is the crux – The transformation of society to environmental sustainability requires three steps: The first is the profound realization we must make the change, because if we don’t our descendants are doomed. The second is finding the proper practices that will allow living sustainably. The third step is adopting those practices.

Society has faltered on the third step. By now the world is aware it must live sustainably, which is the first step. There are countless practical, proven ways to do this, which is the technical side of the problem and the second step. But for strange and mysterious reasons society doesn’t want to take the final step and adopt these practices, which is the change resistance or social side of the problem. Therefore the social side of the problem is the crux.

Acknowledging this leads to the conclusion that:

3. The phenomenon of strong, prolonged, successful solution adoption resistance exists. Therefore there must be an invisible social structure that is the fundamental cause of that phenomenon. – There is no doubt this phenomenon exists, as shown by the way the ecological footprint curve shown below has continued marching upward, ever since the modern environmental movement began in the 1960s. The efforts of the movement have had only a negligible effect on this curve. The footprint went into overshoot about 1985 and is currently at around 125% of carrying capacity. The Living Planet Index shows the concurrent deterioration in the health of the world’s ecosystems.

Something must be causing this phenomenon. Because it is clearly based on human behavior, and because human behavior in the large is caused by social structures, the fundamental cause of this phenomenon must be a particular social structure. There can be no other root cause.

Applying a process that fits the problem and seeks to find this invisible structure leads to the following unconventional but profound conclusion:

4. A satisfying hypothesis for this structure is The Dueling Loops of the Political Powerplace and its current exploitation by the New Dominant Life Form. – Now the chain of insights is leading somewhere. We have arrived at the fundamental cause of failure to solve the problem. Like the good physician who never gives up, we have diagnosed the cause of the patient’s illness at last.

This structure consists of a race to the bottom among corrupt politicians battling against a race to the
top among virtuous politicians. Because the race to the bottom has an inherent structural advantage over the race to the top, it is the dominant loop most of the time, as it is today. Furthermore, the race to the bottom is currently being exploited by the New Dominant Life Form, which is the modern corporation and its allies.

The goal of most corporations is to maximize the net present value of profits. The goal of most individuals, once they have gotten past the survival and security stage, is to maximize quality of life for themselves and their descendents. These goals are mutually exclusive, which explains the very strong, prolonged resistance to solving the global environmental sustainability problem.

Because we have captured the fundamental structure of the problem in a simulation model, inspection of the model causes the solution to the problem to suddenly become blindingly obvious. This leads to the very good news that:

5. There is a high leverage point in this structure that has never been tried. – Because Classic Activism leads to pushing on low leverage points, it should be no surprise there are a number of higher leverage points that have not been tried. The one with the most potential to solve the social side of the problem in a single stroke is general ability to detect political deception.

This ability is currently low. If environmentalists can unite and raise it to a high level the race to the bottom will collapse, leaving the race to the top dominant. Politicians will then respond correctly to the truth about the global environmental sustainability problem because it will now be in their best interests. If they come to the same conclusion that environmentalists have, that sustainability is civilization’s top priority and nothing else comes close, then civilization will at last long enter the Age of Transition to Sustainability.

The five insights point the way to the new paradigm. If most environmentalists come to accept this radically different way of approaching the sustainability problem, then the environmental movement can find its way again. There will be nothing stopping the entire field of environmentalism from shifting into a whole new way of thinking and working that will soon crack the problem of how to move civilization into the Age of Transition to Sustainability.

But this is a bold and radical step. It is every bit as revolutionary as the way the field of biology completely reoriented itself around Darwin’s theory of evolution, or the way all of science threw off the chains of thousands of years of listening to the voice of intuition and tradition, and turned en masse to the new paradigm of the Scientific Method. It will not be easy, because it’s never been done.

But there is no other way.

The Lesser Key Concepts

There are some additional lesser key concepts. These play supporting roles in developing the new paradigm to its full potential. They are:

A. Sustainability is the ability to continue a defined ability indefinitely. For more on this and why the standard Brundtland definition of sustainability is faulty please see page 131.

B. All large social transformations are process revolutions. – Examples are the invention of agriculture 10,000 years ago, the invention of logic by Aristotle in 500 BC, the invention of the Scientific Method in the 17th century, and the invention of modern democracy in the 18th century, starting with France and the United States. In each case, the invention of a radically better process caused a large social transformation, so large that we are still feeling the impacts of all of them today.

Transition to sustainability will be humanity’s next large social transformation, either before or after the fact that it must be done. This transition is so crucial and will take so long it can be called The Age of Transition to Sustainability. Given the principle that all large social transformations are process revolutions, it follows that to begin this transformation a radically better process must be invented.

Process revolutions all use the same basic structure. This is explored in The Basic Structure of Process Revolutions simulation model on page 174.

C. The right precipitating event will lead to the right transformation. – History has shown this to be true many times, such as Thomas Paine’s 47 page pamphlet on Common Sense, the Age of Reason, and the way the Powell Memo precipitated the rise of the conservative movement in the US in the late 20th century. A careful analysis of the patterns involved can give us the insights needed to engineer the right precipitating event for the transformation of global society to the Age of Transition to Sustainability.

D. The more difficult a complex social system problem is, the more important it is to push on high leverage points. – Easy complex social system problems can be solved a vast variety of ways. But difficult problems can only be solved a small number of ways. Finding them requires capture of the social structure of the system, and then a careful study of its leverage points, with the goal of finding the most stable and predictable high leverage points. Only then can a difficult problem be solved reliably.
E. If problem solvers cannot see a social system's structure then they are blind. – If you have not captured the system’s structure, then you cannot see its predictable cause and effect relationships. If you cannot reliably predict how a system will respond to solution alternatives, then you cannot rationally design a solution that will solve the problem, and so must rely on the same guesswork and groping around that a blind person uses to navigate a new and unknown space.

F. The only known method for producing new reliable knowledge is the Scientific Method. – Solutions to difficult problems require many pieces of cause and effect knowledge to be created as the problem solving process being used proceeds. Each piece must have rock solid reliability, or it cannot be used to build a greater whole. Thus if the problem solving process being used is not derived from the Scientific Method, then it cannot solve difficult problems.

* * *

Environmentalism is stuck in the tar pit of Classic Activism. Because the process does not fit the problem, every move, every struggle to solve the problem only pulls the beast in deeper to the wrong approach.

There is, however, a better way. In fact it is so much better that once scientists adopted a process that fit their problem, back in the 17th century, their productivity increased a hundredfold.

What will happen when environmentalists finally do the same, 400 years later in the 21st century?
Acknowledgements

One prerequisite for all transformations is a core group of innovators that can see, using logic alone, that there is a better way. I have been fortunate enough to work with such a group.

The first member of that group was, quite naturally, my editor in chief, who is also my beloved wife Martha. Without her continuing emotional and intellectual support, as well as her handy red pen and logical cutlass that slashed entire bad ideas out of existence, and prodded other good ones onto the page, this ambitious endeavor would have gone the way that most such foolishness goes.

The second and third members were George and Wilma Turner, for whom I worked thirty some years ago to turn their dream into reality. They have since achieved that dream and retired, just in the nick of time to take up several new ones. George not only offered numerous early suggestions, but was adventurous enough to dive into a manuscript that was tottering on the brink of literary catastrophe, and turn it into something more accessible, and better yet, more correct.

The fourth member of this tiny group was Curt Smith, a successful environmentalist and one of two people who inspired me to take up this challenge in the first place. In 2001, after 20 years of consulting for business and solving their problems, I noticed there was a much more important problem: global environmental sustainability. If this problem was not solved, then no other problem mattered, so I switched to that and made it my life’s work. This was largely due to Bill Joy’s essay on Why the Future Doesn’t Need Us and the strength of Curt’s example. After he converted to the new way of thinking expressed in the manuscript that became this book, it was Curt who first asked the question, “How can we implement these ideas?”

The fifth member was Rick Krause, a retired hydrologist from the US Geological Service. Working with Curt, he caused a small explosion of these ideas within a typical environmental organization: the Sierra Club. This led to the first tangible change project involving these concepts. The project failed to change the organization, but as an experiment it made the concepts stronger and was thus a success.

Along the way, as these ideas metamorphosed from mud and sticks to a quite habitable dwelling that no longer falls down every time you open the door, there have been many people who helped to build it.

Certainly the core members of the Sierra Club’s Gwinnett County group of Georgia played an important early role. These include the group’s leader, Curt Smith, plus Rick Krause, Sandy Krause, Terry Jones, Annette Gelbrich, Lydia Pochatko, and Nancy Brideau.

There have been others over the years whose gentle push here and there made all the difference in keeping this long project on course. There was Kathy and Jim McLaughlin. It was Jim who blurted out the insight that “We’ve got to figure out a way to make them work for the system instead of against it,” referring to what this book now calls the New Dominant Life Form, but was then called the modern corporation. And then there was Leo Razaitis, who when things were looking bleak, reacted so positively to a demonstration of the simulation model of The Dueling Loops of the Political Powerplace, and in particular to The Age of Reason feedback loops in it, that he gave me hope. Finally, in 2005, I started to work with Rhonda and Scott Durlacher.

And then, in mid 2006, I was contacted by Philip Bangerter of The Hatch Group. He, Steve Gale, and Andrew Murphy, and I started to work together. Later that year Joe Starinchak of US Fish and Wildlife contacted me and joined in.

Then there was a lull. New paradigms take time to catch on. I waited patiently. Finally in January 2010 my first paper, Change Resistance as the Crux, was published with crucial help from Steve Wehrenberg, Philip Bangerter and two anonymous referees. A few days later Joe Starinchak forwarded a copy to Michael Collins, who read it, grasped the new paradigm in record time, and started applying it to a serious project.

It’s hard to tell, but it could be that paradigm revolution has begun. I can hear the screeching and grinding of the wheels of the system now, as it lurches forward into a whole new way of thinking . . . .
Part 1. How the Environmental Movement Can Find Its Way Again

"Every real problem can and will be solved, entirely by accurate observation and close, searching thought."
Ernst Mach, 1838 to 1916

This is a book for everyone who is aware of the extreme urgency of the sustainability problem and is perplexed by society’s inability to solve it. Accordingly, there is little need to dwell on the severity of the problem, so the book spends little time on that. Instead, it presents an entirely new problem solving path and the results of five years of following that path. The key findings of this work are:

1. **The process does not fit the problem** – The environmental movement has lost its way because it is using a problem solving process that does not fit the problem. This process can be called Classic Activism.

   The environmental movement includes grassroots activists, scholars, businesspeople, activist think tanks, national environmental agency employees, and international organizations like the United Nations Environmental Programme. Classic Activism is the process all of these have been using to solve the sustainability problem. It is the same process that worked so well for other movements, such as women’s suffrage and civil rights. But when you put it under the magnifying glass, Classic Activism suffers from a fatal flaw: it is incapable of solving the difficult problems the environmental movement now faces, like climate change. This is because it is an ad hoc, common sense, event oriented process, as opposed to a formal, analytical, structure oriented process. As a result environmental classic activists have never been able to see how to correctly approach solving the sustainability problem.

2. **Pushing on low leverage points** – Because the process does not fit the problem the movement is "pushing" on low leverage points. This dooms even brilliant and heroic effort to failure.

   Due to decades of reliance on a one-size-fits-all process that worked well on the easy problems they tackled first, environmentalists have become habituated to pushing on low leverage points. Exactly what these are is explained at length in the book. Analytical Activism builds a well documented case that the movement is pushing on low leverage points and that this approach is doomed to eternal failure.

3. **Need to push on high leverage points instead** – It follows that if the movement could find the right high leverage points and push there instead, it could solve the problem.

4. **Need to change to a process that fits the problem** – The only way to find those high leverage points is to do what all of science did in the 17th century: switch to a process that fits the problem. For science this was the Scientific Method.

   If use of the wrong process has caused the movement to be unable to solve the problem, then it follows that use of the right process would change everything. It would allow environmentalists to fulfill their dream: to make the crucial difference in changing the course of human history from unsustainable to sustainable. The importance of the right process is a message this book will drive home again and again, starting with an analogy to the United States urban decay problem of the 1960s in chapter one.

   The application of the right process would break the thirty year deadlock of systemic change resistance. On the surface the deadlock is caused by environmentalists thinking long term while the opposition is thinking short term. But what is the deeper underlying cause of the deadlock? What is the root cause?

   Once problem solvers find the root causes of change resistance the disease has been correctly diagnosed. Then, like the good doctor who starts by first diagnosing the root causes of a patient’s symptoms, we can begin to develop a rational treatment plan. By pushing on the right high leverage points, the patient can be brought back to health.

   Part one presents the argument that all four of these points are true. It also goes one giant step further, by briefly delving into a very promising analysis and solution that illustrates what will happen once the environmental movement finds its way again.

   On the next page is a visual summary of all we’ve said so far, and all we will say in the rest of this book.
The above diagram summarizes the entire argument of this book. (For further discussion of this diagram, please see page 259.)

Currently the modern environmental movement is in the Initial Failure Mode. The symptoms of Initial Failure are that the modern environmental movement is consistently failing to solve the difficult problems that it now faces. Why is this? Our analysis shows the immediate cause is pushing on low leverage points. The cause of this is a faulty analysis of the sustainability problem. These are the defects that the movement must resolve to find its way again.

How can it do this? Well, it needs to dig deeper and find the flaws allowing the defects to appear. This has been done. There appears to be a single fatal flaw: the process does not fit the problem.

Why has this flaw existed for so long? The path the environmental movement chose, without ever giving it any real consideration, was to choose Classic Activism as its central problem solving process. This simple process is characterized by an ad hoc (informal) approach, a common sense (intuitive) way of analyzing problems, and an event oriented way of thinking.

This book argues that environmentalism will sooner or later mature, and move into the Eventual Success Mode. The symptoms of success will come quickly, because the modern environmental movement is now fully capable of solving the complete sustainability problem. Why? Because it is now pushing on high leverage points. And why is it doing that? Because of a correct analysis, instead of a faulty one.

Going deeper, what is the cure? In retrospect, it will be breathtakingly simple: the process fits the problem. Why will it fit it now? Because environmentalism has grown up and adopted Analytical Activism (or an equivalent process) as its central problem solving process. This process is only slightly more complex than Classic Activism. It is a formal process, not an informal one. It is analytical, not intuitive. And it uses structural thinking instead of event oriented thinking, which allows activists to “see” the real structure of the sustainability problem for the first time.

What will happen once we can do that?
Chapter 1

Why the Environmental Movement Needs the Right Process

In October 2004, the environmental movement awoke to the sobering truth: it had lost its way and was becoming terminally ineffective. The message was delivered in a most unexpected fashion: at the annual retreat of the Environmental Grantmakers Association. There, two established environmentalists, Michael Shellenberger and Ted Nordhaus, released a long essay titled *The Death of Environmentalism*. A special series on “the alleged Death of Environmentalism” in Grist Magazine summarized the essay’s main thrust this way:

“The paper—based on interviews with 25 leaders in the mainstream environmental movement...—argues that environmentalism is ill-equipped to face the massive global challenges of our day, particularly climate change. The movement has become a relic and a failure, the authors say, coasting on decades-old successes, bereft of new ideas, made fat and complacent by easy funding, narrowly defining ‘environmental’ problems, and relying almost exclusively on short-sighted technical solutions.

“Mainstream green organizations’ varied legislative and legal victories—and their cumulative membership rolls of some 10 million plus—don’t cut it for [the authors of the paper]. These achievements, they claim, take place against the backdrop of a broader failure to offer the American people an expansive, inspiring, values-based vision.

“They conclude that the environmental movement should meet its re-maker, as it were, and give way to a more cohesive, coordinated, and ambitious progressive movement.”

What went wrong? How could a movement that was so successful in the 1970s become, as the essay called it, “just another special interest” only a few decades later?

*The Death of Environmentalism* did not answer this question. Nor did it even prove that it was true. But most do not, and so in the end, the essay served mostly to create a firestorm of disagreement and confusion, along with some honest self-examination. The latter is such a good thing and so long overdue that I suspect the net effect of the essay was beneficial.

Carl Pope, Executive Director of the Sierra Club since 1992, weighed in with a long and scathing rebuttal. He pointed out that “Their case is not only flimsy, it is internally contradictory and misleading.” I would tend to agree, though it did get a lot of people thinking.

However, the real jewel in Pope’s response for me was this: “If the paper offered a clear and constructive path forward, the internal contradictions of the analysis would matter less.”

Let’s explore what may be a clear and constructive path forward.

Solving the Urban Decay Problem

The failure of the environmental movement is a classic example of an intuitively obvious and widely supported solution that, while it worked well at first on easier problems, failed spectacularly on the more difficult ones. This has happened before.

In the 1950s and 1960s, urban decay and the symptoms it caused were America’s biggest problem. It would eventually reach the crisis stage with the Los Angeles race riot of 1965, which left 34 people dead. Other riots occurred in Newark and Detroit. The problem continued to deteriorate, and in 1968 Martin Luther King Jr. was assassinated, which sparked further riots, including some in the nation’s capitol. The riots, high levels of crime, growing discrimination and race hatred, and a host of factors increased white flight from inner cities. Businesses also moved out. This made the urban decay problem even worse, causing a vicious cycle. Despite a plethora of attempted solutions, the problem failed to get better. By the late 1960s the problem looked hopeless.

Into this void stepped Jay Forrester of MIT in 1968. Twenty one years later, in a fascinating address to the international meeting of the System Dynamics Society in 1989, he described how he began helping to solve the
urban decay problem, along with the reactions he encountered: (Italics added)

“John F. Collins, who had been mayor of Boston for eight years, decided not to run for re-election. MIT gave him a one year appointment as a Visiting Professor of Urban Affairs, bringing him into the academic orbit to meet students, interact with faculty, and advise the administration on political issues. Collins had been a victim of polio in the epidemic of the mid 1950s and walked with two arm canes, so he needed an office in a building with automobile access to the elevator level. The building with my office was one of the few that qualified. The professor next door to me was away for a year on sabbatical leave, so John Collins ended up in the adjacent office.

“In discussions with Collins about his eight years coping with Boston urban problems I developed the same feeling that I had come to recognize in talking to corporate executives. The story sounded persuasive but it left an uneasy sense that something was wrong or incomplete. So, I suggested to Collins that we might combine our efforts, taking his experience in cities and my background in modeling, and look for interesting insights about cities. He immediately asked how to go about it. I told him we would need advisers who knew a great deal about cities from personal experience, not those whose knowledge came only from study and reading. We needed people who had struggled with cities, worked in them, and knew what really happens. And furthermore, we would not know what would come of the effort, or how long it might take.

“The process would be to gather a group that would meet half a day a week, probably for months, to seek insights into the structure and processes of cities that could explain stagnation and unemployment. Collins listened and said, ‘They’ll be here on Wednesday afternoon.’ Collins’ position in Boston at that time was such that he could call upon almost anybody in politics or business, ask for their Wednesday afternoons for a year, and get them. He delivered the people and it was out of the following discussions that Urban Dynamics developed.

“Urban Dynamics was the first of my modeling work that produced strong, emotional reactions. As you know, it suggested that all of the major urban policies that the United States was following lay somewhere between neutral and highly detrimental, from the viewpoint either of the city as an institution, or from the viewpoint of the low-income, unemployed residents. The most damaging policy was to build low-cost housing. At that time, building low-cost housing was believed to be essential to reviving the inner cities.

“The conclusions of our work were not easily accepted. I recall one full professor of social science in our fine institution at MIT coming to me and saying, ‘I don’t care whether you’re right or wrong, the results are unacceptable.’ So much for academic objectivity! Others, probably believing the same thing, put it more cautiously as, ‘It doesn’t make any difference whether you’re right or wrong, urban officials and the residents of the inner city will never accept those ideas.’ It turned out that those were the two groups we could count on for support if they became sufficiently involved to understand. That is a very big ‘if’—if they came close enough to understand.

“Three to five hours were required to come to an understanding of what urban dynamics was about. Urban officials and members of the black community in the inner city would become more and more negative and more and more emotional during those three to five hours. If they were not a captive audience, they would walk out before they understood and accepted the way in which low-cost housing was a double-edged sword for making urban conditions worse. Such housing used up space where jobs could be created, while drawing in people who needed jobs. Constructing low-cost housing was a powerful process for creating poverty, not alleviating it.

“My first experience with reactions to Urban Dynamics came soon after the book was published [in 1969]. We had been running a four-week urban executive’s program twice a year for department-head level people from larger cities to teach various aspects of management. A group was convening shortly after Urban Dynamics came out. I was asked to take a Monday afternoon and a Wednesday morning to present the Urban Dynamics story. I have never had a lecture on any subject, any place, any time go as badly as that Monday afternoon. In the group was a man from the black community in New York who was a member of the city government. He was from Harlem, intelligent, articulate, not buying a thing I was saying, and carrying the group with him. At one point he said, ‘This is just another way to trample on the rights of the poor people and it’s immoral.’ At another point he said, ‘You’re not dealing with the black versus white problem, and if you’re not dealing with the black versus white problem, you’re not dealing with the urban problem.’ And when I said decay and poverty in Harlem in New York or Roxbury in Boston was made worse by too much low-cost housing, not too little, he looked at me and said, ‘I come from Harlem and there’s certainly not too much housing in Harlem.’ That is a sample of the afternoon.

“On Tuesday evening, a dinner was held for the group. Neither Collins nor I could go; but several of our students attended. One student called me at home in the evening to report what was fairly obvious anyway—that
the group was very hostile. On that bit of encouragement, I started Wednesday morning.

“An hour into Wednesday morning, the New Yorker’s comments began to change character. He was no longer tearing down what was being said. His questions began to elicit information. Two hours into the morning, he said, ‘We can’t leave the subject here at the end of this morning. We must have another session.’ I ignored the request to see what would happen next. In about twenty minutes, he repeated it. I agreed to meet them again if he could find a time and place in the program. I was not trying to put him off; however, that usually ends such an exchange. But he went to the administration and scheduled another session.

“Later he made an appointment to come to my office to ask that I talk to a group he would invite in New York—his colleagues on his home turf. He sat in my office as relaxed as could be and said, ‘You know, it’s not a race problem in New York at all, it’s an economic problem,’ after telling me four days earlier that I was not even addressing the urban problem if I was not dealing with the black versus white issue. He gave me a report out of his brief case documenting the amount of empty housing in every borough of New York and the rate at which it was being abandoned. My point had been that too much housing meant that there was too much for the economy of the area to support. He had all the proof right in his brief case. He simply had not realized what his knowledge meant until it was all put together in a new way.

“Two years later a journalist asked me what people thought in the aftermath of Urban Dynamics. I suggested that he talk to others, and especially with the man in New York whom I had not contacted in the intervening two years. After the interview, the journalist called me to report that he had been told that ‘they don’t just have a solution to the urban problem up there at MIT; they have the only solution.’ The lesson about urban behavior had stayed clear and alive for two years even back home in his native environment. The five hours of exposure to Urban Dynamics had made a lasting impression.

“But we have not solved the challenge of how to bring enough people across the barrier separating their usual, simple, static viewpoint from a more comprehensive understanding of dynamic complexity.” 5

The first point of this long passage is that intuitive, common sense solutions to complex social system problems are usually wrong. When faced with proof that a solution they have supported is wrong, people tend to go into denial and anger. But if someone takes the time to explain why a solution is wrong, as Jay Forrester and John Collins did, people generally come around to a new realization, and can even become strong supporters of an alternative and correct solution.

It is my fond belief that this will happen to the many people who are now so strongly behind the environmental movement, as it is practiced today.

Why the Environmental Movement Has Lost Its Way

There is an easy-to-difficult environmental problem continuum, with easy problems at one end and difficult problems at the other. An easy problem has a relatively low number of sources, has clear proof of cause and effect, affects a small percentage of producers and consumers, has a small displacement in time and space, and has a relatively easy and cheap solution. A difficult problem is just the opposite. As problems move up the scale of easy-to-difficult, the present structure of the human system causes them to be harder and harder to solve, mostly because there is more solution adoption resistance. Let’s apply this abstraction.

The first point of the long passage was that intuitive, common sense solutions to complex social system problems are usually wrong. The second point follows from the first: If a problem solving process tailored to the problem type is not used, then you cannot expect to solve the problem unless it is so easy that your everyday approach is sufficient.

This has been the case for environmentalism. Most environmentalists, organization managers included, use an ad hoc, common sense, event oriented approach to solve environmental problems. This works fine on everyday problems. It also works fine on easy environmental problems, which are the ones the environmental movement encountered at first. But when it is applied to more difficult problems, like the ones the movement encountered after the easy problems were solved, it fails most of the time. When it does succeed, it is luck that has allowed success, not problem solving ability.

An example of an easy problem was the ozone layer depletion problem. While it looked like a tremendously difficult problem at the time, it was not. It fit the pattern of easy environmental problems. It was caused mostly by a single type of behavior: chlorofluorocarbons (CFCs) released into the atmosphere from air conditioners and refrigeration equipment. It had solid proof of cause and effect, after scientific studies were completed. The problem source involved a relatively small segment of society: the CFC manufacturing and use industry. And finally, it had a relatively easy and cheap solution: switch to a substitute.

These factors made ozone depletion an easy problem, despite its apparent size and complexity. Easy environmental problems do not produce much solution
adoption resistance. As a result, by the 1990s the ozone depletion problem was largely solved.

But it is the only difficult global problem that was. The rest, such as climate change, groundwater depletion, topsoil loss, deforestation, and abnormally high species extinction rates, remain unsolved. The reason is they do not fit the pattern of an easy problem, and are therefore beyond the capabilities of the conventional problem solving approach. This is the fundamental reason why the environmental movement has lost its way. It lacks the proper problem solving process.

A process is a repeatable series of steps for achieving a goal. For example, doctors have a standard procedure for diagnosing many types of illnesses, starting with the symptoms. Other examples of processes are a constitution, Robert’s Rules of Order, the method of long division, and the Scientific Method. All are a much better and more predictable way of accomplishing a goal than no process or the wrong process.

Environmentalism Is Not Yet Environmentalism

Environmentalism could find its way again, if it looked over its shoulder at another group of problem solvers who finally did find their way.

Their turning point occurred in the early 17th century. They were a small band of dedicated problem solvers who, once they had found their way, went on to bring more benefits to mankind than any other group in history. The string of benefits includes the amazing life spans we see today, the quantum leap in agricultural production efficiency, and the innumerable creature comforts that technology has brought, such as the way you can fill your living room with the perfect sound of the Vienna Philharmonic, and if you wish, an image of the story of Tolkien’s Lord of the Rings so real the mind is transported into a different reality. This string of new benefits shows little sign of stopping any time soon, because this band of problem solvers has found the ultimate tool.

These are the scientists. Their tool is the Scientific Method.

If environmentalists and environmental organizations are serious about solving difficult environmental problems, they will sooner or later be forced to make the same discovery that scientists made centuries ago. Science discovered that unless it used a problem solving process tailored to the problem type, it was doomed to eternal failure, punctuated by a small number of seemingly random successes. We now know these were lucky guesses. Science did not become science until it adopted the Scientific Method, perfected by Sir Francis Bacon and René Descartes in the early 17th century after almost 2,000 years of effort.

Environmentalism will not become environmentalism until it adopts a similar and suitable method.

Identification of the global environmental sustainability problem is now more than a generation and a half old. If the problem solving process presently used is good enough to solve the problem, it would have been solved by now. If the present approach is continued, then problem solvers are essentially doing the same thing scientists did before they adopted the Scientific Method: relying on trial and error. If a problem has a small number of solutions to try, and there is plenty of time, and erroneous solutions do not make the problem worse or insolvable, then trial and error can work. This is not the case with the difficult problems the environmental movement now faces.

After a thousand years of the Second Dark Ages, Europe entered the Second Age of Reason in the 17th century, principally because of the effects of the Scientific Method and similar rational problem solving methods derived from it. Also known as The Enlightenment, The Second Age of Reason emphasized the use of reason over dogma and evidence over time honored assumptions that were too often false. According to
wikipedia.com, “The movement’s leaders viewed themselves as a courageous, elite body of intellectuals who were leading the world toward progress, out of a long period of irrationality, superstition, and tyranny which began during a historical period they called the Dark Ages.”

It could happen again.

The Three Dark Ages

The First Dark Age ended when Aristotle (582 to 496 BC) invented logic. People could now correctly reason out why their world behaved the way it did. The First Age of Reason began, and Western civilization began to flourish, starting in ancient Greece.

The Second Dark Age began around the time of the fall of the Roman Empire, as barbarians periodically swept over Asia and Europe, obliterating any hope of intellectual stability and progress. The church filled the void, but even there, the First Age of Reason had been snuffed out and replaced with dogma. This ended in the 17th century when the Scientific Method was perfected.

Now civilization has slipped into a Third Dark Age. It has become mired in mass self-destruction via environmentally unsustainable practices on a massive, global scale. Environmentalists will only be able to help civilization end this Third Dark Age and begin the Third Age of Reason if they adopt a suitable problem solving process.

The System Improvement Process

Let’s examine a problem solving process that could serve as a suitable starting point. This is the System Improvement Process. It is a simple, generic, highly analytical process designed to apply to all complex social system problems. It has four main steps. The first step defines the overall problem. The process then decomposes the overall problem into three subproblems, and uses steps 2, 3, and 4 to solve each of them. The three subproblems are:

1. **Change resistance** – This is resistance to adopting proposed solutions.
2. **Proper coupling** – This is moving from the present state to the goal state.
3. **Model drift** – The solution model must keep the system in the goal state. If it drifts too far the problem will occur again.

The first subproblem must be overcome so that the solution to the second subproblem can be implemented. The third subproblem must be solved to prevent overall problem recurrence.

The goal state of the system occurs when problem symptoms are reduced to acceptable levels. If the system is in the goal state or is moving there in time, the problem is considered solved. In the sustainability problem moving to the goal state is the same as the proper coupling of the human system to the greater system that it lives within, the biosphere, so that the health of the two systems is automatically maintained indefinitely.

Because the popular conception of the word “solution” refers to what is actually the second subproblem, in this book the term “solution” means the solution to the second subproblem, unless defined otherwise.

In problem solving jargon, the System Improvement Process provides an extremely efficient means of searching a large and unknown “solution space” for a solution that will work. The reduction of millions of possible solutions to one that will actually work is known as Solution Convergence, which must be preceded by System Understanding so that convergence happens quickly and correctly.

Here is an outline of the process:

1. **Problem Definition** – What is the problem? This is defined in terms of the goal state versus the present state of the system.

2. **System Understanding** – Why are the three subproblems occurring?
   2.1 Why is there such strong resistance to adopting the solution?
   2.2 Why is the system not naturally in the goal state?
   2.3 Why is the system not staying in the goal state?

3. **Solution Convergence** – How can the three subproblems be solved?
   3.1 How can adoption resistance to the solution be overcome?
   3.2 How can we move the system to the goal state?
   3.3 How can we keep the system in the goal state?

4. **Implementation** – Once a solution is found, the three subproblems are solved in this order:
   4.1 Overcome resistance to solution adoption.
   4.2 Move from the present state to the goal state.
   4.3 Stay in the goal state indefinitely.
The first step formally defines the problem to be solved. This greatly focuses all subsequent problem solving effort. The second main step seeks to understand the system’s leverage points so well that the third main step, converging on the solution, is relatively trivial. The fourth main step implements the solution.

Use of a process like this changes everything. It allows problem solvers to more easily proceed in an analytical fashion, one much more likely to solve the global environmental sustainability problem in time.

The four main steps are:

**Step 1. Problem Definition** – First the problem to solve is formally defined, in terms of the symptoms to be alleviated. This gives a clear, unambiguous definition of exactly what system behavior must change to consider the problem solved. The result is all problem solvers are now working on the same problem, with a minimum of effort. All work is now very focused.

**Step 2. System Understanding** – Next the system is examined, with a single guiding question: *Why are the three subproblems occurring?*

This question decomposes one large problem into three smaller, distinctly different problems, each of which is much easier to solve. For a difficult complex system problem, this has the effect of taking a giant Gordian knot of incompressible complexity and deftly turning it into three much simpler and therefore potentially solvable problems. *In practice this decomposition is so powerful it can transform a problem from insolvable to solvable.*

Unless the guiding question is answered deeply and correctly for all three subproblems, any solution selected cannot be anything more than an educated guess. Nor can the solution get to the root of the problem. These of course are the prime reasons why past solutions have failed—they were no more than intuitive hunches combined with political expediency, and failed to get to the fundamental causes of the problem.

The output of this step is a comprehensive model of understanding based on structural thinking, the core of which is a computer simulation model of the system and how it behaves. Note this is precisely what Jay Forrester had to do to solve the urban decay problem.

**Step 3. Solution Convergence** – Only after a high level of system understanding is reached does the Solution Convergence step begin. If the previous step has been done well, then this step is almost trivial. This is because system behavior is now predictable. It is now so predictable that solution search can very quickly converge on the solution with the preferred outcome.

Once that happens the problem is “solved.” The key output of this step is a collection of solution elements and an Implementation Plan.

**Step 4. Implementation** – The Implementation Plan is carried out. It uses three sequential and slightly overlapping phases to solve the three subproblems.

In the first phase, resistance to adopting the solution is overcome. This is the phenomenon of *change resistance*, which is very common in complex social system problems. The main reasons social agents resist change are strength of habitual behavior patterns, the one time cost of change, and the perception that an agent will be made worse off by the change. For the sustainability problem the last is the biggest factor. For example, most for-profit corporations are strongly resisting becoming sustainable because they perceive it will reduce short term sales and profits.

*In social systems, solution adoption resistance is usually the crux of the problem.* For example, in the global environmental sustainability problem, civilization knows by now what must be done: live sustainably. But it doesn’t want to take the next step and actually do it, for an intricate variety of reasons. Those reasons cause “change resistance,” which is the social side of the problem. This is what the first phase of the Implementation Plan overcomes. The second and third phases are much easier, and are explained elsewhere.

There are three main reasons for the success of the System Improvement Process. The first is decomposition of one large problem into many smaller problems. This is the main reason SIP is so powerful. The decomposition has two dimensions: the four main steps and the three subproblems. Solving these 3 subproblems using the 4 main steps gives SIP a total of 13 steps.

In a formal process like SIP, each process step is a problem to solve. Processes make work more efficient by redefining one big job into lots of much smaller and hence easier to perform jobs. When applied to difficult complex system problems, this decomposition is so powerful it can routinely transform a problem from insolvable to solvable.

Which would you rather try to solve: One big impossible problem or 13 little easy ones?

The second reason is the presence of the System Understanding step. It is usually almost totally absent from popular problem solving approaches. Yet this is where problem solvers should spend about 80% of their time.

The third reason is the process addresses the change resistance side of the problem. In difficult social problems this is usually the crux of the problem.
The Importance of Modeling

The third point of the long passage above is the importance of modeling. Jay Forrester would have been totally unable to help solve the urban decay problem without the tool of simulation modeling. It was a form of Gedanken (thought experiment) that lay at the heart of his process.

*All conscious decisions are based on mental models.* However the mind has its limitations. If a thought experiment is too big to be adequately represented by a mental model, then its representation requires a tool that can handle a bigger model than the mind can. For complex social systems, the only known tool that can do this well is the one Jay Forrester invented: computer simulation modeling.

A formal model can not only handle a larger model than the mind can. It can also handle it correctly. This is because the human mind is notoriously unable to handle what have become known as feedback loops. A feedback loop exists when a change in one node of a system results in changes elsewhere that ultimately come back to affect the node still more.

The special series on “the alleged Death of Environmentalism” in Grist Magazine also had this to say: (Italics added)

> “Of all the points made by [the Death of Environmentalism essay], perhaps the most telling is in a follow-up post on the Breakthrough Institute blog: ‘Nearly every profession, from public health to business to law, has research studies, conferences, and peer-review journals dedicated to evaluating what’s working and what’s not. … The environmental community has nothing like this.’”

> “Evaluating what’s working and what’s not” is the use of a formal process that employs a critical feedback loop. This loop improves one’s mental and/or physical models of the world. Every time an experiment or solution attempt is tried, the results can be evaluated to see if the hypotheses of the proposed solution was confirmed or denied. Such a loop would look about like the one shown, which illustrates The Extraordinary Power of Modeling.

Let’s walk through this reinforcing feedback loop starting at the top, using the convention of underlining the name of each node. The loop is first created when a mental or physical model begins to be constructed. This increases the completeness and correctness of the model. This in turn increases the number of phenomena it can explain, which also increases the number of problems it can solve. This quite naturally increases the number of solution successes. If each success is examined to see what can be learned from it from the viewpoint of the Scientific Method, then this increases experimental verification of hypotheses. Each hypothesis is a rule of cause and effect. Simplifying, a rule is a model node, so this in turn increases the completeness and correctness of the model, and the loop starts all over again. It grows and grows, because it is self-reinforcing.

Those familiar with the Scientific Method may have noticed that the loop is also an expression of that. The “model” in the loop is the body of scientific knowledge built up over a period of time. Knowledge is the same as a model of understanding of the world. Thus the loop could also be named The Extraordinary Power of the Scientific Method.

The environmental movement has no such loop, as the above quote from Grist Magazine pointed out. The loop is not at all difficult to build, as so many other fields have shown. Until such a loop is built, environmentalism is not yet environmentalism, nor is it science.

The Folly of Pushing on Low Leverage Points

The better the model, the better the understanding of a complex social system. Such systems are so chock full of feedback loops that unless they are modeled, their behavior will remain a mystery. The unaided mind will be unable to understand any but the simplest cases.

This is because hidden feedback loops cause social systems to behave counterintuitively. You expect them to behave one way, but upon trying a solution based on that assumption, they behave in a different, often highly unexpected way. This leads to the trap of pushing on low leverage points to solve a problem, such as happened in the urban decay problem. This is the trap the environmental movement has fallen into, which is explained in chapter two.

Why do people use low leverage points again and again? The founder of the field of system dynamics, Jay Forrester, has this to say: (Italics added)
“Social systems are inherently insensitive to most policy changes that people select in an effort to alter behavior. In fact, a social system draws attention to the very points at which an attempt to intervene will fail. Human experience, which has been developed from contact with simple systems, leads us to look close to the symptoms of trouble for a cause. But when we look, we are misled because the social system presents us with an apparent cause that is plausible according to the lessons we have learned from simple systems, although this apparent cause is usually a coincident occurrence that, like the trouble symptom itself, is being produced by the feedback loop dynamics of a larger system.”

To solve a problem, the System Improvement Process first defines the problem. Then it analyzes in great detail exactly why the problem is occurring. If this is done well, two things become obvious: One is where the low leverage points are that problem solvers have been pushing on. Because they are low leverage, pushing there fails to solve the problem. The second is where the high leverage points are.

This is an extremely powerful way to analyze social system problems, because the results cast bright spotlights on those places in the structure of the human system that are making the critical difference. At last problem solvers can see why they have been failing. They’ve been pushing on low leverage points and didn’t realize it. That’s now as clear as day. And because they can also see what they have to do differently to solve the problem, a whole new alternative to the folly of pushing on low leverage points almost magically appears: push on the high leverage points instead! That too is clear, so clear that what to do is now blindingly obvious.

What exactly is leverage? What do we mean when we say we must push on high leverage points to have the highest probability of solving complex social system problems, given the low amount of force that most social problem solvers tend to have, such as environmentalists?

Leverage is the ratio of change in input to change in output. A low leverage point is a place in a system where a small amount of force causes a small change to system behavior. A high leverage point is a place in a system where a small amount of change force (the total effort required to prepare and make a change) causes a large amount of predictable, favorable response.

An example of a low leverage point would be pushing on the side of a ship to change its course. This would require a large amount of force to have the intended effect. But if the high leverage point of pushing on the rudder is used instead, it takes only a small amount of force to achieve the same effect.

At a favorable high leverage point a small structural change to a system can cause the system to behave much more favorably. Only the use of the correct high leverage points can solve a difficult complex social system problem.

For example, consider the very simple event chain of A causes B and B causes C, where C is the problem symptom. Pushing at B is direct force, but pushing at A is indirect. In this case, if there are no further causes of A, B, or C, then A is the root cause. This is the most common way people see their world—as one that consists of events, event chains, and root causes. This is event oriented thinking.

Let’s examine a second case using a structural thinking viewpoint: Suppose A causes B, B causes C, C causes D, and D causes A. This is a feedback loop. Because we have gone deeper and are now correctly seeing dynamic systems as composed of many feedback loops, we can no longer go to the end of an event chain and blithely declare that to be the root cause. Instead, the so called root cause is the structure of the system. Structure is the shape of a system’s key feedback loops.

Event oriented thinking is seeing the world as consisting of events, event chains, and root causes. Better is structural thinking, which sees the world as what it really is: a complex interacting structure of nodes, relationships, and feedback loops. The key tenet of struc-
tural thinking is the behavior of a system is an emergent property of its structure.

Simple problems are simple enough to be solved by event oriented thinking. They are easy to solve because they yield to root cause analysis, which means following one or more event chains all the way to their end, where the root cause lies. On the other hand, difficult social system problems are the result of hidden, illusive, totally counterintuitive feedback loops. This makes them impossible to solve using traditional root cause analysis, because feedback loops have no end.

Therefore, in order to solve the difficult problems we now face, environmentalists must abandon thinking in terms of events and simplistic root causes, and switch to thinking in a wholly new way: the behavior of a system is an emergent property of its structure.

Summary and Conclusions

The environmental movement has indeed lost its way, as results have shown. And, as The Death of Environmentalism pointed out, it has no credible plan for finding its way.

This has happened before. The failure of the environmental movement has a historic parallel: the US urban decay problem. There problem solvers also tried intuitively obvious solutions for so long that the system threatened to soon turn into mass self-destruction.

The urban decay problem was solved by the application of simulation modeling. As that model showed, the four leading solutions turned out to range from outcome neutral to highly detrimental. None were actually helping to solve the problem. But as the model also showed, there was a surprisingly simple workable solution that had not been seriously tried. The lesson here is environmentalists must model to avoid the same trap.

The environmental movement has lost its way because it is now where science was before scientists adopted the Scientific Method as their central problem solving process. Environmentalism will not become a true science until it adopts a similar and suitable method. Only after it has found the right process can the environmental movement lead humanity out of the Third Dark Age and into the Third Age of Reason.

This can be done only by the rigorous use of a formal problem solving process that fits the problem type. An example of such a process is the System Improvement Process. Most importantly, it addresses the social side of the problem.

This process employs the powerful tools of structural thinking and simulation modeling. Skillful application of these tools will lead problem solvers away from the low leverage points they are currently pushing on to high leverage points. Only the use of the correct high leverage points can solve a difficult complex social system problem.

This is not to say that every environmentalist needs to become a process and modeling expert. But it does mean that every environmental organization should be driven by a suitable process and have sufficient structural thinking and modeling skills at its disposal, unless it is one of the few that is working on problems so easy they do not require these tools.

Process driven problem solving and model centric reasoning are highly analytical techniques. They require high amounts of training and skill to do well. Probably more than 90% of the population has never been exposed to either of these skills. Thus the environmental movement has a sea change ahead. It is the same change that took science centuries to go through, and takes the average profession many decades. This has grave implications.

Such a transformation is so pervasive and deep, and runs so against conventional wisdom, that it qualifies as a paradigm change. Furthermore, the clock is ticking. The projections in the third edition of Limits to Growth in 2004 show that Homo sapiens has, at most, only a few decades left in which to change course.

Can environmentalists and environmental organizations go through this critical transformation in time?
Chapter 2

Why Environmentalists Are Facing Such Hostile Opposition

Chapter One concluded that the fundamental reason the environmental movement has failed to achieve its objective is that it lacks a suitable problem solving process. A suitable one, the System Improvement Process, was presented. Let’s examine a useful example of how it can be applied.

Step one of the process, problem definition, occurred in 1972 when Limits to Growth roughly defined the global environmental sustainability problem. That book, the Stockholm conference of 1972, and other events brought the sustainability problem to the world’s attention. Since then many dedicated problem solvers have worked on the problem. While there have been some small successes, such as the stratospheric ozone depletion problem, the overall problem has grown steadily worse. No comprehensive credible solution is in sight. As the third edition of Limits to Growth lamented in 2004, “humanity has largely squandered the past 30 years.”

Step two of the process involves understanding why the system with the problem behaves the way it does. This requires first understanding why there is such strong resistance to adopting the solution, which is the theme of this chapter.

Since the ascendancy of the George W. Bush administration in the United States in 2001, opposition to almost all environmental initiatives has grown to the point that problem solvers have been forced to fall back from trying to solve the problem to just trying to preserve what little progress they have made. By and large, they are failing.

Why is such strong opposition occurring? Why is there such a “harsh political climate,” as the Natural Resources Defense Council puts it? Why do we face “the most hostile environment in which we have ever struggled to advance our goals,” as the Union of Concerned Scientists describes it?

If we could understand in detail why political decision making works the way it does, then we could go further than we’ve ever gone before. We could find the high leverage points of the system that would allow changing that harsh political climate into one that actively welcomes solving the problem.

A Brief Introduction to System Dynamics

There is only one tool that will allow us to understand in detail why a social system works the way it does. This is the field of system dynamics.

System dynamics is an approach to modeling systems that emphasizes their feedback loops, using stocks, auxiliary variables, and flows of influence. Invented by Professor Jay Forrester of MIT in the late 1950s, system dynamics uses a standard visual notation and an interrelated collection of mathematical equations to mimic a system’s important structure, with the goal of gaining new insights into how and why the system works the way it does. A computer program then runs the equations, which simulates the behavior of the system. The chief output is graphs showing the dynamic behavior of the system under the assumptions used for each particular simulation run.

The great advantage of system dynamics is the way it captures all your important assumptions about how a system behaves, and then allows you to accurately simulate the emergent behavior of the system. The unaided mind cannot do this, except for the simplest of systems. This provides a powerful tool for solving social system problems.

Most of the power of system dynamics can be grasped by understanding its visual notation and the concept of feedback loops. The basic “stock and flow” notation consists of arrows, constants, variables, and stocks. To make this easier to read we add feedback loop names and loop type indicators showing whether a loop is reinforcing or balancing. These six elements are all it takes to produce diagrams that can represent the behavior of any social system. A seventh element, mathematical equations, is then added to the variables and stocks so that the model can be run. But equations are not part of the visual diagrams, so we will not explain them here.

To learn how the first six elements are used to describe systems, let’s examine the model on the next page:
This is the simplest possible realistic stock and flow model. It contains four nodes: the birth rate, Population, percent growth rate, and initial population. The arrows indicate the relationships between the nodes, which is the “flow” of influence in a stock and flow model.

A stock is an important quantity that changes over time, such as Population. Stocks form the foundation of all stock and flow diagrams, because they represent the chief items of interest and contain the “memory” and hence the momentum of the system. Everything else basically determines how the stocks behave. Because stocks are so important they are indicated by boxes and are capitalized.

A constant stays the same over time. The percent growth rate constant in our simple model is 1 percent. The initial population constant is 10 people.

A variable is a less important quantity that, like a stock, also changes over time. The two arrows coming into the birth rate node indicate that the nodes they come from are used to calculate the birth rate, which equals the percent growth rate times the Population.

When the model is run, its dynamic behavior is captured in the graph above. Over a 500 year period the simulation run shows that Population grows exponentially. It grows so high that once it passes 350 it goes off the chart. This is what always happens if a reinforcing growth loop is present and there are no limits to its growth. A reinforcing feedback loop exists when a change in one node causes changes elsewhere in the system that ultimately cause further change in that node in the same direction.

A balancing feedback loop works just the same, except that the further change occurs in the opposite direction.

The circled “R” indicates the Population Growth loop is a reinforcing loop. An increase in the Population in one year causes a further increase in the next year.

Infinite loop growth in the real world is impossible, because all reinforcing loops are balanced by at least one balancing loop. To build a more realistic model, a Population Fall balancing loop could be created by adding a percent death rate constant and a death rate variable. All real world dynamic systems consist of at least one reinforcing loop and at least one balancing loop.

That’s all there is to the visual notation. Then there are the patterns of how all dynamic systems behave:

“The most fundamental modes of behavior are exponential growth, goal seeking, and oscillation. Each of these is generated by a simple feedback structure: growth arises from [reinforcing] feedback, goal seeking arises from [balancing] feedback, and oscillation arises from [balancing] feedback with time delays in the loop.”

These three fundamental modes combine to form all other dynamic behavior patterns. The most common other patterns are S-shaped growth, growth with overshoot, and growth with overshoot and collapse. Below are the fundamental and common modes. The last, overshoot and collapse, is the one we are trying to avoid by proactively solving the sustainability problem.

Using these simple concepts, system dynamics can model the important behavior of any social system problem. This allows such behavior to be rapidly and correctly understood, which is exactly what is required to solve difficult complex social system problems.

Next we apply this tool to the social side of the sustainability problem.
The Invention of System Dynamics

We have already discussed what system dynamics is and why it so vital to the sustainability problem solver’s toolkit. But how was the tool invented? Here, in Jay Forrester’s own words, is the story:

“At the Sloan School of Management at MIT, I found myself at times in conversation with people from General Electric. They were puzzled by why their household appliance plants in Kentucky were sometimes working three and four shifts and then a few years later, half the people would be laid off. It was easy enough to say that business cycles caused fluctuating demand, but that explanation was not convincing as the entire reason.

“After talking with them about how they made hiring and inventory decisions, I started to do some simulation. This was simulation using pencil and paper on one notebook page. It started at the top with columns for inventories, employees, and orders. Given these conditions and the policies they were following, one could decide how many people would be hired in the following week. This gave a new condition of employment, inventories, and production. It became evident that here was potential for an oscillatory or unstable system that was entirely internally determined. Even with constant incoming orders, one could get employment instability as a consequence of commonly used decision-making policies. That first inventory control system with pencil and paper simulation was the beginning of system dynamics.”

Notice how the invention of a powerful tool did not require anything fancier than a pencil and paper, and one more thing: a sharp eye.

The Dueling Loops of the Political Powerplace

We begin our quest to understand how the system works by using the same tool that *Limits to Growth* used: system dynamics. Only this time, instead of modeling the technical side of the problem (economics, technology, the environment, and demographics), let’s model the social side of the problem (human decision making).

This is critical, because society knows what it must do to survive: live sustainably. There are countless practical ways we could do that, which is the technical side of the problem. But for strange and mysterious reasons most of society is strongly resisting doing them. This is change resistance, which is the social side of the problem. Thus the social side of the problem is the crux.

There are two feedback loops in the human system that, in the large, affect citizen’s lives more than anything else. They are the loops that politicians use to gain supporters.

Over time, social evolution has pared the many strategies available for gaining political support into just two main types: the use of truth (virtue) and the use of falsehood and favoritism (corruption). For example, a virtuous politician may gain supporters by stating, “I know we can’t balance the budget any time soon, but I will form a panel of experts to determine what the best we can do is.” Meanwhile, a corrupt politician is garnering supporters by saying, “Economics is easy. You just put a firm hand on the tiller and go where you want to go. I can balance the budget in four years, despite what the experts are saying. They are just pundits. Don’t listen to them. A vote for me is a vote for a better future.”

The corrupt politician is also saying, to numerous special interest groups, “Yes, I can do that for you. No problem.” Guess who will usually win?

The use of corruption to gain supporters is the dominant loop in politics today. Corruption consists of falsehood and favoritism. Most politicians use rhetoric, half truths, glittering generalities, the sin of omission, biased framing, and many other types of falsehood to make themselves look as appealing as possible to the greatest number of people possible.

Particularly when an election is drawing near, most politicians use the *ad hominem* (Latin for against the man) fallacy to attack and demonize their opponents. For example, the use of the Swift boat ads in the 2004 US presidential campaign to attack John Kerry’s character were an *ad hominem* fallacy, because they had nothing to do with Kerry’s political reasoning or positions.
Other terms for the *ad hominem* fallacy are demagoguery, shooting the messenger, negative campaigning, smear tactics, and sliming your opponent. Finally, once in office nearly all politicians engage in acts of favoritism, also known as patronage.

Politicians are forced to use corruption to gain supporters, because if they do not they will lose out to those who do. This causes a **Race to the Bottom among Politicians** to appear, as shown.

To understand how this loop works, let’s start at the bottom. **Corrupt politician influence** is used to broadcast as much falsehood as possible to potential supporters. It is also used to promise and give out as much favoritism as possible. All this is done with speeches, interviews, articles, books, jobs, lucrative contracts, special considerations in legislation, etc. The falsehood and favoritism is a cunning blend of whatever it takes to gain supporters. **The end justifies the means.**

Note that the more influence a politician has, the greater the amount of favoritism they can plausibly promise and deliver.

The greater the falsehood and favoritism, the more people who will make decisions to support corrupt politicians. This causes commitment to occur, which moves people from the stock of **Uncommitted Supporters** to **Degenerate Supporters**. This in turn increases corrupt politician influence even more, and the loop starts all over again. As it goes around and around, each node increases in quantity, often to astonishing levels. The loop stops growing when most supporters are committed, though in extreme cases it continues growing anyhow.

A **degenerate** is someone who has fallen from the norm. They have degenerated. The loop explains why this occurs so easily. The term is not meant as a pejorative label, but rather as a hopefully temporary fall from virtue.

*This is the loop that is driving politics to extremes of falsehood and favoritism in far too many areas of the world. This loop is the structural cause behind most of the corruption and bad decisions in government today.*

The race to the bottom employs a dazzling array of deception types. These are usually combined, which increases their power. Here are four of the main types:

**False promise** – A false promise is a promise that is made but never delivered, or never delivered fully. False promises are widely used to win the support of segments of the population, such as organized special interest groups, industries, and demographic groups like seniors or immigrants. False promises flow like wine during election season. The next time you see this happening, think of it as proof the race to the bottom exists, and as proof that few politicians can escape the pressure to join the race to the bottom.

**False enemy** – Creating a false enemy works because it evokes the instinctual fight or flight syndrome. The brain simply cannot resist becoming aroused when confronted with a possible enemy.

The two main types of false enemies are **false internal opponents**, such as negative campaigning, the Salem witch trials, and McCarthyism, and **false external opponents**, such as communism and the second Iraq “war.” While communism and Iraq were true problems, both were trumped up enormously to serve the role of a false enemy. False enemies are also known as scapegoats. They can also be used to divert the public’s attention from more important issues. Name-calling is one technique used to create a false enemy, but the biggest is fallacious arguments, better known as lies.

**Pushing the fear hot button** – When a politician talks about almost everything in terms of terrorism, or communism, or crime, or threats to the quality of medical care, and so on, that politician is pushing the fear hot button. It is very easy to push. Just use a few of the right trigger words, throw in a dash of plausibility, and the subconsciousness is automatically hoodwinked into a state of fear, or at least into wondering if there is something out there to fear. Whether or not an enemy actually is out there doesn’t matter—what matters is that we think there might be one.

Fear clouds the judgment, making it all the harder to discern whether there really is an enemy out there. Because we cannot be sure, we play it safe and assume there is at least some risk. Since people are risk averse, the ploy works and we become believers. We have been influenced by statements of what might be lurking out there. Our fear hot button has been pushed and it worked.

What is the best way to push the fear button as hard as possible forever? Why perpetual war, of course, such as the “war on terrorism.” *Because war can then be used to justify anything, a false perpetual war is the ultimate deception.*

**Wrong priority** – Wrong priorities stem from hidden agendas. A **hidden agenda** is a goal a politician wants to achieve but does not want his supporters to know about, because he knows they will not like it.

There are many ways a hidden agenda can come about. A politician may support a certain ideology, and so bends everything to support the goals of that ideology. Or maybe he has accepted donations and/or voter support from special interests, such as corporations, and so must promote their agenda. Or maybe he had to cut a deal by agreeing to a position he doesn’t like in order to get other politicians to support his own position. And so forth.
A politician with a hidden agenda must make the wrong priorities seem like the right ones in order to achieve what’s on the hidden agenda. How can he do this? For a corrupt politician such matters are child’s play—manipulate the public through false promises, create a false enemy, push the fear hot button hard and often, repeat the same lie over and over until it becomes “the truth,” and so forth.

The low priority that environmental sustainability receives from most governments today is rapidly becoming the textbook example of how devastating the results of the wrong priorities can be.

Opposing the race to the bottom is the race to the top. The two loops are joined together as shown. Because each loop competes for the same Uncommitted Supporters, they are “Dueling Loops.”

In the race to the top virtuous politicians compete for supporters on the basis of the truth. No favoritism is used, because those who tell the truth treat everyone equitably. Virtuous politicians can help improve things so that society benefits as a whole, but they cannot promise or give anyone more than their fair share.

The race to the top works the same as the race to the bottom. The crucial difference is that in the race to the top, the size of the truth cannot be inflated. Virtuous politicians cannot promise more than they can honestly expect to deliver. Nor can they use favoritism to inflate expectations of how well they can help their supporters.

Thus the race to the bottom has an inherent structural advantage over the race to the top. This is the key to understanding how to solve the problem. A corrupt politician will promise more, evoke false enemies more, push the fear hot bottom more, pursue wrong priorities more, and use more favoritism than a virtuous politician can. The result is the race to the bottom is normally the dominant loop.

The two loops are locked in a perpetual duel for the same Uncommitted Supporters. In addition, each politician has his or her own loop, and battles against other politicians for the same supporters. It is these many loops and the basic dueling loops structure that forms the basic structure of the political powerplace.

The dueling loops structure offers a clear and extremely useful explanation of why environmentalists are facing such a harsh and hostile political climate. This strong opposition occurs because a dominant race to the bottom causes corrupt politicians to work mostly for the selfish good of Degenerate Supporters, instead of working for the common good of the people. In other words:

The Race to the Bottom Is Easily Exploited by Special Interests

Exploitation is the use of others to increase your own competitive advantage, at the cost of theirs. Because this is so obviously self-destructive to those being exploited, deception is required to pull it off.

The race to the bottom provides the perfect mechanism for political exploitation. Each politician has his or her own loop. There is also a hierarchy of loops, since a politician’s supporters can be other politicians. At the top of each hierarchy is the top politician, such as a president, political strategist, or party. Whoever is at the top has tremendous leverage. Thus the dueling loops structure greatly amplifies the power of the exploiter.

Exploitation frequently occurs when a special interest group has interests that conflict with those of society as a whole. Common examples are religious fundamentalists, the rich, the military, and large corporations. The latter two make up the infamous military industrial complex.

A corrupt politician, by accepting donations (legal bribes) and votes in return for favoritism, becomes beholden to the special interest groups involved. If a special interest is powerful enough, it can control and exploit a political system by clever use of the race to the bottom. This is exactly what is happening today. The global political system is by and large being exploited by:
The New Dominant Life Form

Let’s define a life form as any independent agent that follows the three fundamental requirements of evolution. These requirements are replication, mutation, and survival of the fittest.

Here’s a question: What life form has the ability to replicate instantly with almost no expenditure of energy, can mutate during replication or at any time thereafter, and, when it has failed in the battle of survival of the fittest, sells little pieces of itself to its competitors in order to minimize its own pain of death? These are fantastic powers no human could hope to have. But what if we go further, and ask what life form has the miraculous power of being in many places at the same time, has an infinite life span, and can cleave off chunks of itself and have them instantly come alive? That would make it a formidable competitor around any other plant or animal. Darwin would be astounded.

But there’s more. What life form totally dominates mankind, by controlling most jobs in developed countries, by determining the path of nearly all of new technology, products, and services, by controlling elections and political decisions more than any other life form, and by defining the very evolution of culture to its advantage through demand advertising, ownership of the media, and new product design? If that is not enough, what life form controls the billions of boxes in our homes that provide us with most of our “news,” and most of our new knowledge once we have finished school, while at the same time subconsciously indoctrinating us to be high volume, complacent consumers? To top it off, what life form is spreading exponentially from industrialized countries to the rest of the world, and will soon dominate them all? The answer is obvious: It is the modern corporation, which is the New Dominant Life Form. Thus the dominant life form on Earth is no longer Homo sapiens. Instead, it is the modern corporation and its allies.

This is the real enemy environmentalists are battling. The Bush administration, as well as with others before it and around the world who oppose sustainability, are mere proxies for the real opponent: the modern corporation and its allies. Its allies include many of the

The World’s 100 Largest Economies

Corporate revenues versus country GDP for 2000 in millions of US$

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Corporate Revenues</th>
<th>GDP</th>
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</thead>
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<td>BP</td>
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<td>NTT</td>
<td>$100,789</td>
<td>$72,849</td>
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In terms of corporate revenues versus national gross domestic product (GDP), of the 100 largest economies in the world in the year 2000, 53 were corporations. Of the 190 countries in the world, ExxonMobil, the largest corporation on the planet, is larger than 170 of them. Because the economic subsystem is the prime driver of the modern human system, is there any doubt as to who is now the dominant intelligent social agent?
rich, the military, politicians, and special interest groups, such as the religious right.

Please note this is not an indictment of all corporations and their managers. Most are doing the best they can, and are basically good. Each agent, from its own perspective, is behaving rationally. It is the life form as a whole that has the emergent property of behaving unsustainably.

The goal of an agent determines its behavior. The goal of most corporations is to maximize the net present value of profits. The goal of most individuals, once they have gotten past the survival and security stage, is to maximize quality of life for themselves and their descendents.

**These goals are mutually exclusive.** As a result, as things get better for the New Dominant Life Form they get worse for the previously dominant life form: *Homo sapiens*. For example, as Gross World Product continues to rise, sales and profits soar to unprecedented heights. However, so does pollution and natural resource depletion. While these effects are delayed, it is only a matter of time before the quality of life for *Homo sapiens* begins to fall.

Previously corporations were artificially created entities designed to serve their masters: people. But now the relationship has been reversed. It is the modern corporation who is now the master, and people are its servants. But because most people cannot find another master to work for, they have no choice but to work for this one. This makes them really a slave to a new master.

However, “slave” has strong connotations that sound too much like rhetoric. It is also not quite the correct definition of this relationship. We need a better word.

According to former US Senator S. I. Hayakawa in *Choose the Right Word: A Contemporary Guide to Selecting the Precise Word for Every Situation*, a “slave refers to someone who is owned by another and has no civil rights, particularly someone who serves involuntarily or is given no pay for services performed.” Hayakawa discusses the nuances of the meanings of *slave, bondman, bondmaid, thrall, and vassal*, before arriving at *serf*: “Under feudalism, a *serf* was bound to an estate and could not leave it; whoever owned the land was perforce the *serf’s* master.” This, I believe, is very close to the relationship between the New Dominant Life Form and *Homo sapiens*. But here people are not bound to the land. They are bound to corporatism.

To more precisely indicate this shade of meaning, let’s coin the word **ideoserf** to mean “someone who is bound to an ideology, as serfs were bound to the land.” The term is close to ideologue (someone infected by an ideology), but more apt, because it indicates the bonded, involuntary nature of the relationship.

While ideoserf applies to any ideology, we will use it almost exclusively to apply to the ideology of the New Dominant Life Form. Hereafter this book will use “ideoserf” instead of “slave” to indicate those members of society who have become enslaved to the ideology of the New Dominant Life Form, and so, zombie like, think and walk and talk so as to promote the interests of their master before all else.

**Why Conventional Wisdom Fails**

Given this model of behavior, why does the conventional approach to solving the environmental sustainability problem fail?

The standard solution is to employ the race to the top to spread as much truth as possible about the problem. This is intended to gain enough support to solve the problem.

The truth is spread by lobbying, articles, environmental magazines, interviews, demonstration projects, scientific reports, and so on. By now there is overwhelming evidence that mankind must change course soon, so this approach has tremendous appeal.

However, this approach only works on those who can see the real truth and are not already committed to supporting corrupt politicians and their ideologies. Therefore which of the two dueling loops is dominant depends on who can spread the most truth versus who can spread the most falsehood and favoritism. Because falsehood and favoritism allows corrupt politicians to inflate the value of what they can offer their supporters, corrupt politicians have an inherent advantage. The race to the top could only dominate if its special interest groups were much more powerful than those associated with the race to the bottom. However, this is not the case. Corporations are typically able to outspend environmentalists by one or two orders of magnitude. Thus corrupt politicians have a second advantage: the ability to spend much larger amounts of money on deception. When these two advantages are combined, they become unbeatable.

Therefore pushing on “more of the truth” is a low leverage point. There is very little gain for a large amount of effort. Environmentalists simply do not have the force (wealth, numbers, and influence) necessary to make pushing on this point a viable solution.
The Basic Process of Classic Activism

Classic Activism and Why It Fails

Another way to explain why conventional wisdom fails is to examine the main problem solving approach of environmentalism, Classic Activism, and see why that is failing to solve the problem. This analysis leads to the same conclusion: “more of the truth” doesn’t work.

Classic Activism has been used for centuries by citizen groups, particularly progressives, to solve problems that governments are not addressing. Examples are discrimination, women’s suffrage, the dangers of smoking tobacco, and the plight of the poor. If it is extremely successful, then governments assume solution responsibility. The basic high level process is shown above.

The process starts with discovery of the problem symptoms, which causes step 1. Identify the problem to be solved. The symptoms are caused by the proper practices are not being followed. For example, the symptoms of environmental degradation are caused by too many people not following the proper practices that would make their behavior sustainable. Proper practices are not being followed has three causes:

**Cause A** – If the problem is new, problem solvers must start with the first cause: **A. The proper practices are not yet known.** This can be solved by step 2. Find the proper practices. For example, renewable energy sources can be developed, tested, and proven to be effective.

**Cause B** – Once the proper practices are found, classic activists move on to the second cause, which is: **B. People don’t know about the proper practices or don’t know why they should follow them.** This is to be expected if the proper practices are new. This can sometimes be solved by step 3. Tell people the truth about the problem and the proper practices. The truth can be spread by lobbying, articles, environmental magazines, interviews, conferences, demonstration projects, scientific reports, and so on. For easy problems, solutions 2 and 3 are enough.

**Cause C** – But in more difficult problems there is a third cause: **C. People don’t want to follow the proper practices, even though they are fully aware of them and why they should logically follow them.** Here the standard activist strategy is to 4. Exhort, inspire and bargain with people to get them to support the proper practices. This is attempted with eloquent writing, passionate speeches, pleadings with decision makers, bargaining with concerned parties, demonstrations, marches, confrontational stunts to shock the public into coming to its senses, and so on. This can work for some medium difficulty problems. However, for certain types of difficult problems, solution 4 does not work.

Most what-to-do environmental literature falls into the three main branches of this process. For example, *Silent Spring* was a superb mixture of solutions 3 and 4, with a little bit of 2. *Natural Capitalism*, a book about how corporations can take the lead and create the “next industrial revolution” by switching to more environmentally sustainable technology, uses mostly 2 and 3. Al Gore’s *Earth in the Balance* is mostly 3. Environmental and nature magazines, such as *Sierra, National Wildlife,* and *Audubon,* are 3 and 4. 3 is also known as education on the facts or “appeal to logic.” 4 is the “appeal to emotion” side of the facts, also known as rhetoric.
Most environmental organizations also rely exclusively on 2, 3, or 4 to achieve their goals. Lawsuits to comply with existing environmental regulations would seem to fall outside of 2, 3, or 4. However, this is enforcement of the legal truth by telling judges about the truth of the facts involved. It is thus a form of 3. Lobbying is mostly 3, with a dash of 4. Scientific research into alternative energy, sustainable agriculture, recycling, ways to reduce population, and so forth is a form of 2. Extremist actions such as sit-ins and blocking nuclear test sites are forms of 4. So are demonstrations, marches, and publicity stunts. Polls, such as how strongly people support a clean environment, are a form of 3. They are “the truth” why decision makers should enforce proper practices.

**Why “The Right Inspirational Vision” Will Not Work**

Given these two models of system behavior, the dueling loops of the political powerplace and Classic Activism, let’s see where the *Death of Environmentalism*’s main solution fits in. This essay was introduced in chapter one. It is well worth examining in more detail because it seems to embody the very essence of conventional wisdom.

As I read it, the essay’s central argument is that environmentalism is failing because it is not promoting The Right Inspirational Vision. The essay hammers this theme home again and again, with assertions like:

“But in their public campaigns, not one of America’s environmental leaders is articulating a vision of the future commensurate with the magnitude of the crisis.” – Page 6.

“…Our failure to articulate an inspiring and positive vision.” – Page 14

“Perhaps the greatest tragedy of the 1990s is that, in the end, the environmental community had still not come up with an inspiring vision, much less a legislative proposal, that a majority of Americans could get excited about.” – Page 16.

“…a disturbing sign that, once again, environmentalists are putting the technical policy cart before the vision-and-values horse.” – Page 23

“We could find nobody who is crafting political proposals that, through the alternative vision and values they introduce, create the context for electoral and legislative victories down the road.” – Page 25.

“Most environmental leaders, even the most vision-oriented, are struggling to articulate proposals that have coherence.” – Page 26.

“What’s so powerful about Apollo is not its 10-point plan or its detailed set of policies but rather its inclusive and hopeful vision for America’s future.” – Page 27.

“Once environmentalists can offer a compelling vision for the future…. And once we have an inspiring vision we will have the confidence we need to…” – Page 30.

“A positive, transformative vision doesn’t just inspire, it also creates the cognitive space for assumptions to be challenged and new ideas to surface.” – Page 31.

The theme of “we must find The Right Inspirational Vision” was so strong the word vision was used 34 times in the 31 page body of the essay. But what exactly does the term mean, as used here? It appears to be an inspiring truth that someone wants others to accept and strive to achieve. In this sense it is a goal. This agrees with Webster’s definition, which is “a vivid, imaginative conception or anticipation.”

I would agree that a vision of where to go is important. But strident insistence that The Right Inspirational Vision is the solution is just plain wrong. It is a seductive trap environmentalists must avoid. The reason is The Right Inspirational Vision is the same as The Right Truth.

A vision is really a collection of perceived truths that a person or group wants to spread to others. Therefore The Right Inspirational Vision is the same as “more of the truth,” which is more of steps 2, 3, and 4. As the dueling loops of the political powerplace model showed, environmentalists do not have the force necessary to make that solution work, because it uses a low leverage point. And, as the model of Classic Activism shows, The Right Inspirational Vision is the same as a little of step 2, a medium amount of 3, and a lot of 4.

Now we can see the fundamental flaw in *The Death of Environmentalism*. While it was correct in its assessment that environmentalists are failing to achieve their objectives, its argument that the correct way forward is The Right Inspirational Vision is the same as saying, “Let’s wrap a new vision of a sustainable world in a new package, make it compelling and inspirational like we’ve never done before by adding better values and political appeal, and get people to rally behind it.” While similar strategies did work for other movements, such as racial discrimination and women’s suffrage, “more of the truth” will not work on difficult environmental prob-
lems because of the dominance of The Race to the Bottom among Politicians, and the very strong resistance to adopting a solution this causes.

In addition, The Right Inspirational Vision has been tried many times before. A typical example may be seen in the book Progress As If Survival Mattered: A Handbook for a Conserver Society, by Friends of the Earth, 1977. In 20 cohesive, factual, logical, compelling and inspirational essays, it laid out a complete vision of where the planet and all its citizens needed to go. The first essay, by David Brower (Sierra Club Executive Director from 1952 to 1969), led off with these memorable words:

“What kind of country do you want? What kind of world? What kind of neighborhood on a small planet? If you have asked yourself such questions, we think you will like this book. If you haven’t, you need it.”

Unless I’m missing something, this book and many others provided The Right Inspirational Vision not once but many times. If these visions were going to work, they would have done so by now. But they have not. Our analysis has shown why.

Furthermore, the environmental movement already has a sufficiently correct and inspiring vision. The global and the American environmental movements, almost from their inception, have pointed out that society, including America, needs to be fully sustainable. Al Gore’s Earth in the Balance even laid out “a global Marshall Plan” for how to do that as fast as possible. Natural Capitalism, Progress As If Survival Mattered and numerous other works have done the same. In 1992 the United Nation’s Agenda 21 program committed the world community to a comprehensive global vision.

Thus the assertion in The Death of Environmentalism that “But in their public campaigns, not one of America's environmental leaders is articulating a vision of the future commensurate with the magnitude of the crisis” is a false red flag. They don’t need to articulate such a vision, because it is already there. The problem that remains is the movement has not been able to figure out a way to achieve that vision. The goal is there but the means are not.

How might the environmental movement be able to achieve this vision? To find out, we need to examine:

How the Movement Can Go
Beyond Classic Activism

Let’s resume our discussion of Classic Activism. That process has three main solutions: 2, 3, and 4. What does the environmental movement do when these fail to work, and opposition not only continues, but becomes even more harsh and hostile? Almost exclusively more of the same, but stronger. Why is this?

Jay Forrester not only saw why problem solvers are so often attracted to low leverage points, he also saw why they persist in pushing on those points even in the face of repeated failure. In 1969, he wrote in Urban Dynamics that:

“Commonly in complex systems a vicious cycle develops in which the action erroneously assumed to be corrective makes the problem worse and the worsening calls forth still more of the presumed remedial action, which only further aggravates the situation.”

In the case of the global environmental sustainability problem, failing to solve it is making it worse. Corrupt politicians and special interest groups also push back even harder when problem solvers try “more of the truth.” This also makes the problem worse.

Because there is little doubt that global environmental degradation is continuing and catastrophe lies ahead unless the problem is solved now, more of 2, 3, or 4 is obviously needed. This results in even “more of the truth,” such as The Right Inspirational Vision or a global Marshall Plan. This fails to solve the problem and causes even more pushback. The problem grows worse, causing even more of 2, 3, and 4 to be applied. The vicious cycle Forrester identified grows and grows.

Basically, since Classic Activism has no other solution strategies than the above, it piles error upon error by continuing with more of steps 2, 3, or 4. What else can environmentalists do?

Just as scientists did in the 17th century when they adopted the Scientific Method, environmentalists could face reality, admit their error, and adopt a process tailored to the problem type. For environmentalists this could be something like the System Improvement Proc-
Chapter 2. Why Environmentalists Are Facing Such Hostile Opposition

Step 2.1 asks the question, “Why is there such strong resistance to adopting the solution?”

Nowhere in Classic Activism are problem solvers asking that question deeply. If they did, they would abandon putting so much effort into solution 4 and replace it with a problem solving branch that would look like the one shown below.

1. Why is this?
   Resistance to adopting the solution is occurring
2. Why is this?
   The race to the bottom among politicians is dominant
3. Why is this?
   The general ability to detect political deception is too low

By asking a series of the correct “Why?” questions, problem solvers would soon arrive at an adequate explanation for the reason cause C is occurring. The diagram shows that in this case it takes three high level why questions to do this. Let’s walk through them one at a time.

By now it is painfully obvious that people don’t want to follow the proper practices, even though they are fully aware of them and why they should logically follow them. This leads to the first why question: “Why is this?”

The process has anticipated the question because it occurs so often in complex social system problems. The reusable answer is resistance to adopting the solution is occurring. If problem solvers were following a suitable process, it would lead them this far, and then ask “Why is this?” a second time.

The answer, as we explained above, is the race to the bottom among politicians is dominant. However we are not done. The process says to keep asking why until you have fully answered the first why question.

Finding the answer to the second why question required building a simulation model of the problem. The model shows that under present conditions the race to the bottom is dominant. This makes answering the third why question, “Why is this?” relatively easy, because we know the structure of the social system involved.

The answer is the general ability to detect political deception is too low.

Classic Activism has failed to solve the global environmental sustainability problem because as a process, it does not ask these why questions. Because it doesn’t ask them, it has not discovered that:

**There Is a High Leverage Point that Has Not Yet Been Tried**

We have extremely good news. There is a high leverage point in the human system that has not yet been tried. It is what the third why question found: the general ability to detect political deception is too low. Pushing there appears to give problem solvers the greatest possible chance of solving the problem.

The dueling loops model presented here is simplified. It doesn’t show general ability to detect political deception. This affects how well falsehood and favoritism work. If ability to detect deception is low, then it works like a charm. But if it is high, then it doesn’t, and the race to the bottom cannot collect as many supporters as the race to the top.

My estimate is that currently the general ability to detect political deception is low, somewhere around 20%. A simulation model of the political powerplace using the dueling loops and other factors shows what would happen if the ability to detect deception was raised. As shown in the graph below, as ability to detect deception rises to about 50%, the race to the bottom (degenerate supporters) begins to collapse. As it rises still further to 80% or more, the race to the bottom collapses altogether, and the race to the top (rational supporters) becomes dominant.

![Run 6 - 100 Year View of the Political Powerplace](image)

Notice how the percentage of degenerate supporters starts at much more than the percentage of rational supporters. This is what we mean when we say “the race to the bottom is dominant.” After the ability to detect deception is raised this is reversed. The new state is “the race to the top is dominant.”

The graph shows crossover (when dominance shifts from the race to the bottom to the race to the top) takes
over 40 years. Because the model is not yet calibrated (the numbers used in it are estimated, not measured), this is not an accurate prediction. However, it does look as if it will take a long time. Will it take too long? That is one of the great questions facing problem solvers and civilization.

How problem solvers could best push on this high leverage point is covered in chapter three. For the simulation model behind the graph and much further detail, please see the manuscript for *A Model in Crisis* at www.thwink.org.

Ability to Detect Deception can be seen at the lower right of the diagram on the right, which we will not discuss in detail here. This is a “stock and flow” simulation model, the same type so successfully used in Urban Dynamics and Limits to Growth.

The diagram shows the key subsystem of the actual simulation model explaining why solution adoption resistance is so strong. Note the seven well named feedback loops, such as Return to the Age of Reason, which is my favorite. It is these loops that appear to explain the fundamental reasons why the political powerplace behaves the way it does, and where the low, medium, and high leverage points are. Once problem solvers know how to read models like these, the social systems they represent become as transparent and predictable as is humanly possible.

Environmentalists must be able to discuss social structures like this fluently if they are to have any hope of developing effective solution strategies for difficult problems. Hopefully the day will come when, instead of endlessly debating inspiring visions and classic activist strategies that fail repeatedly, when environmentalists get together they will spend most of their time excitedly drawing models on anything they can get their hands on, even walls and watermelons. They will be trying to name their feedback loops with insightful, memorable terms that evoke exactly what each loop does. Discussions will become centered on trying to find a comprehensive model that explains each issue they are concerned with. This is because once these models of understanding exist, system behavior becomes predictable. And once that occurs, the effect of alternative solutions becomes so predictable that converging upon the final solution is now, as they say, child’s play.
Summary and Conclusions

We promised to explain why environmentalists are facing such hostile opposition. The reasons are subtle. Finding them requires the structural thinking tool of modeling and the use of a process tailored to the problem type, such as the System Improvement Process.

By going beyond the technical side of the sustainability problem to the social side, which is the crux of the problem, we arrived at the dueling loops model. This consists of The Race to the Bottom among Politicians battling against the race to the top for the same supporters. Whichever loop can offer uncommitted supporters the most perceived benefits wins.

The race to the bottom has an inherent structural advantage over the race to the top. This causes the race to the bottom to be dominant most of the time. Because the race to the bottom requires generous amounts of falsehood and favoritism to work, that is what characterizes politics today.

The modern corporation and its allies is the New Dominant Life Form. Because it is the dominant special interest, it controls the race to the bottom, and thus the political systems in industrialized countries. It doesn’t control all of each system, but it controls enough to cause the rules of the game to be defined in its favor. It also controls enough to acquire the favoritism needed to remain dominant. In this manner the modern corporation has become humanity’s master, and most of us it’s compliant, uncomplaining ideoserfs. An ideoserf is someone who is bound to an ideology, as serfs were bound to the land. An ideoserf is also called an incognizant proxy.

Corporations are each in their own life or death struggle, based on who does the best at maximizing the net present value of profits. This causes the life form as a whole to be locked into a preference for unsustainable behavior. Because corporations are the dominant life form, this in turn causes the entire system to be locked into the mode of unsustainability.

There is no one reason, no one root cause, why environmentalists are facing such hostile and successful opposition. Rather it is a multiplicity of factors which have caused the structural dynamics of the social side of the system to behave this way. Hostile and successful opposition to sustainability is an emergent property of the structure of the system.

Because the structure of the human system is largely invisible, most problem solvers have responded by pushing on an inviting but low leverage point. This is to spread as much truth as possible about the environmental sustainability problem, and hope that people will see why solving it proactively is in their own best interests and take appropriate action.

This solution, known as Classic Activism and “more of the truth,” has become the modus operandi of the environmental movement, and is thus the only solution the movement has. It works on easy problems but fails on the difficult ones, which includes the most urgent problem of them all: climate change. Despite repeated failure, different versions of this solution keep reappearing ad infinitum, because environmentalists have no other solutions.

A key finding of the analysis is that “more of the truth” is a low leverage point. Pushing on this point fails because it is no more than a heavy handed, naive attempt to make the race to the top dominant through the application of brute force. It does not consider that the race to the bottom is inherently stronger and has a more powerful special interest group behind it. Thus conventional solutions have no hope of succeeding, unless the laws of physics change or a “wakeup call catastrophe” occurs in time. Neither appears likely.

Fortunately there is at least one way out. It is the high leverage point of general ability to detect political deception. Currently this is low. If problem solvers can raise it to a high level the race to the bottom will collapse, leaving the race to the top dominant. Politicians will then respond to the truth about the global environmental sustainability problem because it will now be in their best interests. If they come to the same conclusion that environmentalists have, that sustainability is civilization’s top priority and nothing else comes close, then civilization will at long last enter the Age of Transition to Sustainability.
Chapter 3

How to Raise the General Ability to Detect Political Deception

WHAT WE ARE ABOUT TO PRESENT MAY SOUND HOPELESSLY NAÏVE. At first glance it may appear there is no earthly way it could work. Indeed, this is the way people reacted at first to Jay Forrester’s analysis of the urban decay problem. As the first chapter related:

“The conclusions of our work were not easily accepted. I recall one full professor of social science in our fine institution at MIT coming to me and saying, ‘I don't care whether you're right or wrong, the results are unacceptable.’ So much for academic objectivity! Others, probably believing the same thing, put it more cautiously as, ‘It doesn't make any difference whether you're right or wrong, urban officials and the residents of the inner city will never accept those ideas.’”

What is really happening here, at the deepest appropriate level of abstraction? The 19th century German philosopher Arthur Schopenhauer knew exactly. He put it this way, in what has become one of the most well known quotes in the advancement of science:

“All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as self-evident.”

The articulate, intelligent man from Harlem in Forrester’s story passed through these three stages in a matter of days. On Monday he ridiculed what Jay Forrester was presenting when he said, “I come from Harlem and there's certainly not too much housing in Harlem.” Next, as one of Forrester’s students reported Tuesday evening, “the group was very hostile.” At that point the man was in the second stage. Four days later when he said to Forrester, “You know, it's not a race problem in New York at all, it's an economic problem,” he had reached the third stage. He had accepted the full truth of the model of urban dynamics, along with its counterintuitive but undeniable conclusions.

I now ask you to put yourself in that man’s shoes, because the truth that is about to be presented may be just as unacceptable—at first.

The truth is that if experimental confirmation shows the analysis presented in chapter two to be sound, then the solution elements presented in chapter three have a high probability of solving the problem, however unconventional and counterintuitive they may appear to be.

However, this is part of an even greater truth, a greater conceptual whole. This is the causal chain that leads from problem discovery to successful solution when the proper problem solving process is applied. How this looks is shown on the next page.

Emphasis on the complete problematique is a systems thinking concept promoted by Aurelio Peccei, an Italian industrialist who founded the Club of Rome in 1968. His point was that for the incredibly complex and interlocking problems global society now faces, only a sufficiently complete analysis of the meta-problem can realistically expect to solve any of the subproblems. 17

The chain holds only if each link in it is strong. As Aurelio Peccei so presciently observed over 30 years ago, a correct solution can only follow a correct analysis of the complete problem.

Let’s review the process presented and used in our approach to solving the sustainability problem. The System Improvement Process has these four steps:

1. Problem definition
2. System understanding
3. Solution convergence
4. Implementation
The chain starts with problem discovery. Unless it is a simple problem, the next step must be selection of the right process. Applying the right process leads to correct analysis of the complete problem, which is steps one and two of the System Improvement Process. If this is done well, then the analysis leads to a correct solution, which is steps three and four of the process.

If this chain is conceptually sound, then failure to solve the problem can only be due to one or more weak links in the chain. Failure to solve the problem has clearly occurred. This forces us to ask: Which link or links in the chain are weak?

My conclusion is that the second link in the chain, the right process, is the culprit. My reasoning on why this is so runs like this:

In 1972 the international bestseller Limits to Growth brought the global environmental sustainability problem to the world’s attention. This and other events spawned the modern environmental movement. Since then millions of environmentalists have relentlessly attempted to solve the problem. Some success has occurred. But this has been only on the easy problems, the low hanging fruit. The more difficult problems, which are the ones where solution adoption resistance is strong, remain unsolved.

Here is a hypothesis for why this happened: Limits to Growth (as well as most other efforts) analyzed only the technical side of the sustainability problem. By modeling only the environmental, economic, demographic, and technology aspects, it left out the social side of the problem. This is the crux of the problem. In general, society knows what it must do: live sustainably, which is the technical side. But for rational reasons many powerful agents refuse to do so. This causes change resistance, which is the social side of the problem.

It appears no one has addressed the social side of the problem successfully, because the processes used (particularly Classic Activism) have not gone far enough beyond the analysis introduced in Limits to Growth in 1972. Thus the next step is to use a process that includes the social side, such as the System Improvement Process. This will allow us to tackle the complete problematique, in a manner comprehensive and mature enough to solve it.

This leads to the most fundamental truth of them all. It is the one that environmentalists must accept fully, if they are to improve their operative model and have any rational hope of solving the problem in time. This is the critical importance of using the right problem solving process.

Thus if the modern environmental movement wants to succeed, it must acknowledge this new truth, and build the proper second and third links in the chain. This will lead to a strong fourth link, which is the real goal of the chain. Doing a good job of this will probably require a collective effort, such as a coalition of leading environmental organizations, because of the large amount of investment, experimentation, coordination of effort, and expertise required. Or perhaps one bold organization will lead the way.

The right process link is the key link, because if it is strong, then the chain will hold. But if it is weak the chain will usually not hold, because the next link will usually not be a correct analysis. That is exactly what has happened here, and so the chain is broken. The result is the complete problematique has never been fully and correctly addressed.

Applying the Right Process

The right process, as Jay Forrester and so many others have shown, is a process with the right steps and the right tools for the problem at hand. If problem solvers take the wrong steps and use the wrong tools, then no matter how hard and long they try, a truly difficult problem will not yield to even heroic efforts except by luck. That occurs so seldom that it would be more
than a little irresponsible to bet the future of Homo sapiens on the wrong process.

This book is a modest demonstration of what happens when the right process is applied to the global environmental sustainability problem. To maximize the chance of solving this problem, as well as the other complex social system problems that have become entangled with it, in 2001 when I began work on this problem I paused and took the time to design an appropriate process from scratch. This is the System Improvement Process. It has four simple steps.

The first step is Problem Definition. The second step is System Understanding. This is where problem solvers should spend about 80% of their time. If the all important second step is done well, problem solvers (and anyone else, including decision makers) will understand the system with the problem so deeply and correctly that the third step, Solution Convergence, is almost trivial. Problem solvers will understand the dynamic structure of the system so completely that they can predict, within a broad range, how it will respond when low, medium, and high leverage points are pushed on. Solution Convergence then becomes a simple matter of selecting a reasonably straightforward way to push on the high leverage points. Because the correct points will be used, almost any form of pushing on them will do. A seemingly trivial solution is the payoff for using the right problem solving process.

Chapter two concluded that the general ability to detect political deception was the key high leverage point. If problem solvers can raise it to a high level, then the race to the bottom among politicians will collapse, leaving the race to the top dominant. Politicians will now be competing on the basis of who can provide the most benefits to society as a whole, based on the objective truth. It will not take them long to realize that their top priority needs to be global environmental sustainability, causing that problem to finally receive the full attention and commitment it deserves.

But that will never happen unless the general ability to detect political deception can be raised from low to high.

The Solution Convergence step of the System Improvement Process has discovered that it takes six solution elements to achieve this. The first is the foundation for all the rest. It is:

**The Freedom from Falsehood Solution Element**

Hindsight sharpens the vision. Most difficult social problems have, in retrospect, what appears to be a surprisingly simple solution. Looking back at history, it almost seems the bigger the problem, the simpler the solution. For example, the Magna Carta of 1215 introduced the idea that a ruler’s subjects have rights that must be respected by law. The invention of democracy gave a population the right to choose its own leaders, who must respect the population’s lawful rights. The ending of serfdom and slavery gave serfs and slaves the right to freedom from control by their former masters. Each of these solutions solved an age old, seemingly intractable problem with a solution so simple that we can now describe it in a single sentence. \(^ \footnote{Read this chapter, try to view it from at least two angles. One is that the solution presented may have a much higher probability of working than past solutions, because it is the product of a continuously improved problem solving process tailored to the problem, rather than a solution based on intuition and no formal process. The other is that I’m presenting in these chapters is an approach to solving the problem and a sample analysis and solution to illustrate the approach. It is not intended to be the analysis or the solution.}

Civilization remains saddled with a problem that is every bit as debilitating and exploitive as any problem the solutions above solved. Ever since politics began, corruption has been the norm. Corruption is so rampant that a “good” politician is not the one Diogenes could hold a lamp up to and say, “This is an honest man.” Instead, a good politician is one who is the least corrupt. That we are forced to choose from the lesser of the evils is pathetic and perverse. \(^ \footnote{But this need not be so. Diogenes would find an honest politician every time he held up his lamp if people had the right to Freedom from Falsehood.}

**Freedom from Falsehood** gives people the right to freedom from falsehood from sources they must be able to trust. This includes all “servants” of the people, such as politicians, public employees, and corporations. A **servant** is an agent created or employed by Homo sapiens to do something useful. All servants must remain subservient to Homo sapiens and keep the interests of humans above their own.

What is not prohibited by law is permitted by implication. Therefore if people do not have the legal right to freedom from falsehood, then by implication it is okay for those in positions of power to manipulate citizens by the use of lies, fallacies, the sin of omission, and all the forms of deception, propaganda, and thought control available.

Corruption relies on the use of falsehood to hide or rationalize favoritism. Eliminate falsehood, and you have eliminated favoritism. This is because once false-
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Hood is banished, politicians will be forced to compete for supporters on the basis of the objective truth. The truth includes the long term optimization of the general welfare of all members of Homo sapiens. Favoritism conflicts with this goal because it gives someone more than his or her fair share, and hence someone else less. This promotes the welfare of an elite few, rather than that of the many, so it is not the optimal allocation of a society’s resources.

If “we the people” do not have freedom from falsehood, then falsehood in all its Machiavellian and Orwellian forms will continue to appear again and again, because it is the surest way to rise to power, increase power, and stay in power.

However this new right alone will do little good unless falsehood can be detected. This is why we need:

The Truth Test Solution Element

The Truth Test is a personal skill, much like other skills such as frugality, language, and mathematics. It is designed to handle nearly all arguments the average person receives in seconds or minutes. The rest take longer or an expert.

The objective of the Truth Test is to reduce deception success at the individual level to a very low, acceptable amount. It consists of four simple questions:

1. What is the argument?
2. Are any common fallacies present?
3. Are the premises true, complete, and relevant?
4. Does each conclusion follow from its premises?

The Truth Test allows people to see the widespread fallaciousness of the arguments they receive from corporate proxies, such as corrupt politicians, many news sources, and articles. Once citizens can no longer be fooled by unsound arguments, they will elect better leaders and support better positions.

We certainly don’t expect the general population to master the Truth Test very soon. But we do expect those performing Truth Ratings (described below) to do so, as well as those who are trying for high Truth Ratings.

As the general population sees the published Truth Ratings and occasionally reads the details behind a rating they are particularly interested in, they will get a long, gradual exposure to how the Truth Test works. This and more direct educational efforts will gradually lead to truth literacy, which is the ability to tell truth from falsehood.

Universal truth literacy is just as important to society as reading literacy, because if people cannot “read” the truth, then they are blind to what the truth really is.

The average person is never taught anything like the Truth Test in school or the workplace. Thus their immunity to deception is largely a matter of cultural chance. For truth literacy to become a cultural norm and achieve its full success, it must become as essential to a person’s education as reading and writing.

History has shown again and again that those who are not truth literate become the unknowing slaves (really ideoserfs) of the masters of falsehood, as the cyclic nature of the race to the bottom versus the race to the top plays itself out over and over. A cycle ends when corruption becomes so extreme and obvious that the people rise up, throw the bums out, and become much harder to deceive for awhile. But as good times return, people become lax, and another cycle begins. These cycles never end, because presently there is no mechanism in the human system to keep ability to detect deception permanently high.

The appalling effects of this cycle, during which corrupt politicians and special interests are dominant most of the time, is historic evidence that truth literacy is more important to society than reading literacy. This applies even more so today as we enter the 21st century.
because if the truth is not seen in time, *Homo sapiens* will surely perish by his own hand.

### How the Truth Test Works Dynamically

Implemented properly, the Truth Test is true structural change. It works by introducing the reinforcing feedback loop shown below:

**The Dynamic Structure of the Truth Test**

The Truth Test lifts the blanket of deception higher and higher by the more you use the Truth Test, the more you benefit, and so the more you want to use it.

Once a person completes initial study of the Truth Test the cycle of **Lifting the Blanket of Deception** can begin. Use of the Truth Test increases the amount of falsehood spotted on everyday arguments. This increases quality of decisions. Once a person perceives this has happened, an increase in knowing you benefited from better decisions occurs. This causes that person to use the Truth Test even more, and the main loop starts over again.

Let’s examine the side loop. Knowing you benefited from better decisions will increase study of the Truth Test. This occurs when people realize that if they study the test more, they can handle a broader range of arguments and make better analyses. Or there may be a particular type of argument they would like to handle better. After the delay of learning, there will be a tendency to use the test more, because now it can offer them even greater benefits.

Nothing can grow forever, so these reinforcing loops have balancing loops associated with them. Examples are the increased time and cost of using the test, and the increased complexity or cleverness of arguments. Each of these causes diminishing returns, which keeps the **Lifting the Blanket of Deception** loop from growing forever. For simplicity these additional loops are not shown.

As just one example of how the Truth Test might affect society, imagine what a talk show might be like if the host was trained in the Truth Test and was familiar with Truth Ratings. After a particularly fallacious string of comments from a guest, such as one from a biased think tank, the host might reply with “By the way, while you and I have been talking, my assistant was jotting down how many fallacies and truths you uttered, and what kind. Did you realize that since you began ten minutes ago, out of a total of 24 propositions, 6 were *ad hominem* attacks, 4 were based on biased samples, and 8 were false enemies or pushing the fear hot button without any justification? This leaves only 6 reasonably true propositions. In other words, in my opinion your sequacious punditry is false 75% of the time. THAT is the real news here. And…, let me see, my assistant reminds me that it was about the same last time you were on. What do you say to that?”

The silence that followed might be the sound of the beginning of the race to the top.

The Truth Test provides a way for citizens of all kinds, including talk show hosts, to spot the truth. But it is a bit of a stretch to expect that truth literacy will sweep the world soon. The Truth Test also provides no incentive whatsoever for corrupt politicians to start telling the truth. For that we need:

### The Truth Ratings Solution Element

Truth Ratings would provide an accurate measure of the truth of what key politicians are saying and writing. If this objective can be achieved, then construction of a new reinforcing loop causing virtue to triumph over corruption in the political arena becomes possible. Once this new loop is established, it becomes increasingly difficult for political deception to succeed.

Truth Ratings work by rating the truth of important statements made by important politicians. They are similar to other types of ratings that have been around for a long time.

Credit ratings quantify the creditworthiness of a person, organization, or government. Product ratings, such as those in Consumer Reports magazine, quantify the worthiness of products. Both are widely used. Truth ratings would quantify the truthfulness of important arguments, such as those in political statements, articles, and so on.

A **truth rating** is the probability an argument is true. For example a few days after a presidential debate, its truth ratings would come out. They might say that candidate A averaged 45% true, while candidate B aver-
aged 70%. Guess which candidate would probably win the debate in the public’s mind?

If the organization doing the rating was credible and the public trusted the truth ratings, a race to the top would begin. Politicians would compete to see who could be the most truthful in the fullest sense of the word, and therefore the most helpful. Campaigns would become based on reason and truth rather than rhetoric. Due to a trickle down effect from the successful use of Truth Ratings, a race to the top would also begin in many other areas of society where less than the truth has long prevailed, such as advertising, the appeals of special interest groups, editorials, and to a growing degree, the news.

No one person can become an expert on the many critical issues of our day and spend hundreds and sometimes thousands of hours analyzing each important political argument they encounter. Therefore the public has no choice but something like Truth Ratings.

Instead of individuals continuing the impossible task of deciding the truth of each important argument, rating organizations would do that. Certified rating organizations would quantify the truthfulness of important arguments by applying the Truth Test and providing a written rationale for each rating, so that the public could make its own final judgment. As they read more about the logic behind ratings of interest, the public would gradually become educated in how to apply the Truth Test.

Efforts to provide the beginnings of Truth Ratings are springing up spontaneously. For example, in October of 2006 Eric Schmidt, chairman and CEO of Google predicted:

“…that, within five years, ‘truth predictor’ software would ‘hold politicians to account.’ Voters would be able to check the probability that apparently factual statements by politicians were actually correct, using programs that automatically compared claims with historic data.”

However, the truth of political arguments is not the only behavior that needs to be rated in order to establish the correct feedback loops. The overall corruption of politicians must also be rated. This is done with:

**The Corruption Ratings Solution Element**

A corruption rating is an overall measure of how corrupt a politician is. Corruption includes falsehood, favoritism, coercion, abuse, criminal activity, the giving or accepting of bribes, knowledge that corruption is going on, and so on.

A major component of a politician’s Corruption Ratings is past Truth Ratings. This would account for 40% or so of the rating. As a politician’s Truth Ratings go up, his or her Corruption Rating would go down.

Corruption Ratings would need to be done regularly, perhaps every two years. The running average of the last ten years or so would be a politician’s rating. Corruption Ratings would become as routine and cost about as much as a high level security check.

Truth Ratings and Corruption Ratings are examples of politician ratings. They would be calculated in a similar manner by certified independent organizations. Both could cause the race to the top to become dominant. Because it measures total corruption, Corruption Ratings would play the stronger role. However Truth Ratings are easier and cheaper to perform, and thus would probably make a difference first.

Politician ratings need not affect all voters to make the critical difference—only the swing voters, who are normally just 10% to 30%. Fortunately it is this group who is most likely to be receptive to a tangible, sound reason to choose one politician over another.

**The Analogy of Credit Ratings**

Politician ratings are analogous to credit ratings. To demonstrate how important credit ratings have become in just one area, the corporate bond market, here is an excerpt from testimony presented to the US Senate on March 20, 2002, to the Committee on Governmental Affairs, chaired by Senator Joe Lieberman:

> “Simply put, a credit rating is an assessment of a company’s credit worthiness or its likelihood of repaying its debt.

> “John Moody, the founder of what is now Moody’s Investors Service, is recognized for devising credit ratings in 1908 for public debt issues, mostly railroad bond issues. Moody’s credit ratings, first published in 1909, met a need for accurate, impartial, and independent information.

> “Now, almost a century later, an ‘investment grade’ credit rating has become an absolute necessity for any company that wants to tap the resources of the capital markets. The credit raters hold the key to capital and liquidity, the lifeblood of corporate America and of our capitalist economy. The rating affects a company’s ability to borrow money; it affects whether a pension fund or a money market fund can invest in a company’s bonds; and it affects stock price. The difference between a good rating and a poor rating can be the difference between success and failure, prosperity and bad fortune.”
In a similar manner, the difference between a good politician rating and a poor one would be the difference between success and failure for politicians, and prosperity and bad fortune for the public.

But even more interesting is the testimony went on to say:

“The government - through hundreds of laws and regulations - requires corporate bonds to be rated if they’re to be considered appropriate investments for many institutional investors.”

So too would the government require politicians to be rated if they were to be considered appropriate choices for many citizens. Credit ratings greatly lower the risk of financial loss. Corruption Ratings would greatly lower the risk of corruption. If they proved as successful as credit ratings, they would lower it by somewhere around 99%, which would make sizeable cases of corruption about as frequent as Halley’s Comet.

Presently Corruption Ratings are not required but corporate bond ratings are. This is one more example of how, over the centuries, the New Dominant Life Form has silently and relentlessly defined the rules of the game to be in its favor.

How Politician Ratings Work Dynamically

Like all deep structural change, politician ratings would cause important new feedback loops to become dominant. A diagram of these is shown. The main loop is **The Public Loves Those They Can Trust**. This is probably the most important feedback loop in the entire solution, because if it works, the whole solution will probably work.

Let’s start at the top of the main loop, on the **use of ratings of politician’s behavior** node. Suppose that node is activated because ratings have been implemented and are being regularly published for a few politicians. The ratings would at first be embarrassingly bad.

This would cause a politician being rated to want to improve the quality of his or her behavior in order to get better ratings. This causes an increase in **virtuous behavior**, which would lead to **better Truth and Corruption Ratings**. This would increase the relative advantage of a politician in the eyes of the public, because the public can now reliably tell whose arguments are more truthful and whose overall behavior is less corrupt, and thus who is a more trustworthy representative and more likely to get better results. This would increase **public support of the politician**, which would, in turn, increase their **election and reelection advantage**. The politician would know this happened. They would also know this benefited the people, so he or she would promote the use of ratings of politician’s behavior so as to gain an even larger advantage and more benefits for the people. The loop then starts over.

Because politicians would now be competing to get better and better in the quality of their behavior, a race to the top among politicians would begin. This would cause the race to the bottom to collapse, because its supporters would switch to the race to the top.

The effect of ratings on the behavior of *Homo politico* would be astounding. That sub species would be singing “The public loves those they can trust, those they can trust,” and other little ditties all the way to election day, and after that, to the next election day. *Homo citizenicos* everywhere would applaud, and join the chorus.

It is essential to understand the balancing loops that accompany the main loop.
If problem solvers don’t comprehend how the balancing loops work, they may be unable to design the most effective solution aspects, or they may have difficulty figuring out what went wrong if things go awry in implementation. They may fail to understand what is limiting how far the race to the top can go, so they may be unable to make it go far enough.

How the balancing loops work is too involved to cover in this brief chapter. For those curious about this, as well as the rest of the issues raised here, please see the manuscript for A Model in Crisis.

Returning to our discussion, what if there is no way for truth and corruption raters to get the facts they need, because they are hidden behind a wall of secrecy? This is why we need:

**The No Servant Secrets Solution Element**

The objective of No Servant Secrets is to prevent servants, particularly politicians and corporations, from using secrecy to their own advantage.

This is accomplished by complete openness in all that a servant does. No servant may keep competitive secrets of any type, either from their masters or other servants. After all, if a servant is an entity created or employed by the hand of man to provide him with goods and services, why should a servant need to keep any form of competitive advantage secret, except to gain advantage over its master or other servants?

Competitive secrets are a form of non-sharing and hence a form of non-cooperation. When combined with the mutually exclusive goals that servants have of each maximizing something, such as profits, this leads to a destructive competition mindset. But what we want is constructive competition, where agents compete in a friendly, let’s help each other manner. It appears that removing competitive secrets takes independent agents one step closer to cooperation. Therefore full and complete cooperation between servants and their masters, as well as between servants, requires no competitive secrets.

No Servant Secrets is short for No Competitive Servant Secrets. It covers many areas. Some could be tackled soon. Others would take time. A few are counterintuitive and controversial, though less so as the analysis and solution strategy is more fully absorbed. Ultimately all would be dealt with, because a servant that keeps competitive secrets from its master has time and time again proven to be a danger to its master. The transition would probably take several generations.

No Servant Secrets is part of the Servant Realignment Package, which has eight solution elements. Together these serve to reengineer the modern corporation so that its interests no longer conflict with those of *Homo sapiens*. Because there are so many elements, a very flexible, as-needed approach can be taken.

No Servant Secrets is already spontaneously appearing in the form of freedom of information acts, sunshine laws, and so forth. But these are a haphazard collection of ways to reduce servant secrecy. Competitive secrecy needs to be reduced to zero in a comprehensive manner, which No Servant Secrets finally does.

One type of servant secret is government secrecy. A standard objection to eliminating government secrecy is the need for “national security.” However this objection is really designed to benefit one country (and its military industrial complex) at the expense of others. Military secrecy is a form of competitive advantage. If countries truly want to cooperate instead of compete, then there is no need for military secrecy.

The standard rebuttal to this argument is that if I can’t keep secrets and my competitor can, then they will gain an advantage over me. Rubbish. The same logic can be used to argue if I can’t steal and my competitor can, they will gain an advantage. We have all seen that it is to society’s benefit as a whole to outlaw theft. The same is true for secrecy. A country insisting on military secrecy is a country refusing to cooperate for the common good of all.

Because national security secrets increase the destructive competition mindset, they increase international conflict and/or preparation for it, which in turn increases the sales and profits of military goods and services. This benefits the military industrial complex, and hence the New Dominant Life Form. But it does not benefit *Homo sapiens*. In fact, international conflict or the diversion of national output to military purchases (the guns or butter choice) does just the opposite.

Servants include corporations. No Servant Secrets would mean the end of all competitive corporate secrecy. No longer could corporations ply politicians with secret favors and donations, or secretly influence political decision making. No longer could they secretly receive political favors. Because all this would now be out in the open, it would stop, because corporations are loathe to draw criticism from the people or the press.

Corporate secrecy includes trade secrets, which would no longer be allowed. The standard defense of trade secrets is they are necessary to provide an incentive for invention. Without trade secrets, a corporation could not make enough profit to pay for innovation.

This argument is fallacious. If corporations are servants and are truly working for the good of their masters, then the incentive to innovate should come from the desire to serve their masters the best they can, rather
than to serve themselves as best they can. Trade secrets are really a form of selfishness.

Trade secrets are not necessary for scientists to innovate. Nor were they necessary for the long history of innovations that occurred up to modern times.

The real reason corporations want trade secrets is they are a form of competitive advantage. This greatly increases profits. But why should humans allow their servants to have any form of competitive advantage over other agents, which includes humans? There is no good rebuttal to that or the points raised above. Therefore trade secrets are not necessary and, because they are a form of secrecy that can be abused, they would not be permitted.

If any type of competitive advantage servant secrecy is allowed, then servants can use that as an excuse to hide all sorts of corruption from their masters. Thus No Servant Secrets means exactly that: No Competitive Servant Secrets of any kind.

Certain forms of non-competitive advantage servant secrecy would be allowed, such as passwords. This is because passwords serve as identification and ownership identifiers, rather than as a form of competitive advantage. Other allowed types involve personal information, law enforcement, jury deliberations, and so on.

A special note: Several careful readers have suggested that the section on No Servant Secrets be removed because it makes it too easy for the opposition to find a spot to attack successfully. But without No Servant Secrets, there is no way to fully and accurately implement Truth and Corruption Ratings. If servant secrets continue to be allowed, so much of the data needed for ratings will remain hidden behind a wall of secrecy that ratings will probably fail. Thus No Servant Secrets is the prerequisite for creating the key new feedback loops necessary to eliminate the current dominance of the race to the bottom.

**

Let’s assume that we have implemented the first five solution elements. These are Freedom from Falsehood, the Truth Test, Truth Ratings, Corruption Ratings, and No Servant Secrets. Would this be enough to raise the level of ability to detect political deception to a high enough level to solve the global environmental sustainability problem?

Not quite, because it lacks a measure of problem solving success. Lack of this has allowed many politicians (really corporate proxies) to more easily deceive the public, and has dissipated problem solving effort.

The measure of problem solving success would be:

### The Sustainability Index

#### Solution Element

The top problem facing humanity today is the global environmental sustainability problem, because due to large social and ecological delays, it must be resolved proactively now to avoid catastrophe later. To trick the public and politicians into not solving this problem now, there is a tremendous fear, uncertainty, and doubt (FUD) campaign underway. This campaign has been so successful that millions of citizens, corporate managers, and politicians have been hoodwinked into thinking that the problem does not even exist, is not that bad, is too expensive to solve, lies too far in the future to worry about, or is so full of uncertainty solution is not required. Environmental sustainability has become such a low priority, especially in the US, that it is no longer a significant factor in elections or the national agenda. The corporate FUD campaign has worked all too well.

But it could be stopped in its tracks if citizens and politicians could look up and see, every day, a number that told them point blank how bad the problem really is and a graph showing where the trend is going. The Sustainability Index would provide exactly that. It would be an accurate, universally understandable measure of how well society is doing on solving the global environmental sustainability problem.

Instead of fear about the problem being too expensive to solve, there would now be fear about the cost of not solving the problem. This would really be concern, not fear, because now citizens would be facing a known, measured problem.

Instead of uncertainty about the status or magnitude of the problem, there would now be easily understandable numbers measuring how sustainable the planet is.

Finally, instead of doubt about the accuracy of data, there would now be a strong sense of trust that the Sustainability Index was as correct as is humanly possible. And, instead of doubt the problem needs solving now, there would be just the opposite: a strong national or global desire to solve the problem as soon as possible.

While no single measure of environmental sustainability is perfect, it is possible for a single number to accurately summarize how sustainable society is on a global basis. This single measure is called the Sustainability Index. It measures how much of the earth’s carrying capacity is being used. If the index is over 100%, then it is unsustainable. Currently it is about 125%.

It will take more than one index to pilot planet earth into the Age of Sustainability. An example of these and how they might be presented is shown on the next page.

Here we have used the Ecological Footprint for the Sustainability Index, though any suitable measure would do. The carrying capacity of the earth is approximated...
Chapter 3. How to Raise the General Ability to Detect Political Deception

Dashboard for Piloting Planet Earth into the Age of Sustainability

Today's Sustainability Index is 125%

by the horizontal line. This line was crossed around 1985. The dashboard shows how, if the footprint line is projected a few decades ahead, it will grow to such a high level of overshoot that catastrophic collapse is inevitable. Now that we are in overshoot, the only question is how bad that will be.

The Best Case, Expected Case, and Worst Case scenarios would tell the world the true story. Everyone would be educated on what they mean. If society is doing too little to solve the problem, then people can immediately see that the Expected Case is still not good enough. (All data on the dashboard is estimated, except for the footprint up to 2003.)

The dashboard indexes would be as widely published as stock market indexes. Eventually, once a suitable data collection system was in place, they would be updated just as frequently, in real time. Regional, national, and local indexes would also be published and compared. Together these would serve as a constant reminder of the true state of affairs, a sort of giant thermometer of the environmental health of civilization.

Note the inclusion of the Average Quality of Life index. For most people this is what matters most, once their basic survival and security needs are met. A Quality of Life graph (not shown) would probably show that since sometime in the late 20th century it started going down a little, and is projected to go down a lot as the 21st century unfolds. Meanwhile, profits have been going up for the New Dominant Life Form. Showing these two curves on the same graph might have a startling, eye opening effect, because it would become clear which life form was benefiting the most from their relationship.

On the Quality of Life dial, zone A is suffering. If this goes too low it causes Death. Zone B is where Qual-
ity of Life is adequate. Above the Enough point it is too high. This takes the system into zone C, the safety zone. If this goes too high then Overshoot occurs. Once that happens, collapse is just a matter of time because the system will inevitably self-correct. The optimum for Quality of Life is in the right side of the B zone.

*Homo sapiens* as a whole has never solved the problem of how to stay in the B zone (adequate Quality of Life) for 95% of all people 95% of the time. This is the Instability of Quality of Life Problem.

**How the Sustainability Index Works Dynamically**

The purpose of the Sustainability Index is to provide an accurate, universally understandable measure of how well we are doing in solving the global environmental sustainability problem. Once the index is created, the *We Need to Be Sustainable* loop shown will appear.

Actually many Sustainability Indexes or their equivalent already exist. Unfortunately they are not in the public’s eye every day, mainly due to wrong priorities. Many are also not sufficiently mature or updated frequently enough. If the wrong priorities of the race to the bottom can be changed to the right priorities of the race to the top, high quality Sustainability Indexes will start springing up faster than cornstalks in the springtime.

Starting at the left node, the loop works like this: When the index starts to be widely published, the *ubiquity of the Sustainability Index* goes up. This increases the percent of the population knowing the current and projected levels of sustainability. Due to a delay little will change at first, because it takes time for leaders to come to their own new conclusions. That is, it takes time for their sustainability memes (a meme is a mental belief) to grow in strength and number. But once those memes grow and reach a certain threshold of activation, people will increase their *demands on leaders to be more sustainable*.

Once again, little will change at first, because it also takes time for leaders to come to their own new conclusions. Their sustainability memes must grow in strength and number too. They must also grow to a high enough quantity and strength to overcome the competing memes emanating from the New Dominant Life Form.

But eventually, after a delay, this will happen, causing an increase in realization by leaders that the more people who want to be sustainable, the easier it will be to get all people to drastically change their behavior. One way to do that is to increase the *ubiquity of the Sustainability Index*, and the loop starts over again.

The loop also affects a node outside the loop. As demands on leaders to be more sustainable grows, so does group decisions to become more sustainable. This is the real benefit of creating the loop.

As the loop grows, more and more citizens and leaders will be thinking *We Need to Be Sustainable*. As the percentage of the population thinking this way becomes the majority and then a super majority, the desire to be sustainable will become an irresistible, unstoppable force that will lead to rapid solution of the problem. This will occur even if a large amount of self-sacrifice is necessary, because people will now see sustainability as the highest priority. They will see it this way because the alternative of not doing enough to solve it will be clearly shown by Sustainability Index projections as a certain road to disaster.
Summary and Conclusions

The six solution elements presented have been engineered to work closely together to change the general ability to detect political deception from low to high. These elements change the structure of the human system so that its new equilibrium is a state of high ability to detect deception. Once ability to detect deception goes high enough, the race to the bottom will collapse, causing the race to the top to become the dominant loop in politics. This in turn will lead to an intense global effort to solve the environmental sustainability problem.

Actually, these six solution elements are only part of the overall solution. Due to space limitations the solution presented here is incomplete. The full solution requires 23 solution elements divided into five packages. There are also more high leverage points than the single one used here. We have presented only the first package and the most important high leverage point here. This is probably sufficient to get the ball rolling in the right direction, but not fast enough. Nor is it a permanent solution. For the reasons why and the other solution elements, please see the manuscript for *A Model in Crisis*.

However, please note that *A Model in Crisis* is not that concerned with the exact solution. Instead, it focuses the bulk of its efforts on developing a problem solving path which, if taken, should quickly lead to an adequate solution. *A Model in Crisis* emphasizes again and again that the solution presented is only a sample solution, and should not be interpreted as the solution. This is because the fundamental reason for solution failure is the problem solving approach that most problem solvers have been using. This is basically an ad hoc, common sense, event oriented approach. This works fine for everyday problems, but usually fails disastrously for difficult complex social system problems, such as the global environmental sustainability problem.

It is time for a final few words about that problem. The political decision making process we use today was designed by the forces of evolutionary experimentation, one trial and error at a time. It is no more that a vast, ramshackle collection of historical precedent. Thus it is well designed to handle what it has encountered in the past. But it is ill prepared to handle problems which differ radically from those of the past, such as global environmental sustainability.

As a result, just when we need it to be working at its best, the political system is working at its worst. In most countries, highly partisan conflict frames legislative debate. Behind the scenes the modern corporation and its allies control all the key agents participating in that debate. This causes decisions to favor the interests of the New Dominant Life Form over the interests of *Homo sapiens*. Consequently what should be the political system’s top priority, solving the global environmental sustainability problem, is barely on its radar.

*It is time we threw off the backward looking forces of evolution as the chief designer of the political decision making process, and replaced it with the forward looking forces of engineering.*

This may look hopelessly naive and impossible. Where do we start? How do we do it? Those questions will remain unanswered as long as problem solvers continue using an ad hoc, common sense, event oriented approaches. But if they switch to the same stunningly successful approach that science adopted in the 17th century—rationality, through the use of a process that when correctly applied guarantees results—they could answer these questions.

The answers might be much like the six tightly coupled solution elements presented in this brief chapter. Out of millions of possibilities, these six were converged upon by the persistent application of the System Improvement Process and the continuous improvement of that process as it was applied. *It is only the output of a rigorous, highly refined engineering process like this that has any hope of solving a problem that has reached the very edge of a precipice.*
Part 2. First Things First: Solving the Transformation Problem

Part One concluded that the environmental movement can find its way again if it switches to a process that fits the problem. This is the transformation problem: How can we transform environmentalism from Classic to Analytical Activism?

Part two attempts to solve the problem, using an example of the kind of process environmentalists need to switch to. Thus as you read part two you will be learning two things: how the transformation problem can be solved and how to use the System Improvement Process. This is important, because once the environmental movement is transformed its most powerful tool will be the process it uses to achieve its objectives.

Somewhere in this book we hope you undergo a personal transformation and breakthrough. It may be like the one David Perkins presents in his book, The Eureka Effect: The Art and Logic of Breakthrough Thinking:

“If breakthrough thinking built our world, or at least a good deal of it, what can be said about the process of breakthrough thinking? Simply on the basis of historical examples, it is useful to set out an initial sketch. In Archimedes’ adventures at the baths, and in many similar episodes, one can discern a fivefold structure that goes something like this:

1. **Long search** – Breakthrough thinking characteristically requires a long search. The Wright brothers dedicated years to their quest.

2. **Little apparent progress** – A typical breakthrough arrives after little or no apparent progress. The Wright brothers wasted time on nautically inspired versions of the airplane propeller.

3. **Precipitating event** – The typical breakthrough begins with a precipitating event. Sometimes external circumstances cue this moment: the water overflowing in Archimedes’ bath. Sometimes a mental event is sufficient: finding the right point of view, such as thinking of a propeller as a screw of a wing.

4. **Cognitive snap** – The breakthrough comes rapidly, a kind of falling into place, a cognitive snap. Not much time separates the precipitating event from a [mental] solution, even if details remain to be checked. This is Archimedes’ classic ‘Eureka!’ The time might be a fraction of a second, several minutes, or sometimes more, but the time is characteristically short compared with the time leading up to the breakthrough. In contrast, working out the ramifications of the basic insight may take some time. The Wright brothers labored and argued for months on the technical problems of translating their propeller-as-wing insight into a well engineered propeller.

5. **Transformation** – The breakthrough transforms one’s mental or physical world in a generative way. Propellers were not screws or wings until Leonardo and the Wright brothers made them so. Ideas like the principle of displacement of water and technologies like flight have had a profound impact, altering the way we human beings get things done. … Not incremental but transformational invention is the theme here.” (Italics are his)

When it comes to difficult problems like climate change, the modern environmental movement has been on a long search, with little apparent progress, for over 30 years now. Is it possible that a precipitating event is gathering force, and will soon cause a cognitive snap? If this occurs in enough forward thinking environmentalists and organizations, their mental world will be forever transformed. And soon, so too might the entire environmental movement be transformed—into Analytical Activism.

And how exactly might we make that breakthrough? The same way millions of inventors made theirs: by using the right tools. Nothing separates the neophyte from the expert, and failure more from success, than the right set of tools and the knowledge of how to use them.

The strategy of part two centers on using these tools to engineer the third of David Perkins’ five steps: a precipitating event. The nine chapters of part two go into extreme detail on how this can be done, so that you can learn how to slice the bacon and slay the dragon yourself, all with a small set of tools you can tuck neatly into your saddlebags.

As you and your fellow travelers journey through part two, you will see many jewels scattered about. Each is a valuable tool—but only if you stop, shake it a little, and peer deep inside to see how it works.
Chapter 4

The Transformation Strategy Map

After people have read part one and gotten past their initial skepticism, the most common reaction is “How can we implement these ideas?” The same question keeps appearing over and over in many forms. For example, after reading the first three chapters a board member of a large environmental organization wrote that: “The biggest question is how one would implement any of these concepts. So, what exactly do we do tomorrow morning?” Another environmentalist asked “How can we implement these ideas?” in exactly those words, and then explained his needs in more detail. He said, “Until people can visualize this can be implemented, the first steps won’t be taken.”

I believe that the main reason implementing these ideas is not obvious is they require a totally different mindset from the one environmentalists are accustomed to thinking in. Environmentalists need to abandon their dependence on an ad hoc, common sense, event oriented approach and switch to an analytical one.

There is nothing fundamentally more difficult in an analytical approach. In fact, once you learn it, the analytical method is actually easier than the non-analytical method for difficult problems, because it takes much less time and resources to solve the same problem.

Evidence of the success of analytical methods is all around us. This was the method used to develop the medicines you take, the low price you pay for almost anything, and the amazing selection of consumer goods available today. This is also evidence that the analytical method is not that difficult to learn, because if it was, there would be a scarcity, instead of a surplus, of the marvels that now surround us.

Thus to implement these ideas, all activists have to do is switch from their present ad hoc, common sense, event oriented methods to analytical ones. “Ad hoc, common sense, event oriented” is a phrase I’ve deliberately repeated throughout this book, to drive home the message that these three techniques are the heart of what needs to change. Here is what they need to change to:

In Analytical Activism, the ad hoc (informal and improvised) approach is replaced by the organized approach of always following an appropriate process, which is usually a simple one. Common sense is replaced by a reliable body of knowledge that has been accumulated by the Scientific Method. Event oriented is replaced by structure oriented, which is required to solve the more difficult complex social system problems the environmental movement now faces.

Event oriented thinking sees the world as a vast, complicated, unorganized collection of events, each of which “causes” other events. One drawback is that for complex social system problems these are too often coincident or false causes. Another drawback is the many events have no inherent organization, so there is no way to see how the system as a whole works. This leads to solutions that fail to solve the problem.

Better is structural thinking, which sees the world as structures of feedback loops. Problems are caused by faulty structures. Sound solutions can only be based on changing faulty structures to ones whose normal behavior is the desired behavior. It follows that to solve a difficult complex social system problem, you must deeply and correctly understand its structure. There is no other way.

Even better is to integrate structural thinking into a complete approach to solving the problem, such an Analytical Activism. This new way of thinking and working is not nearly as formidable as it may seem. It lies within the reach of every environmentalist who sincerely wants to use the right tools for the problem at hand.

The Analytical Method

Environmentalists practice a form of activism. Activism is changing the goals of society, and thus governments, to ones that are more appropriate for the times and the general welfare of the people. If the environmental movement is successful, then the goal of society tomorrow will become what the goal of environmentalism is today: an environmentally sustainable world.

However, environmentalism hasn’t been as successful as it needs to be. Chapter two argued the reason is dependence on Classic Activism as the central problem solving process. Classic Activism is the use of three main types of “more of the truth” to solve problems. Its limitation is that the more difficult subproblems of the sustainability problem, such as climate change, cannot be solved by “more of the truth” alone. For difficult problems, “more of the truth” is essential but insufficient.

However, as this book argues starting with its title, there is a better way. Not only is it a better way, it is the
only way. This is because difficult problems require analysis, and analysis requires reliable knowledge, and the only known way to produce reliable new cause and effect knowledge is the Scientific Method.

The Scientific Method works well because it is an analytical process. Environmentalists need to instinctually understand what analytical and process mean, so that the following reaction becomes automatic: “This is a problem. What steps will I take to solve it? How can I be reasonably sure my solution will work?”

Analytical means the use of analysis to accomplish something. According to our good friend wikipedia.org, “An analysis is a critical evaluation, usually made by breaking a subject down into its constituent parts, then describing the parts and their relationship to the whole.”

But analysis needs something to focus it and make it communicable, repeatable, and improvable, and hence less intuitive and variable. That’s where process comes in. A process is a repeatable series of steps for achieving a goal. If the steps define how to perform an analysis, then you have an analytical process. Thus a more complete definition of analysis is breaking a problem down into smaller problems and solving them individually, using a repeatable process.

Science is the use of an analytical process to achieve scientific goals. It follows that Analytical Activism is the use of an analytical process to achieve activist goals. In both cases the process must be a derivation of the Scientific Method, because that is the only known method for producing reliable knowledge.

The search for this process leads to the nine steps of the Analytical Method, which were derived in Introduction to the New Paradigm.

Now that we know what process Analytical Activism uses, we can say that Analytical Activism is the use of the Analytical Method to achieve activist objectives. Note how this is identical to the working definition of science, which is the use of the Scientific Method to achieve scientific objectives.

The Analytical Method is so generic it applies to achieving any objective, not just activist objectives. It is the method that the New Dominant Life Form (the modern corporation and its allies) has used so successfully. For example, starting with step 1 of the Analytical Method, the standard problem to solve in a for-profit corporation is how to maximize the net present value of profits in a particular market. A standard body of problem solving techniques for achieving that objective has evolved, which is step 2. These techniques form a repeatable process which centers on financial planning, using reliable information from double entry accounting. This process is so stable it is widely taught at business schools.

Using this process, business plan alternatives are hypothesized, which is step 3. Experiments are designed and run to test which plan works best, which gives steps 4 and 5. Management decisions are then made in step 6. The results are improved by repeating steps 3, 4, 5, and 6 until the business plan is so optimized that no better one is economically feasible. In step 8 the plan is then rolled out for widespread use, or, if already in use, it is stabilized. But even then, use of the Analytical Method does not end. In step 9 the plan is continually refined as the years go by, because our world is forever changing. More importantly, the process of finding the best business plan is also improved as opportunities arise.

The real power of the Analytical Method is it can be used to create reusable, reliable knowledge.

For example, the problem to solve might be to create an effective, reusable approach to lobbying by environmental NGOs. The solution could be a component of other solutions to future problems, such as how to achieve sustainability in energy or agricultural land use. In this manner the Analytical Method can be used to build a large body of related knowledge that works, because each component can be safely assumed to be reliable.

Let’s explore an example of how to use the Analytical Method in some detail. Suppose an environmental organization notices it is failing to achieve its mission. Sure, lots of work is being done, membership is up a little, funds are still pouring in, and the organization is being heard in the media and in congress. They are even winning some small battles. But the bottom line is they are coming nowhere close to achieving their objectives.
Stated in terms of the Analytical Method, what the organization is probably doing is:

1. Identify the problem to solve.
2. Use no process to hypothesize a solution.
3. Implement the solution.

It’s not hard to see why they are failing. This method is the equivalent of Ready, Fire, as opposed to Ready, Aim, Fire. All the organization has been doing is blasting away at the problem with the first solutions that come to mind. Unlike an Olympic sharpshooter, who spends most of his or her time aiming, they spend almost none. By not spending plenty of time to prove their hypotheses are true before implementing them, the organization has been missing the target most of the time, with an occasional lucky (and very misleading) bull’s eye.

As is usually the case, there is a better way. Suppose they adopt the Analytical Method. They might decide that their most urgent problem is determining why they have been failing (step 1). After all, if they cannot determine that, then they are in all likelihood going to continue to fail.

Next they choose an appropriate process (step 2). Then they use the process to hypothesize why they are failing to achieve their objectives (step 3). To do that they might call in a consulting firm, launch an internal task force, and form a coalition of environmental organizations who had come to the same stark realization. The recommendations of these projects would be the hypothesized solution alternatives.

Next they design a series of experiments to test each hypothesis (step 4). Then the experiments are performed (step 5). The results allow each hypothesized solution to be accepted (it was capable of solving the problem), rejected (it cannot solve the problem), or modified (step 6).

All this is repeated until a hypothesis capable of explaining why the organization is failing to achieve its objectives is accepted (step 7). Then it is implemented (step 8) by determining how the organization use this new knowledge (the explanation) to change to a successful way to achieve its objectives. This involves the field of change management.

Someone in the organization would be responsible for managing the use of the Analytical Method, which is generally called process management. The top strategy of process management is to continuously improve the process (step 9) so as to best support the organization’s mission.

Those with business management experience will recognize this is the approach hard nosed business managers have been taking for centuries. But from what I’ve seen of the typical environmental organization, the analytical process approach is lacking. Why? Environmental organizations are typically non-profit, small corporations of less than 500 employees. Small corporations simply fail to attract their share of top management talent. Instead, most of it goes to the for-profit, large corporations, who pay well over an order of magnitude more to their top executives. While there are exceptions, these are such a small percentage that they have little overall effect.

To summarize, if the environmental movement adopted the Analytical Method, it would be able to achieve its objectives every bit as well as the two most successful groups of problem solvers in the world: scientists and business managers.

**The First Problem to Solve Is the Transformation Problem**

*How then can we cause the environmental movement as a unified whole to adopt the Analytical Method as its central problem solving process? That question is so difficult to answer that it becomes a problem to solve in itself, which is what part two is all about. Let’s call this the environmental movement transformation problem.*

Part two applies the four steps of the System Improvement Process (SIP) to the transformation problem. Chapter 4 performs step 1 of the process by formally defining the problem so that we can focus on it properly. Chapters 5, 6, 7, and 8 seek to understand the system so well that its low and high leverage points become obvious, which is process step 2. Chapters 9 and 10 then converge on the solution by using that analysis to construct a model of how the environmental movement can make a successful transformation in time, which is process step 3. *This model, called The Transformation to Analytical Activism Simulation Model, is the solution.*

Finally, chapter 11 gives an overview of process step 4, implementation, by summarizing the gist of how implementation might be kicked off.

**The Strategy Map Tool**

*There is no such thing as a simple solution to a complex problem, because if it could be solved by a simple solution, then by definition it was not a complex problem in the first place. It could only have been a simple problem posing as a complex one.*

This explains why part two ventures into some complex areas. To help manage this complexity before it spirals out of control, we will be using one of the most powerful tools in the SIP user’s toolkit: strategy maps. A **strategy map** is a template for visually planning and communicating the topmost strategy required to solve a
Part 2. First Things First: Solving the Transformation Problem

Problem, no matter how complicated the problem may be. The template guides the analysis through a series of successively deeper layers of understanding, until the root causes of the problem are identified and resolved.

To explain how strategy maps are used, first we will apply a strategy map to a simple educational problem and then to the transformation problem.

Above is an SIP strategy map with a very simple problem and two solutions: the wrong one and the right one. This application of a strategy map illustrates Lao Tzu’s classic proverb: “Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.”

When beginning work on a problem with SIP, start with a blank strategy map. Then use SIP and the map to engineer the answers to these four questions:

1. What are the symptoms to be alleviated?
2. What are the defects causing the symptoms?
3. What are the flaws allowing the defects to appear?
4. What are the fixes and structural changes that could prevent the defects from appearing in the first place?

In the sample problem, the symptoms to be alleviated are starvation. This becomes the first node added to the map. It is the problem to solve.

Next, what are the defects causing the symptoms? That’s a little obvious: there is not enough food to eat. That node is added to the defects section of the map, because it causes the symptoms. The solid arrow connecting the defect to the symptom indicates a direct relationship: As not enough food to eat increases, so does starvation.

Let’s follow Lao Tzu’s lead and assume it is a man who is starving. According to the proverb, if you give him a fish to eat, this only feeds him for a day. This is because that solution is only a quick fix, and hence is a state change. (A state change changes the value of a node, such as the price of tea in China or which politician is currently President.) Here the fix of give him a fish to eat decreases the value of the not enough food to eat node, as shown by the dashed arrow. (A dashed arrow is an inverse relationship.) But because tomorrow he will need another fish, this does not permanently resolve the defect. That’s why this solution is only a quick fix.

A better way, according to master Lao Tzu, would be to find out what flaw is allowing the defect to appear, and then eliminate that flaw permanently by structural change. This is the philosophy of defect prevention, as opposed to the much less effective and far more common practice of defect removal.

Here the flaw is not knowing how to fish. It can be eliminated by introducing the structural change of teach him how to fish. Once this change is made, the system behaves completely different from now on.

Give a man a fish is simpler, easier, cheaper, and faster than teach him how to fish. This is why society has developed the habit of fixing defects as the normal first response to complex system problems. However in truly difficult problems, defects will reappear as fast or faster than you can fix them. If this is the case then the use of structural change to resolve flaws is the only viable solution.

It should come as no surprise that fixing defects, with a runaway growth of unfixed defects, is the current response to the global environmental sustainability problem. If someone took the time to graph out how many new problems have appeared in each decade, and how many were solved, we would probably see that starting in the late 20th century new problems began appearing faster than we could fix them, and probably exponentially faster. This is because the new problems are really the same old types of defects appearing over and over,
because the flaw allowing the defects to appear has never been resolved.

Why are sustainability problems appearing faster than they can be solved? Let’s answer that question just for pollution to keep it simple.

As the above sketch shows, once you are familiar with SIP strategy maps, you could answer the question by pulling out a scrap of paper and drawing a map showing how environment degradation symptoms are due to the defect of too much pollution, which appears because the flaw of no universal incentive to not pollute is present. Until that flaw is resolved by deep structural change, more new pollution problems will appear, even though the old ones have been solved. This is because the old ones were solved by the quick fixes of lots of custom regulations, custom quotas, and so on, on a case by case basis. These solutions did not address the structural issues causing agents to continually bypass old solutions as well as create new problems, and so in the long run were hopelessly ineffective.

There are two kinds of changes to a system: state change and structural change. State change occurs when the value of a node changes, such as lobbying frequency, the temperature of the ocean, or population size. This usually has no significant effect on the fundamental behavior of a complex system, because its structure will tend to bring the overall system back to normal.

On the other hand, structural change can completely alter the fundamental behavior of a system. This is because structural change is a change to a system’s structure. This is done by the addition, removal, or modification of nodes and relationships. Doing this predictably requires knowing the system’s structure.

This leads to an important definition: deep structural change is structural change that causes loop dominance to change significantly and indefinitely. The result is the system now behaves so differently it seems to have “flipped” into a new mode, such as from sustainable to unsustainable, which on a global basis was triggered by the Industrial Revolution. Deep structural change is what is required to solve any difficult complex social system problem, because the solution requires the system to behave fundamentally differently indefinitely.

In rare cases a system is so close to a threshold point that only a slight state or structural change is needed to push it over, and into a new mode. In all the rest, only deep structural change will work.

Next, let’s follow the wisdom of Lao Tzu as we apply strategy maps to the problem of how to transform the environmental movement from Classic to Analytical Activism.
The High Level Strategy Map

This is shown below. It previews what is coming in the rest of part two, during which much more will be added. The high level map shows only the most important elements, which serve as the backbone of the map.

The purpose of this book is to help solve the global environmental sustainability problem. While many of the easy parts of the problem have been solved, the overall problem has not, as shown by the sobering fact that the modern environmental movement is consistently failing to solve the difficult problems it now faces. The analysis of part one shows this symptom is caused by not pushing on high leverage points correctly. This becomes the problem we wish to solve in part two. We already have a hypothesis for the high level solution: transformation of the environmental movement into one based on Analytical Activism. That provides the title of the strategy map.

The defect causing not pushing on high leverage points correctly is faulty analysis of difficult problem. This is due to using a problem solving process that works on easy problems, but fails on more difficult problems.

What allows that to occur is the flaw of dependence on Classic Activism, as explained in chapter two and in The Trap in the Introduction to the New Paradigm. Most flaws in a complex system problem are not obvious, which is one reason they are difficult to solve. This flaw is no exception.

Now the dynamic behavior and thus the real power of the map starts to appear. Dependence on Classic Activism is increased by success on easy problems. This in turn is increased by using a problem solving process that works on easy problems, but fails on more difficult problems. This forms the reinforcing feedback loop of the Illusion of the Right Process.

As explained elsewhere, the modern environmental movement was lured into dependence on an inadequate problem solving process by its ability to solve easy problem. This process is Classic Activism. The result, as the loop shows, is this fosters a growing belief in the Illusion of the Right Process. From my own experience in working with environmentalists, this illusion is so powerful that many find it impossible to believe that a better way could exist.

Another result is because Classic Activism fails on the more difficult problems and the loop is growing in strength, faulty analysis of difficult problems is also growing. It is not static. This may be hard to accept, but this simple model shows why conventional wisdom is not getting closer to the right analysis and the right solutions. Instead, it is getting further away.

This is because the process of Classic Activism is only getting better at solving simple problems, because that’s all it can solve. Thus it tends to make a faulty analysis on difficult problems. When the solution based on that analysis fails, what do the problem solvers do? Why the only thing they can—more of the same, but stronger. This results in an analysis that is even further wrong, which leads to pushing even harder on low leverage points.

At first glance it might appear that success on easy problems is not a defect. How could success be a bad thing? But here success is environmentalism’s own worst enemy, as described. This is another example of the counterintuitive nature of complex social systems.
Based on this analysis, the strength of the Illusion of the Right Process loop must be drastically reduced to solve the transformation problem. How can this be done? This becomes the next problem to solve as we build the strategy map: How to reduce the dependence on Classic Activism.

**The Growth of Analytical Activism Loop**

True, deep, lasting structural change for a large, difficult problem, especially those of a novel nature, requires the creation of entirely new feedback loops. Here the solution depends on successful creation of the Growth of Analytical Activism loop.

The solution hypothesizes that as the three types of proof Analytical Activism is better begin to appear, supporters of Classic Activism will abandon that approach, go through a conversion experience, and become Analytical Activism supporters. The more supporters there are, the more work will go into the three types of proof Analytical Activism is better, and the Growth of Analytical Activism loop starts all over again. The three types of proof are logical proof, artificial world experimental proof, and real world experimental proof that Analytical Activism is better, as shown on page 198.

There are actually two loops here. The other one also starts as the three types of proof Analytical Activism is better begin to appear. That and the growing number of Analytical Activism supporters causes hypotheses generation to occur. These are the result of problem solving process output and consist mostly of analysis models and solution elements.

There is only one way to prove a physical world hypothesis, and that is to subject it to physical world experimentation. This increases the amount of experimental proof available to accept, reject, or modify these hypotheses, which increases the size of the Analytical Activism accepted body of knowledge. Because this is scientifically proven knowledge it is reliable, and can serve as the foundation for further hypotheses and proof, which helps to increase the three types of proof Analytical Activism is better, and the loop starts over again.

Having two loops instead of one makes the solution all the more powerful. Once the Growth of Analytical Activism gets going, it will probably be as impossible to stop as the Enlightenment was.

Notice how we did not resort to any quick fixes in the main solution.

**Strategy Maps in the Business World**

The American business world added strategy maps to its toolkit in the mid 1990s, when strategy maps took the business world by storm due to the work of Robert Kaplan and David Norton. A strategy map shows a company’s or business unit’s overall strategy on a single page, in the form of a layered diagram of nodes and arrows. Each layer goes deeper. Each node on the diagram is designed to be measurable. This allows the map to serve as the central planning and management tool, even more so than the previously most popular tool for that, financial statements. Used correctly, a strategy map captures and manages the conceptual integrity of complex projects, all of which do the same thing: they solve complex problems.

The Harvard Business Review summarizes the power of strategy maps this way:

“[Strategy maps have] transformed companies around the globe. This performance management system helps top executives set corporate strategy and objectives and then translate them into a coherent set of measures, transforming strategy into a continuous process owned by everyone. The [strategy map] also enables you to communicate high-level goals down to all organizational levels. Employees know not only what to do, but why. Most important, the [strategy map] augments financial measures with objectives and metrics in customer relationships, internal processes, and learning and growth—less tangible areas notoriously difficult to measure.”

A System Improvement Process (SIP) strategy map is a reusable fill-in-the-blanks diagram. It serves as the architectural blueprint for an organization’s high level strategy as it proceeds to apply SIP to solve a problem. The map provides a simple framework that guides SIP users along a road that allows them to more easily maintain the conceptual integrity of a project, even when it tries its best to spiral out of conceptual control.
**Our Analysis Strategy**

The rest of part two consists of one or more chapters for each of the four steps of the System Improvement Process. The key to the process is step two, System Understanding. This is often called the “analysis” step, because it is where the deepest decomposition of the problem occurs, and thus the most analysis. If we do a good job it is also where the most major insights will occur. If these are deep enough and correct, then the remaining steps will be straightforward and the solution will work. Accordingly, there are four chapters dedicated to performing the System Understanding step.

The key to doing a good job of any analysis is to have a good analysis strategy. Ours is to explain why other similar social transformations failed or succeeded. To do that, we will examine three of the largest and most relevant paradigm changes (also known as movements) of the second millennium.

The first social transformation examined is the environmental movement itself. Why has it failed so badly? As we argued in part one, it has failed because the process does not fit the problem. Why this is so is explored in exhausting detail by first analyzing the problem difficulty of a list of top environmental problems. The results show that the more difficult a problem is, the less likely the movement has been able to solve it. This implies that most environmental organizations have an immature process. Is this so? A second analysis of a list of representative environmental organizations shows that, sure enough, most have an immature process and the few that have mature ones are working on what are actually easy problems. These two analyses provide strong evidence that the environmental movement must change to a mature process, one capable of solving the sustainability problem in time.

The second social transformation was the rise of the Corporate Proxy Movement in the United States. While this is better known as the latest brand of conservatism, or neo-conservatism, or the label they themselves prefer, compassionate conservatism, its most accurate name is the Corporate Proxy Movement. This is because at the root of this ideology lies unquestioned total allegiance to the goal of the New Dominant Life Form, which is to maximize the net present value of profits.

How the Corporate Proxy Movement rose so swiftly to power in the US has much to offer, because it is this movement, and not environmentalism, that is the current expert on successful large-scale social transformation. As we will show, its rapid and successful rise to power was precipitated by the now infamous Powell Memo of 1971. That memo laid out the nucleus of a master plan that was so easily implemented and pushed so correctly on the right high leverage points that its progress became unstoppable. As the current behavior of the world’s sole remaining economic and military super-power has shown, it succeeded all too well.

The third social transformation we will examine is the largest one since the invention of agriculture. This is the Enlightenment, also known as the Second Age of Reason. It was as large as paradigm change comes, because it changed mankind’s greatest tool, reason, from being based on trial and error and superstition to being based on experimental proof. As simple as that change was, it unleashed the forces of modern science, which are so powerful and, like the Corporate Proxy Movement, so unstoppable, that civilization was transformed beyond anyone’s boldest imagination.

As environmentalists we must be scientists first, before all else. As scientists, how can we ensure that our analysis will lead to the correct solution? This question must be answered, because we are up against the most powerful competitor *Homo sapiens* has ever encountered. Furthermore, if we skip the question and rush pell-mell into an ill thought-out analysis, then we have abandoned all that the First and Second Ages of Reason bestowed on those who came later.

It is for these reasons that we now pause and take the time to setup a proper framework for the analysis, by first defining the problem we seek to solve. This will take only a few pages, after which we will take up what I personally feel is the most exciting material in this book: the material on problem difficulty, process maturity, and perhaps most electrifying of all, the story of how the Powell Memo led to the downfall of the modern environmental movement.
THE SYSTEM IMPROVEMENT PROCESS ACHIEVES ITS SPARTAN SIMPLICITY and power by focusing on the few things that make the big difference, and ignoring everything else. The first step of the process is so simple that this chapter runs only three pages.

According to Robert A. Humphrey, “An undefined problem has an infinite number of solutions.” Therefore the first step of the System Improvement Process is Problem Definition. The objective of this step is to define a clear, measurable objective that, when reached, means the problem is solved. This greatly focuses all work. It is easily done by:

**Filling In the Standard Problem Definition Format**

The guiding principle of this step is: *The more correctly a problem is defined the less work required to solve it.* Difficult complex system problems are best defined using this standard format:

*Move* system A *under constraints* B *from* present state C *to goal state* D *by deadline* E *with confidence level* F.

The letters are the variables that are filled in to define a problem. Variables D, E, and F are the solution goal, the most important part. Constraints B include human resources, budget, conflicting goals, uncertainty, authority limitations, and so on. The problem is solved when a solution is created that will move the system to goal state D by deadline E with confidence level F.

An example of defining a problem using this format is, “Given you are downtown and have lost your wallet and car keys, get home by 6:00 PM today with a 90% probability.” Here system A is implied. It is the normal world you live in.

Note how this format makes the work objective unambiguous and measurable. There’s an old business saying that “You cannot manage what you cannot measure.”

Let’s formally define the problem one variable at a time using the standard format:

**System A** – The system to change is the system that will be doing the startup phase of solving the global environmental sustainability problem. *This is the environmental movement as a global whole.* If the startup phase is successful, solution responsibility will shift to governments and associated agencies, such as the United Nations and in the US, the Environmental Protection Agency.

Looking ahead a little, this will probably begin to occur as the analysis (and hence the solution that follows logically from it) becomes conventional wisdom, due to the success of showcase implementations of the key solution elements proving that the analysis is correct. For example, if real world experimental applications of politician ratings begin to cause a race to the top, that is substantial proof the analysis of the Dueling Loops of the Political Powerplace is correct.

**Constraints B** – Constraints are limits imposed on solution effort and actions. There appears to be only one main constraint:

As of June 2006 the number of innovators supporting these concepts is under 10, and includes none who are highly influential in the environmental movement, science, politics, or the business world.

However this is par for the course. All new ideas start with only a few supporters and grow from there. How to gather more supporters and especially more influential supporters is part of the problem to solve.

**Present state C** – The present state is the environmental movement is pushing on low leverage points, especially “more of the truth.” This causes solution failure.

**Goal state D** – The goal state is the environmental movement is now pushing on the correct high leverage points, and is pushing on them correctly.

A popular management maxim is “Do the right things right.” But according to our analysis the environmental movement is not doing this. *Instead, they are doing the wrong things right.* The consequence is that
presently “improvement” consists of doing the wrong things even better.

For example, many environmental organizations are very efficient at mobilizing people to exert change pressure related to various issues. Some, particularly grassroots activist centric organizations, are also becoming adept at polling their members to find out what they want to work on, and what the members think the organization itself should work on. But this only increases their efficiency of pushing on low leverage points, which is the same thing as doing the wrong things even better.

If an organization wants to determine what the “right things” are, it cannot rely on polling its members, because the average member simply does not have the expertise required. Expecting such a “direction setting process” to work is like polling the general public to find out how to best put a man on the moon. All polling results tell is what members want to work on. They do not tell the organization what it should be working on.

The point is that, as Jay Forrester showed in the long passage on urban decay in chapter one, it takes very high expertise to find the correct high leverage points in complex social system problems. Or as Peter F. Drucker, widely considered the father of modern business management, wrote over 40 years ago in Managing for Results: 28

“The pertinent question is not how to do things right but how to find the right things to do, and to concentrate resources and efforts there.”

If environmental organizations are to become effective, they need to switch to doing the right things right. That is, they need to move from their present state of pushing on low leverage points to the goal state of pushing on the correct high leverage points correctly. There is no other way to solve the problem, except to rely on luck. But because luck is unpredictable, it cannot be used to satisfy confidence level F (explained below). This leaves us with only one alternative for goal state D: the environmental movement must begin pushing on the correct high leverage points correctly.

We will arbitrarily estimate that 50% of the movement must be pushing on high leverage points for this approach to work.

**Deadline E** – According to my interpretation of the analysis and projections in the 2004 edition of Limits to Growth, as well as model projections by the International Program on Climate Change, the deadline for the effect of pushing on high leverage points correctly is somewhere around 20 to 30 years from now. If the transition to the Age of Sustainability is not begun in earnest by that time, it will be too late to proactively avoid large catastrophe, due to the existence of many environmental limit thresholds. It is already too late to avoid a minor economic and population collapse. But it is not too late to avoid a major one.

Let’s assume there will be a 10 to 20 year delay from when the correct high leverage points begin to be pushed on correctly to when the system responds by aggressively pursuing global environmental sustainability. This means that we have only about 10 years to complete the transformation to pushing on high leverage points correctly. This becomes deadline E.

**Confidence level F** – A confidence level quantifies how confident you are something is true, such as how likely you are to solve a problem. 90% confidence means that if you worked on a hundred problems like this, you would solve at least 90 of them. If the confidence level is left out of the problem definition, problem solvers have no idea of what priority to give the problem, or how drastic the measures they should take to solve it should be.

It is not enough to say a problem is “important” or “critical.” For truly complicated, difficult to solve problems, words like this are so slippery and vague as to be nearly worthless. For problems of this nature, if you use such words then they must have standard definitions, such as: 29

- Almost certain – Greater than a 99% chance
- Very likely – A 90 to 99% chance
- Likely – A 66 to 90% chance
- Could go either way – A 33 to 66% chance
- Unlikely – A 10 to 33% chance
- Very unlikely – A 1 to 10% chance
- Exceptionally unlikely – Less than a 1% chance

But again, for some problems even these definitions are not good enough. For example suppose a spaceship has 10 parts and all must work for the mission to succeed. Can each part be designed to be “almost certain” to not fail in a mission? No, because it is the success of the mission, not each part, that must have a 99% chance of success. If each part has a 99% chance of success and their failures are independent of each other, then the chance of success is .99 times .99 ten times, which equals .904. Thus the mission would have only a 90% chance of success.

Now suppose the mission must have a 99% chance of success. What must the chance of success for each of the ten parts be? It must be 99.9%. What about 100 parts? Then each part must have a 99.99% chance of success. The point is in some problems, such as the global environmental sustainability problem and putting a man on the moon, the standard terms and percentages
cannot be used. Therefore we must calculate a custom percentage.

The sustainability problem must be solved for an indefinite period of time. We will arbitrarily define indefinite to mean at least 100,000 years. That’s the bare bones minimum it would be reasonable to plan for, considering that Homo sapiens has already survived for around 200,000 years. By comparison one of our ancestors, Homo erectus, survived for 2 million years. But this is a mere ripple of time compared to the humble cockroach, which appeared at the end of the Devonian Period, 350 million years ago, and cyanobacteria (blue-green algae), which appeared 3.5 billion years ago.

Next we need to set the confidence level for solution success over the 100,000 year period. Is the standard level of 99% for “almost certain” good enough? Remember now, this is not just a moon mission we are considering. It is the very survival of Homo sapiens. And it is not just his survival that is at stake—it is survival at a high quality of life for the optimum number of members of Homo sapiens and other species the biosphere can support.

99% is not good enough. It’s like Russian roulette. I would not want to be the one to hold a gun with 100 chambers and one bullet to the head of the 6.5 billion people on the planet today, not to mention the billions more that are unborn. Personally I would not feel comfortable picking up such a gun unless there was only a 1 in 10,000 chance of there being a bullet in the firing chamber. This would be 99.99%.

Next, how many problems similar to the New Dominant Life Form problem will occur in the next 100,000 years?

No one knows. But judging by the rocky past that history has taken, we can assume that there will be many more similar problems. Let’s assume at least one equally difficult sustainability problem will occur every 100 years for the next 100,000 years. This is 100 problems, which raises the required confidence level from 99.99% to 99.9999%. Now I feel comfortable.

99.9999% is not as ridiculously high as it may seem. A popular and mature quality control practice known as Six Sigma is built around this number. As the www.isixsigma.com website explains: “Six Sigma is a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve a company’s operational performance by identifying and eliminating ‘defects’ in manufacturing and service-related processes. Commonly defined as 3.4 defects per million opportunities, Six Sigma can be defined and understood at three distinct levels: metric, methodology and philosophy.”

3.4 defects per million opportunities is a confidence level of 99.99966% over a million opportunities. This rounds off to 99.9999%, or 6 nines, which explains why the practice was named Six Sigma. In statistics one sigma means one standard deviation. By happy accident six standard deviations in a normal distribution comes out to 6 nines.

In other words, failure is not an option.

The Definition

We now have enough to state the formal problem definition. A problem is solved when the system with the problem is on a predictable trajectory to reaching the goal state in time with the desired confidence level. Omitting the constraints to keep it simple, here is the problem definition:

The environmental movement transformation problem will be solved when at least 50% of the global environmental movement is pushing on the correct high leverage points correctly. This must occur within 10 years with a confidence level of 99.9999%.

This leads to the strategy map shown below, which completes the first step of the System Improvement Process.

Next comes the System Understanding step. It is the most important step of all, because it builds the vast body of knowledge upon which our attempt at solution convergence depends.

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**Transformation Strategy Map**

<table>
<thead>
<tr>
<th>Symptoms</th>
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<tbody>
<tr>
<td>The problem is solved when the symptoms decrease to an acceptable level, without causing any new symptoms.</td>
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<tr>
<td>not pushing on high leverage points correctly</td>
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Chapter 6

Process Step 2: System Understanding

The goal of the second step of the System Improvement Process is to understand why the system works the way it does so well that its leverage points become obvious. This will cause two supremely powerful insights about the problem of interest to emerge. The first is that because the system’s low leverage points are now so clearly revealed, it becomes perfectly obvious why we have been failing to solve the problem. The second is that because we can now see where the high leverage points are, how to solve the problem becomes a relatively simple matter of determining how to best push on these points.

This is why if we do a good job in this step then the next step, Solution Convergence, is relatively easy. This strategy forms the very heart of why the System Improvement Process is so powerful. To execute this strategy, problem solvers should spend approximately 80% of their time in the System Understanding step and 20% in Solution Convergence.

As a group of craftsmen approach their workbenches, they start to pick up the tools needed for the job. What tools do we need for the System Understanding step? Or to even be more ambitious, what is the one key tool that, if we use it reasonably well, is going to turn our job into one so easy that we can be finished by sundown?

That question has an easy answer. The goal of the System Understanding step is to find the system’s leverage points and how the system responds when these points are pushed on. The transformation problem is a complex social system problem. The only known tool that can reliably and quickly achieve this goal on this type of problem is system dynamics. It is the tool for the job.

The Analytical Power of System Dynamics

We have already tossed out the archaic tools of ad hoc, common sense, and event oriented thinking from our toolkit, and replaced them with a process driven approach, use of the Scientific Method, and structural thinking. But this is not enough to perform the System Understanding step. To do that requires the tool of system dynamics, which has been underused for far too long. We now pick up that tool, drop it in our toolkit, and pause to inspect it so that we know what it has to offer.

Known more widely known as stock and flow simulation modeling, the application of system dynamics leads to a detailed and correct understanding of the dynamic behavior of complex systems. The approach consists of modeling a system using these four steps:

1. **Structure** – First describe the structure of the system by identifying its nodes and their relationships, with emphasis on the key feedback loops.
2. **Equations** – Next define each node with a simple mathematical equation. This defines a node’s value using the values of the nodes it is connected to, such as the value for node A equals B times C. Here node A is connected to nodes B and C.
3. **Simulation** – Then simulate system behavior by running the equations over a defined time period, such as 200 years.
4. **Graphical Output** – Finally, analyze the results by examining the graphs showing the dynamic behavior of the variables (nodes) of interest. Lists of data may also be examined, but graphs are more useful for understanding patterns of behavior.
An example of graphical output is shown above. Notice how easily behavior trends can be spotted. This graph, published by Forrester in Urban Dynamics in 1969, is primitive by today’s standards. But despite advances in computer technology, the value of its information for making managerial decisions has not improved one bit.

This is a historically famous graph, one that still inspires me every time I see it. For the first time the world could now see that given present urban management policies, the inevitable outcome of a city’s life cycle was rapid initial growth followed by decay and prolonged stagnation. Forrester had accomplished the same thing the System Understanding step does: he had explained why the system behaves the way it does.

In Forrester’s analysis, the leverage points were the places in the system where urban management policies were presently being applied. But his stroke of genius was to go even further than that, by examining the system to discover new untried leverage points where new policies could be applied. This was quite easy. It probably took only a few moments for the new insights to appear, because once he had a model the structure of the system was plainly visible.

In Urban Dynamics Forrester presented his model, explained why the urban decay problem was happening, and stated his recommendations for how to solve the problem. On page 101 he made this stark observation: (italics added)

“The natural tendency toward imbalance in which housing dominates industry might be corrected by urban policies that encourage industry as well as by policies that discourage construction of excess worker housing.”

“Housing dominates industry” was a euphemism for ghettos (underemployed housing in the graph) causing businesses and the middle and upper classes to flee the inner city. Worse yet, the inner city kept growing and growing. The phenomenon of why this was happening and what could be done to solve the problem was an uncracked nut before Forrester came along.

Using the simulation model presented in Urban Dynamics, Forrester was able to so persuasively explain why his suggestions would work that it was not long before urban policy in the United States shifted from pushing on the wrong leverage points to pushing on the right ones. In ten to twenty years the urban decay crisis, which had been the country’s second biggest postwar problem (after the Cold War), was largely resolved.

It could happen again.

The Importance of Diagnosing the Cause of the Disease First

Another way to look at what the System Understanding step is trying to do is through the analogy of disease. When a wise doctor is confronted with a patient with a new problem, the first thing the doctor does is
find out what the symptoms are. This is done by asking the patient to describe the symptoms and by running quick tests, such as ones that measure temperature and blood pressure. What the doctor is doing is identical to the first step of the System Improvement Process: Problem Definition.

Next the wise doctor will try to diagnose the cause of the symptoms. This is the equivalent of the second step of the System Improvement Process, System Understanding, which determines the underlying cause of the problem symptoms. Only after diagnosis is complete does the doctor begin to decide what treatment is best, which is the same as the third step of the System Improvement Process: Solution Convergence. Finally, once the doctor and patient have settled on a treatment plan, the plan is implemented, which is the fourth step of the System Improvement Process.

But what has the environmental movement been doing so stubbornly for the last thirty years? They have skipped the diagnosis step and have leaped straight into deciding what treatment is best. Some say we need to focus on education. Others prefer more direct means, such as lobbying. Still others lean towards confrontation, such as demonstrations, boycotts, and occasional sabotage. And so forth.

Suppose you sat down in a room with the CEOs of the top twenty sustainability problem solving organizations in the world, and asked them why they are so certain the solutions they are promoting will work. You would get a hornet’s nest of disagreement and a firestorm of denial and anger, because none of them will be able to give a defensible reason. Why? Because they are all promoting intuitively derived solutions.

Now imagine you went one step further and asked those CEOs what their diagnosis of the cause of the sustainability problem is. Now you will get much more agreement. What you will probably get is the equivalent of the IPAT equation. (This says that environmental Impact equals Population times Affluence times Technology. Affluence is measured in consumption per person. Technology is measured in degradation units per unit of consumption.) You will hear answers like “It’s mostly a population growth problem, combined with dependence on technology that has adverse environmental side effects. If we can just cut population growth and convince society to switch to more environmentally sustainable practices, the problem would be solved.”

But this is a fatal error, because it is a misdiagnosis. In the business world, a fatal error is one that leads to the loss of something big, such as the loss of a project, a division, or the entire company. In the medical world, as well as environmentalism, a fatal error leads to loss of life.

The error occurs because environmentalists, even the very brightest, assume they have correctly diagnosed the problem when actually they have not. Why does that happen? Once again, this leads us back to the central thesis of this book: the environmental movement is using a process that does not fit the problem. Only if the movement changes to a suitable process will it be able to solve the sustainability problem.

This is exactly where the medical industry used to be, because it was not so long ago that doctors were skipping the diagnosis step too.

We have some bad news, however, because:

<table>
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<tr>
<th>Two Processes Compared</th>
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<tr>
<td><strong>The Cure the Disease Process</strong></td>
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<tr>
<td>1. Describe the patient's symptoms</td>
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<tr>
<td>2. Diagnose the underlying cause of the symptoms</td>
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<tr>
<td>3. Develop a treatment plan</td>
</tr>
<tr>
<td>4. Implement the treatment</td>
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</table>

These two processes follow the same general pattern. The Cure the Disease Process is a domain specific variation of SIP, because SIP is a process for improving the behavior of any complex system.

The key to both processes is the second step. Once a system’s leverage points become obvious, two insights will occur. For a social system problem the insights will be that pushing on low leverage points is the cause of inability to solve the problem, and that if problem solvers push on high leverage points instead they will be able to solve the problem. For a disease problem the doctor's long training has already led to understanding the body’s standard leverage points. The question in the diagnosis step is what disease is pushing on what leverage points? Once this is determined a solution is converged upon by designing a treatment plan that will push on the body’s high leverage points, in such a manner that the body’s normal equilibrium is restored.

It follows that for both processes, if the second step is skipped the solution will be based on guesswork, causing it to fail most of the time.
Conventional Wisdom in the Social Problem Solving Industry Is to Skip the System Understanding Step

Given the importance of diagnosis first and determining the treatment second, you would expect that this is the way problem solvers would approach important social problems. But they don’t. Today the norm for public policymaking studies is to skip the System Understanding step almost entirely. The result is that solution hypotheses are based on guesswork instead of a sound model of where the system’s high leverage points are.

Several examples should prove this point. The book *Social Experimentation and Public Policymaking*, by Greenburg and others, 2003, opens with these words: (Italics have been added to this and other quotes in this chapter)

“In social experiments, the effects of a proposed change in social policy are examined by first assigning individuals, households, or organizations to either a treatment group that is covered by the policy of interest or a comparison group that is not. The groups are then compared in terms of outcomes of interest—for example, earnings, receipt of welfare payments, or health status. Such experiments represent a very powerful means of estimating the impacts of social policies and programs.”

This says that the purpose of social experiments is to test policies of interest, or in plain English, to test solution alternatives. This reveals a bias toward only using social experiments to test possible solutions, which ignores the fact that social experiments can also be used to determine how the system works in detail.

This bias runs throughout the field of social experimentation. For example, the book reports that the *Digest of Social Experiments* only includes “random assignment field tests of social policies.”

Perhaps the problem is that the definition of “social experiments” has narrowed to include only experiments on solutions. If so, then those environmental problem solvers taking a broad view of their work should be able to break free of this constrictive mindset. The book *Better Environmental Policy Studies: How to Design and Conduct More Effective Analyses*, by Susskind and others, 2001, would seem to do this. But it does not, because the entire field is trapped in the paradigm that social experiments and modeling are only useful for evaluating solutions.

For example, on page 92 we encounter this promising statement: “Models are the heart of system analysis.” I couldn’t agree more. But the next sentence says: “Models are used to predict the consequences of a particular [solution] alternative.” That statement is false. Models can also be used to perform the equivalent of the System Understanding step in the System Improvement Process.

Drawing from the work of Quade and Carter, 1989, the book lists “the five elements of a systems analysis” as:

1. **Formulation** – Clarifying and constraining the problem and determining the objectives.
2. **Search** – Identifying, designing, and screening alternatives.
3. **Forecasting** – Predicting the future environmental or operational context.
4. **Modeling** – Building and using models to determine impacts.
5. **Synthesis** – Comparing and ranking alternatives.

How does “identifying” alternatives actually happen? The most the book says on that is “Once objectives are established, the analyst must then *identify* alternatives by which the objectives can be achieved.” In other words, the generation of solution hypotheses is based entirely on the intuitive judgment of the analyst. There is no process step whatsoever to support these crucial decisions.

Compare this to the System Improvement Process. It says that problem solvers should spend about 80% of their time in the System Understanding step. The purpose of that step is to understand how the present system works so well that the next step, Solution Convergence, is relatively easy. This is because once you know where the high leverage points are, it’s easy to generate high quality hypotheses about how to best push on these points. The hypotheses will tend to work reasonably well, because we already know approximately how the system will respond.

Contrast this with the magic of “identifying” solutions from the five step process above. These are low quality hypotheses, because they are wild ideas plucked out of the sky and the analyst’s imagination. They are such low quality that heavy experimentation is required to weed out the bad ones.
The book *Better Environmental Policy Studies* presents another process on page 93. As shown in the diagram on the right by Walker and Fisher, this “illustrates how the systems analysis methodology outlined above [the five step process] fits into public policy analysis more generally.” It is nice to see some iterative feedback loops. But step 4, Select Alternatives, is still 100% magic and intuition. Its only input is steps 1, 2, and 3, plus what went right or wrong with steps 6 and 8. *None of these provide a sound model of how the system works.*

The result is that Select Alternatives will usually produce a stream of weak hypotheses. The remaining steps cannot improve these very much, because they are designed mostly to weed out bad solutions. *They cannot put radically innovative good solutions in.* Steps 5 and 6 remove bad solutions. They are the equivalent of the inspection steps of a manufacturing process that remove defective products. But as the famous quality improvement expert Dr. Harold Dodge observed: \(^{31}\)

> “You cannot inspect quality into a product. Quality must be built into the product. If you depend on inspection to achieve quality, you will fail to look at the process to improve it.”

This process needs a complete overhaul. More than anything else it needs step 3.5, System Understanding. This would change the remaining steps from their present pattern of “low quality in, low quality out” to “high quality solution hypotheses in, high quality solutions out.”

But that would only fix part of the problems this process has. Where is the decomposition of the problem into the three subproblems that all difficult social problems have? Wouldn’t it be even better to eliminate step 8, Monitor and Evaluate Results, and design self-management into the solution? And so on.

Improvements like these would lead to a process that was designed to solve difficult complex social problems in the most efficient and effective manner possible. Process designers could get there if they remembered only one guiding principle: *You cannot inspect quality into a product. Quality must be built into the product from the start.*

Proof that a comprehensive model of understanding is what makes all the difference was provided in the first chapter of this book. There Professor Jay Forrester spent somewhere around 90% of his time in studying and modeling urban decay. Once he knew how it worked, it became obvious, to him and anyone else that examined the model, why conventional solutions were failing. It also became obvious where the high leverage points were for solutions that should work. *And they did, because they were high quality hypotheses.*
The Process Is the Foundation

Two hundred years ago, the field of medicine was where the field of environmentalism is today. Doctors were unable to correctly diagnose the fundamental cause of most of the problems their patients brought to them. The reason is they had not yet discovered the germ theory of disease. Without the knowledge that germs were the fundamental cause of diseases, up until the late 19th century doctors were unable to correctly diagnose the vast majority of the problems their patients had. As a result mortality rates were high, especially child mortality. For example, the average life expectancy in the United States in 1850 for white males was 38 years. By 1900 it has risen to 48 years, by 1950 to 66 years, and by 2003 to 75 years.

It was the elegant experiments of Louis Pasteur, Francesco Redi, and others that led to the momentous discovery that disease is not due to “spontaneous generation” of germs or “poisonous fumes” given off by dung heaps and decaying matter. Instead, there is a fundamental cause for all infectious disease: microorganisms such as a virus or bacteria that can spread.

Of these experiments, the one that put the theory of the spontaneous generation of germs to rest forever was Pasteur’s conclusive experiments in the 1860s that proved it was not spontaneous generation of germs that was causing boiled broths to putrefy. It was airborne organisms. When he boiled broths in glass vessels and then sealed them, nothing grew in the broths. But when he exposed them to the air, they soon became infested with tiny living organisms. And the higher the altitude at which he exposed them, the less likely a flask was to develop life, presumably because there were fewer organisms floating around in the air at higher altitudes. Or when he exposed some flasks to air but filtered the air entrance with guncotton, no life developed, presumably because there were fewer organisms that could not pass through the filter.

Once the new tool of the germ theory of disease appeared, all sorts of related discoveries marched onto the field of medicine. Correct diagnosis on more and more diseases became the new norm. So did disease prevention via vaccination and hygienic practices. And, now that a correct diagnosis of the problem was possible, so was a correct treatment. A wave of antibiotics became the “magic bullets” of the 19th century, including one, penicillin, which saved this author’s life from pneumonia in infancy.

The discovery of the germ theory of disease was the breakthrough of the 19th century in medicine. What will be the breakthrough of the 21st century for environmentalism? Or perhaps the question should be framed more appropriately: What will be the breakthrough of the 21st century for the Science of Sustainability?

I believe that history has already answered that question. Sustainability is a new field. What marks the emergence of a new field of science is a comprehensive set of foundational knowledge on which the field can now build in earnest. Sustainology has no such foundation yet, because what it does have contains gaps so wide we are unable to build solutions to difficult problems on it. As this book has been arguing in almost every chapter, those gaps exist because of the wrong process. This in turn has caused no comprehensive model of the sustainability problem to exist (mostly due to exclusion of the social side of the problem), which means that basically we are all running blind because we are unable to see what matters most.

Without a solid basic System Understanding we are as blind as the doctors of two hundred years ago, who were unable to see the microbes that were the real causes of their patient’s problems. And we are as blind as the early physicists and chemists who were unable to see the basic structural elements of the universe (atoms, molecules, and the forces driving their behavior, like gravity) that had to be understood before they could solve problems of any real magnitude.

It is time to move forward and create the first sufficiently complete foundation for the Science of Sustainability. First we must solve the problem of how to transform the environmental movement from one based on Classic Activism to one based on a process that fits the problem. To do that we must first study the sustainability problem to find the key factors that make it so difficult to solve. The next chapter, An Assessment of Problem Difficulty, argues that seven main factors determine the degree of problem difficulty for all important environmental problems. The chapter after that, An Assessment of Process Maturity, then presents the eleven key process elements needed to solve difficult problems, as defined by the seven factors. These process elements are then used to rate ten representative environmental organizations on process maturity.

The conclusion is that presently the environmental movement has such low process maturity it is incapable of solving the sustainability problem. Since we now have proof this conclusion is true, in the form of the above two assessments, this conclusion should be a powerful incentive for those environmentalists reading this book to change course and adopt a process that fits the problem.

The process they adopt will not only lead to discovery of the foundational concepts of the Science of Sustainability. The process is the foundation.
Chapter 7

An Assessment of Problem Difficulty

The more difficult the problem, the more mature the process used to solve it must be. This chapter explores the ramifications of this key principle.

The Two Right Questions

All it takes is two simple questions to determine if someone is on track to solving a problem. The questions are:

1. What process are you using?
2. Why are you so sure that process will lead to a successful solution?

If the problem is the global environmental sustainability problem, then you will make an astounding discovery: Most people and organizations have no formally defined process for solving the problem. The very few that do have no way of proving that their process is highly likely to lead to a solution that works.

For example, what process have you or your organization been using, not to run your business but to actually solve the problem? What about those other environmentalists and other organizations that you are familiar with?

I have asked these questions and have never found a good answer. The only exception is those organizations that are working on a sustainability subproblem that is so easy that the process they are using is bound to work, such as the way the Nature Conservancy applies its Conservation by Design process to its mission of preserving “the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.” But such processes cannot be scaled up to solve the complete sustainability problem, though they do have some of the required elements.

Now suppose you could answer yes to the first question and provide strong proof for the second. Wouldn’t that put you on the road to solving the problem?

The remainder of this chapter will allow you to do exactly that.

The Top 11 Environmental Problems

The most practical place to start in solving a problem is to learn enough about the problem so that you can take the right strategic approach. Mountain climbers first study a mountain and its surroundings to see which face offers the best prospects for a successful climb. Tournament bass fishermen first study a lake to see where the potential big spots are. Only after that do they begin to develop a fishing plan. Settlers immigrating to the new world first surveyed a broad area (by word of mouth) to see where the most promising settlements might be before they begin to make more detailed inquiries and visits. In all cases, it is always the very first strategic decisions that made the biggest difference.

Our first strategic decision is to decompose one big problem into many little ones. This will allow us to more easily analyze the little ones, and from that determine why the big problem is so difficult to solve.

The decomposition we have chosen is from the Scientific Committee on Problems of the Environment study (SCOPE), whose results were summarized in the UNEP’s *Global Environment Outlook 2000* on page 339. The highlight of the study was a list of “major emerging issues.” Some of these are social issues, such as “poor governance.” Others are contributors (proximate causes) to other issues, such as “population growth and movement.” Extraneous issues like this were removed, so as to leave only bona fide environmental problems. The top eleven of these are listed below:

1. Climate change, 51%
2. Freshwater scarcity, 29%
3. Deforestation and desertification, 28%
4. Freshwater pollution, 28%
5. Loss of biodiversity, 23%
6. Air pollution, 20%
7. Soil deterioration, 18%
8. Ecosystem functioning, 17%
9. Chemical pollution, 16%
10. Stratospheric ozone depletion, 15%
11. Natural resource depletion, 11%

The percents are the percentage of SCOPE study respondents mentioning the issue. There were 200 environmental experts in more than 50 countries who contributed to the study. For example, 51% of all respondents mentioned climate change as a major emerging issue. All in all, this study was the best ranked source I could find for the world’s top environmental problems. Note that the problems are ranked by urgency, not difficulty.
What Are the Factors That Make the Sustainability Problem So Difficult?

Our second strategic decision is to perform a second decomposition. The top environmental problems are top issues because they urgently need solving. But despite the fact they should have been solved long ago, they have not. What is it about these problems that makes them so difficult to solve? To answer that question we decompose difficulty into the key factors we suspect can be used to differentiate easy and difficult problems.

Every situation is driven by a small number of factors. Thus it is safe to assume that only a small number of factors account for why some problems are easy to solve and some are difficult.

When we start to examine the sustainability problem for difficulty factors, a few jump right out because they are nearly unique to the problem. The first of these is:

**Factor 1 – High displacement in space** – Displacement is distance from cause to effect. Displacement in space is how geographically close to a problem source its symptoms are.

Let’s look at three examples: (1) A tanker oil spill mostly pollutes the sea around it and the shores it lands on, which tend to be nearby. This is a low to medium displacement in space. (2) The acid rain pollution emitted by a coal fired power plant has a medium displacement in space, because the effects occur hundreds of miles away, especially as the use of tall smokestacks to reduce local pollution has grown. (3) The greenhouse gases emitted by fossil fuel burning cause the effects of climate change all over the world, which is a high displacement in space.

Thus oil spills have a low displacement in space, while the acid rain problem has a medium displacement and greenhouse gas emissions have a high displacement. Which has been historically easier to solve? This varies directly with displacement in space. Oils spills have been the easiest to solve, and occur at a very low rate, considering the large number of annual tanker trips. The problem of acid rain has been moderately reduced, through the use of low sulfur coal, cleaner coal burning technologies, and the use of natural gas instead of coal. But the problem of greenhouse gas emissions from fossil fuel burning has not been solved at all, and has in fact grown worse every year for decades.

There is an easily discernable, fairly widespread correlation between displacement in space and problem difficulty. This makes this an important factor.

Next, let’s meet this factor’s twin sister:

**Factor 2 – High displacement in time** – Another type of displacement is displacement in time. This occurs when the problem event and the appearance of problem symptoms are separated by a delay in time.

We can reuse the same examples from above. An oil spill has a low displacement in time, since the effect shows up immediately as an oil slick and a few days later as the slick washes up on shorelines. Acid rain has a medium displacement in time. It takes days to weeks or even months before rain, snow, or sleet causes the water droplets in the air containing sulfur dioxide and nitrogen oxides to transfer to the ground. Greenhouse gas emission have a very long displacement in time of decades or centuries, because of the very long delay of the time it takes for temperatures to rise and weather patterns to change.

Again, there is an excellent correlation between displacement in time and problem difficulty. The higher the displacement in time, the more difficult the problem is to solve.

Let’s pause to apply the first two factors to the list of environmental problems. If the factors are useful then what we should see is a medium to high displacement in space and time in most of the problems.

Below is a table of difficulty ratings for the first two factors. The ratings are on a scale of 0 to 5, where 0 is infinitely low, 1 is very low, 2 is low, 3 is medium, 4 is high, and 5 is very high. Rather than an exhaustive scholarly analysis for each rating I have used my own best judgment. This should suffice, since the prime purpose of the table is to open up a new dimension of understanding.

<table>
<thead>
<tr>
<th>Environmental Problems</th>
<th>Displacement In Space</th>
<th>Displacement In Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Climate Change</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2. Freshwater scarcity</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>3. Deforestation and desertification</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4. Freshwater pollution</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5. Loss of biodiversity</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>6. Air pollution (excluding climate chg)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7. Soil deterioration</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8. Ecosystem functioning</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Chemical pollution</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>10. Stratospheric ozone depletion</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>11. Natural resource depletion</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Average Difficulty Rating</strong></td>
<td><strong>2.4</strong></td>
<td><strong>3.9</strong></td>
</tr>
</tbody>
</table>

Every problem has at least one factor with a rating of medium (3) or above except air pollution, so the factors correlate well with problem difficulty.
There are two patterns of interest. One is it does not appear that the higher the rating, the higher the problem appears in the ranking. This is because these were selected as the top environmental problems due to their urgency, not their difficulty.

The other pattern is that displacement in time averages much more than displacement in space. This can be explained by the principle that the top strategy for competitive agents is to maximize the net present value of their competitive advantage. All other behavior follows from that. This causes social agents, given a choice between working on a displacement in space or time problem, to choose the displacement in space problem first. While the truism “Out of sight, out of mind” often determines decisions, the rules of “This is not going to cause a problem any time soon” and “We must maximize value to today’s stockholders” hold priority and determine even more. It is deeply embedded cultural norms like these that determine aggregate agent behavior, not the ones we might like them to follow, such as the precautionary principle.

Next let’s return to identifying the main factors that cause one environmental problem to be more difficult to solve than another. These will not be nearly as obvious as the first two.

**Factor 3 – Weak perceived proof of cause and effect** – If perceived proof of cause and effect is weak, then a problem is difficult to solve, because it is difficult to convince people that is should be solved.

Notice the word “perceived.” Suppose physical proof of cause and effect is low, as it was for global warming until the last ten years or so. Add to this the fact that logical proof that the phenomenon of global warming is true has been around for a long time, and you have the ingredients for differences of opinion. Some people (those who are accustomed to logically proving things) will perceive that proof of cause and effect is high. Others (those who need conclusive evidence) will perceive that proof of cause and effect is low. Still others will be caught in the middle and not know what to believe, causing them to be susceptible to pleads from either side to see it their way. This frequently causes them to fall victim to fallacious appeals based on FUD (fear, uncertainty, and doubt) that argue that there is just not enough evidence to justify strong action. Or they may be persuaded by the fallacious emotional appeals of environmental classic activists to see things their way.

When this situation appears in the business world or science, cool calm logic and standard analytical practices are used to determine what to do. But most of the public, environmentalists, and politicians are not trained to think like business managers or scientists. This causes them to be highly susceptible to fallacious appeals as described above.

There is, however, an alternative: teach the public to think like business managers and scientists. This is starting to be done with rules of thumb, also known as principles. Of these the precautionary principle is an outstanding example. While this principle has long been used in business, science, and academia, it is new to the environmental debate. Essentially the precautionary principle says that if physical proof that a practice is harmful is low, but logical proof that it may be high is present, then decision tree analysis should be followed, which will usually indicate that the practice should be avoided until further and more conclusive evidence becomes available.

**Factor 4 – Caused by many types of agent behavior** – A problem is easiest to solve if it is caused primarily by one type of agent behavior. Usually the more types of agent behavior that cause a problem, the more difficult it will be to solve the problem.

Examples of one type of behavior and easy problems are the way acid rain is caused mostly by the burning of sulfur-containing coal, or the way a river may be polluted mostly by a single source of pollution, such as agricultural runoff or factory waste dumping.

Each type of agent behavior is a problem source. The more different types of sources there are the more difficult the problem becomes, because each unique type of source generally requires a custom solution and/or is a source of change resistance. If there are many types of agent behavior causing the problem, then there are probably going to be many special interest groups battling to be allowed to continue their behavior. Thus the higher the number of sources, the greater the change resistance will probably be.

**Factor 5 – Caused by a high percentage of agents** – The higher the percentage of agents whose behavior is causing a problem, the more difficult it will be to solve the problem.

For example, consider the climate change problem versus the soil deterioration problem. In industrialized countries, over 90% of the population directly causes climate change through the burning of fossil fuels as they drive or consume energy. But less than 10% are responsible for soil deterioration, because such a small percentage are farmers. This factor helps to explain why, in industrialized countries, climate change is so much more difficult to solve than soil deterioration. In the unindustrialized countries the percentages are approximately reversed, which explains why they find that soil deterioration is a harder problem to solve than climate change.
Factor 6 – High solution cost – The more a solution costs, the more difficult it will be to fund. Expensive solutions tend to be postponed, driven by hopes there is a cheaper way or that the problem will just go away. Very high solution costs can make a problem appear unsolvable if a society cannot afford the expense, or if there are competing problems vying for investment.

If a society is faced with a multitude of problems, many of which are expensive, it will be forced to solve some and not others, or to go with partial solutions. In the case of the sustainability problem this is the equivalent saying the problem has reached the point of insolvability.

Factor 7 – High influence of agents who perceive they will be made worse off by the solution – Finally we come to what is probably the biggest factor of them all. If the agents who perceive they will be made worse off by the solution have high influence, then they can usually block progress on solving the problem until a “wakeup call catastrophe” occurs. This is a catastrophe so large, and with such an obvious cause, that enough agents in the system are galvanized into taking critical action immediately. Or it may take a series of wakeup calls.

There is no doubt this is a key factor. Leading the charge against taking action on the sustainability problem are large for-profit corporations and their proxies, which include the United States, innumerable politicians, lobbyists, other countries, and so on. This source of change resistance was identified earlier on page 32 as the New Dominant Life Form. This section argued that the modern corporation and its allies is now the dominant life form on Earth. Because its top goal is to maximize the net present value of profits, it correctly perceives that it will be made worse off (in the short term) by the solution. This will happen, because the largest reductions in environmental degradation will come from reductions in population and consumption per person, not from changes in technology. This fact is often glossed over by environmentalists so as to soft pedal a harsh truth, and thereby win over corporate minds to their cause. But in an objective analysis it cannot be glossed over as easily. It is as real as the moon.

This completes the identification of the main factors that make solving the sustainability problem so difficult.

The Problem Difficulty Table

On the next page is the table of problem difficulty ratings for a list of problems. How the ratings are calculated will take some explanation.

The first thing to realize is the rating system is generic. It applies to all complex social system problems, not just sustainability. This is important, because the power of an abstraction increases exponentially with its universality.

All complex social system problems are different. Each has its own unique challenges. But underneath the veneer of a social problem’s outward appearance lies a pattern that can be used to calculate the problem’s difficulty. The pattern consists of the problem difficulty factors. While there are many more than the seven factors listed, these appear to be enough to roughly determine a problem’s difficulty on a relative basis.

The table is not meant to be definitive. The raw scores are estimated. So are the weightings. Selection of the factors and weights is my own first pass educated guess, rather than one based on expert opinions and studies. The purpose of the table is to illustrate the concept of problem difficulty factors, and to encourage that concept to grow into the realization of the need for a problem solving process that can handle such factors.

As we discuss the table it is vital to remember that the factors are only superficial. They are only proximate (immediate or direct) causes. They are not the underlying causes of why a problem is difficult to solve. However the factors are very useful for designing the proper process to solve the problem and as clues on where to focus one’s analysis.

How the Ratings Are Calculated

How much of each of the factors is present in a problem determines that problem’s difficulty rating. Because some factors are more influential than others, a weighting system is used.

An example is factor 1, high displacement in space. This receives only a weight of 1 because it is much less important than factor 2, displacement in time, which gets a 3. Looking at the climate change problem, we see a raw score of 5 and 5 for factors 1 and 2. But after these are multiplied by their weights, the weighted scores are 5 and 15. The raw scores are first and the weighted ones are second for each factor.

The maximum weighted scores are designed to add up to 100. This gives a total weighted difficulty rating ranging from 0 to 100. This is squared to get the final score, the relative difficulty rating, which ranges from 0 to 10,000. Squaring is necessary because problem difficulty rises approximately exponentially as the weighted score goes up. A counterpart is how in school grades 1 to 12, the ability of a student in grade 12 is not double that of one in grade 6. It is much, much more. There are something like a dozen times as many types of problems the twelfth grader can solve as the sixth grader. The
The higher the difficulty rating, the greater the change resistance will tend to be.

<table>
<thead>
<tr>
<th>Problem Difficulty Factors</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High displacement in space</td>
<td>1</td>
</tr>
<tr>
<td>2. High displacement in time</td>
<td>3</td>
</tr>
<tr>
<td>3. Weak perceived proof of cause and effect</td>
<td>2</td>
</tr>
<tr>
<td>4. Caused by many types of agent behavior</td>
<td>2</td>
</tr>
<tr>
<td>5. Caused by a high percentage of agents</td>
<td>2</td>
</tr>
<tr>
<td>6. High solution cost</td>
<td>4</td>
</tr>
<tr>
<td>7. High influence of agents who perceive they will be made worse off by the solution</td>
<td>6</td>
</tr>
</tbody>
</table>

**The Factor Weights**

The weights vary from 1 to 6 as shown in the list below. They have been very approximately estimated. Their exact values are unimportant. Only their rough relative values are.

<table>
<thead>
<tr>
<th>Difficulty Factor</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High displacement in space</td>
<td>1</td>
</tr>
<tr>
<td>2. High displacement in time</td>
<td>3</td>
</tr>
<tr>
<td>3. Weak perceived proof of cause and effect</td>
<td>2</td>
</tr>
<tr>
<td>4. Caused by many types of agent behavior</td>
<td>2</td>
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<tr>
<td>5. Caused by a high percentage of agents</td>
<td>2</td>
</tr>
<tr>
<td>6. High solution cost</td>
<td>4</td>
</tr>
<tr>
<td>7. High influence of agents who perceive they will be made worse off by the solution</td>
<td>6</td>
</tr>
</tbody>
</table>

Here’s how the weights were selected:

The first factor, **high displacement in space**, has a weight of 1. This is arbitrarily chosen as the reference weight. All other weights are multiples of the reference weight.
The second factor, **high displacement in time**, has a weight of 3. This factor is estimated to be three times as influential as the reference weight, due to the way social agents heavily discount the future. That is, a bird in the hand is worth two in the bush. Or there’s the golden rule of for-profit corporations: Maximize the net present value of profits above all else, because if you don’t your competitors will and you will be their lunch tomorrow. The first and second factor weights give us a *reference range* on which to place the remaining weights. All other weights are assigned as relative to the reference range.

The third factor, **weak perceived proof of cause and effect**, carries a weight of 2. Weak perceived proof is about the same as weak physical proof, since most people depend on physical rather than logical proof to make up their minds about new problems. This factor is less influential on agent behavior than displacement in time, but more influential than displacement in space.

This factor is not as influential as high displacement in time because if you compare “I’m not sure” to “This won’t happen for 50 years,” the latter has more influence on decision making. This is because very few people are accustomed to thinking that long term. Almost no one does in the normal course of their job or in their everyday life.

But this factor is more influential than displacement in space, because when you compare “I’m not sure” to “This is not causing a problem here,” the uncertainty of “I’m not sure” makes that take precedence over “This is not causing a problem here.” The more uncertain you are, the less you want to take action.

The fourth and fifth factors, **caused by many types of agent behavior** and **caused by a high percentage of agents**, also have a weight of 2 for about the same reasons that the third factor does.

But the sixth factor, **high solution cost**, is another story entirely. It carries a weight of 4. This is 1 more than the weight for high displacement in time, because “This is going to be expensive to solve” is a bigger impediment to taking solution action than “This won’t happen for 50 years.” The reason is the way maximization of corporate profit, as well as the accumulation of money and other forms of wealth by individuals, rulers, and governments, is the top driver in most agent decisions.

The last factor, **high influence of agents who perceive they will be made worse off by the solution**, starts to go off the chart. In solving a social problem there is no factor that comes even close to how difficult the problem is to solve if those who will be made worse off are in a position to block the solution. Thus this factor has a weight of 6.

These weights are all estimated. Another way to set them would be with a simple measurement poll. It could ask respondents how they would weight or rank the seven factors, which could be represented by the following list of phrases:

1. This is not causing a problem here.
2. This won’t happen for 50 years.
3. I’m not sure.
4. Many of types of behavior cause this problem.
5. Many different types of agents, such as different groups of people or different industries, are causing this problem.
6. This is going to be expensive to solve.
7. There are a lot of very influential parties who don’t want to see this problem solved.

A poll would undoubtedly find a different set of weights than those estimated above. But it would also find that the weights are not all the same, and therefore there are specific, measurable reasons why some problems are more difficult to solve than others. That is the key insight here.

**The Two Levels of Change Resistance**

Looking over the seven factors, we see that each of them increases the tendency of the system to resist change. The higher the rating for a factor, the more that factor increases change resistance. The higher the total rating or the relative rating for a problem, the higher the change resistance associated with that problem. *More than anything else, the ratings are a measure of change resistance.*

This is exactly what we would expect, because the more difficult a problem is to solve, the more the system is resisting change. But change resistance at the agent level means the refusal of a person or organization to fully support or adopt new behavior. At the system level change resistance is the tendency for a system to resist change even when a surprisingly large amount of force is applied. Thus there are two levels of change resistance at play here: *system change resistance* and *agent change resistance*.

When we are thinking about a problem and the system that contains it, change resistance is the tendency for the system to resist change. But when we analyze the system for the sources of change resistance and start to think in terms of types of agents, change resistance is the refusal of those agents to support or adopt new behavior. *It is only by thinking at the deeper level of agent type change resistance that we can begin to see the social structures that are the fundamental causes of a problem.*

This is a critical insight, because the change resistance side of the problem is the crux.
The Environmental Problems

The table below lists the top 11 environmental problems identified by the SCOPE study. Each problem has been rated. As shown in the sorted table, the higher the difficulty rating the lower the success in solving the problem. Thus it appears that the difficulty ratings do indeed explain why some problems are difficult and some are easy, at the factor level.

A very high difficulty rating does not mean a problem is impossible to solve. It only means there is going to be a high level of change resistance. If the process used in solving the problem takes change resistance into account, then problem solvers will be able to routinely sail right through problems like the ones on the list above.

Let’s compare the problems at the top and bottom of the table, to see why one was so easy to solve and why the other remains unsolved. These are stratospheric ozone depletion and climate change.

As soon as the stratospheric ozone depletion problem was close to being solved, the environmental movement began to regain some of its confidence. It looked as if it just might be possible to begin solving the problems on the list above. After all, if we can solve the first one, then why can’t we use that as a pattern of success and propagate it to the remaining problems?

But this did not happen, much to the consternation of the movement. The difficulty factors explain the reasons why. These reasons are especially easy to see if we compare the top and bottom problems.

The table below compares the ozone depletion and climate change problems. The difficulty factors show precisely where the differences in solution success come from. They are the same for the first two factors, high displacement in space and time. But in all the other factors the climate change problem scores much higher. This is why the climate change problem remains unsolved, while the ozone depletion problem was solved back in the 1990s by the Montreal Protocol. Let’s examine factors 3 to 7 to see exactly why this happened.

3. Weak perceived proof of cause and effect – Once scientific studies were completed a few years after the problem was first noticed, there was solid proof of cause and effect on what was causing stratospheric ozone depletion and exactly what its effects would occur, causing this problem to receive a raw score of 1. But on climate change solid proof of cause and effect has taken much longer, and there are still wide variations in the predicted consequences of excessive amounts of greenhouse gases. It was not until the third IPCC report in 2001 that scientists were able to predict, with 95% confidence, that global temperatures would rise between 1.4 to 5.8 degrees Celsius over the period 1990 from to 2100. This is 150 years after the buildup of excess greenhouse gases began in the 1850s, due to the beginning of the Industrial Revolution and its dependence on the burning of coal, and later other fossil fuels.

Thus for a long time there was weak proof of cause and effect. In addition, given the variability in predictions of how much temperatures will rise and when, there is still not the high perceived proof of calamitous effects that are needed for society to take a highly ag-
gressive approach to a solution. Thus the climate change problem receives a raw score of 4.

4. Caused by many types of agent behavior – Stratospheric ozone depletion was caused mostly by a single type of human behavior: the release of chlorofluorocarbons (CFCs) into the atmosphere. The pie chart below shows how CFCs were used in five main areas. The sixth area causing harm was other products containing halons, such as waterless fire extinguishing systems.

At first glance it appears that ozone depletion is caused by many types of agent behavior. But “many” is a relative word. Depending on how they are chosen, there are hundreds or thousands of main types of agent behavior. If industries are used then only a very small percent of industries were dependent on CFCs and halons.

The negotiations leading up to the first version of the Montreal Protocol on Substances that Deplete the Ozone Layer thus only had to deal with a relatively small segment of industry. This is so much easier than dealing with hundreds of industries that this factor receives a raw score of 1 for ozone depletion.

But for climate change there is an endless multitude of types of agent behavior causing the problem. Looking at just fossil fuel burning, we have the auto industry, the airlines, the shipping industry on land and sea, the oil industry, the coal mining industry, and the coal, oil, and gas electric power plant industry. Tucked into this are small industries like the use of tractors for farming and pumps for irrigation. And then there is deforestation, which also causes climate change. This is caused by the building of homes and commercial properties, the clearing of forests for agriculture use, logging for the paper and wood industries, and subsistence farming.

The list of agent behaviors linked into the causes of climate change is so long it is impossible to list them all. Thus this factor received a raw score of 5 for climate change.

5. Caused by a high percentage of agents – This follows the pattern of the fourth factor. The percentage of agents involved in the production of CFCs was so low this factor receives a 1 for ozone depletion. But the percentage of agents involved in the production of greenhouse gas emissions and the loss of greenhouse gas sinks is so high this factor gets a 5 for climate change.

6. High solution cost – CFC substitutes initially cost 3 to 5 times as much. This would seem to be high, but coolant cost is a small fraction of the total cost of the equipment that uses it, so this factor scores a 1 for ozone depletion.

But the climate change problem has a high solution cost, because affordable substitutes for the uses of fossil fuel have in most cases not yet even been found. For example, biofuels like ethanol are being promoted as a replacement for gasoline. But in temperate climates, such as most of the industrialized world, the energy costs of producing ethanol sources like corn are so high that there is barely a net gain. In addition, the production capacity of countries for ethanol sources is very small compared to their needs.

As another example, photovoltaics (PV) are much more cost competitive. Small PV systems connected to the electrical grid cost only 2 to 5 times as much as buying power from the grid. But they cannot supply any electricity when the sun is not shining. They must be quite large to satisfy peak loads. And unlike CFC substitutes, conversion cost is huge. One 2006 article reports that “In a Sacramento, California home, it would cost around $16-$20,000 to satisfy around 25% of that home’s energy needs.”

This is so unaffordable that photovoltaics have a very high solution cost. The same is currently true for all large scale fossil fuel substitutes. Thus this factor receives a 5 for climate change.

7. High influence of agents who perceive they will be made worse off by the solution – Finally we come to the factor with the highest weight of them all: a 6. This is the factor that makes the biggest difference.

For the ozone depletion problem, the influence of corporations made worse off by having to phase out CFCs and halons was very small. Their initial resistance was led by the world’s largest manufacture CFCs: DuPont, who also invented them. DuPont founded and led the so called Alliance for Responsible CFC Policy, which successfully stonewalled industry conversion for years. But it was a tiny industry, and could not do this forever. As soon as conclusive scientific evidence appeared linking CFCs to ozone layer depletion, DuPont
reversed its position and supported immediate conversion to safe substitutes. Why? Because DuPont was essentially alone against the rest of the world. It was the only corporate giant backing continued use of CFCs. It knew it could not hold out against public opinion alone, and so it gave up the struggle as soon as it was evident the tide would be against it. Thus this factor receives a 1 for the ozone depletion problem.

But the hundreds of oil companies, car companies, and electric power plant companies promoting fossil fuel consumption are not so alone. And they are giants. On page xx is a table of The World’s 100 Largest Economies in 2000. 53 of them were corporations. Scanning the first 16 corporations in the left side of the table, we see that 10 of them are car manufacturers or oil companies. ExxonMobil, for example, has larger revenues than the GDP of 170 out of 190 countries in the world. The top 16 corporations each have larger revenues than 156 out of 190 countries. That economic power translates directly into such strong political power that the fossil fuel industry has had little trouble stopping all significant progress in solving the climate change problem for decades. Thus this factor gets a 5 for climate change.

Now we can see why, at the factor level, the climate change problem is so fiendishly difficult to solve, and the ozone depletion problem was so easy. But has the environmental movement been able to see why this is so?

No. A recurrent theme in the environmental literature is attempting to replicate the success of solving this global problem to other problems. For example, a very thorough article on The Evolution of Policy Responses to Stratospheric Ozone Depletion in the Natural Resources Journal, 1989, stated that: (italics added)

“The Montreal Protocol is a landmark agreement in that it is the first international treaty for mitigating a global atmospheric problem before serious environmental impacts have been conclusively detected. As such, the Montreal Protocol has stirred much interest, and both scientists and policymakers have suggested that it can be used as a model for international agreements on other global environmental problems, especially the problem of CO2 and trace-gas induced global warming.”

The conclusion that “it can be used as a model for international agreements on other global environmental problems” is faulty. It can only be used as a model on other problems with similar difficulty factors. Attempts to use it as a model for solving the global warming problem will not work, because they are as different as day from night. Until environmentalists recognize why, at the factor level, the ozone depletion problem was solved and why others like global warming have resisted solution, their efforts will remain as ineffective.

The Many Difficult Subproblems Factor

Let’s step back to look at the sustainability problem as a whole. How difficult is the complete problem? Here we must realize that if any sustainability subproblem remains unsolved, then so does the main problem. A chain is only as strong as its weakest link. Therefore the highest difficulty rating is the rating for the whole problem.

But this does not consider an eighth factor: the presence of many difficult subproblems in the original problem you are trying to solve. If this is low, then the problem does not require peeling back layer after layer of yet another problem, just to solve the whole problem. But if this factor is high, then the deeper you dig the more problems you find.

The world is belatedly discovering that when it comes to this eighth factor, the sustainability problem is the granddaddy of them all. The problem probably deserves a raw score of 5 and the factor a weight of at least 10. Using the raw score from the most difficult subproblem, this would give the sustainability problem a raw score of $98 + (5 \times 10) = 148$. Squaring this gives a relative difficulty rating of 21,904. When we compare this to the only problem solved on the list of environmental problems, the ozone depletion, we have a 1,296 versus a 21,904.

Given this, is it any surprise that classic activists have been unable to solve the sustainability problem?

The Dread Factor

Peter Morrisette, in The Evolution of Policy Responses to Stratospheric Ozone Depletion, argues that a major reason the ozone depletion problem was solved is it contains a high amount of “dread.”

“Catastrophic Nature of the Risks: The ‘Dread Factor’

“The public's perception of the risks from an environmental problem can have a significant effect on how policymakers respond to that problem. Slovic et al. have identified a shared set of characteristics called ‘dread’ that help explain how the public perceives risks from certain technologies and hazards. The risks from a technology or hazard that are perceived to be high in dread are those that are seen to be globally catastrophic, threatening to future generations, increasing, hard to prevent, not easily reduced, involuntary, and personally threatening. Tech-
nologies and hazards that score high in dread include among others nuclear power, nuclear weapons, DDT and other pesticides, liquid natural gas, and asbestos. A second important factor is familiarity, that is, whether the risks are observable, known to those exposed and to the scientific community, and whether the effects are immediate or delayed. A third factor is the extent of exposure. Risks from technologies such as nuclear power or DDT that are perceived to be high in dread, low in familiarity, and high in exposure are more likely to be seen as unacceptable by the public.

“The CFC/ozone-depletion problem shares many of these characteristics. In particular, the increased risk of skin cancer is a global problem which is threatening to future generations, increasing, hard to prevent, and not easily reduced. Furthermore, exposure is involuntary and personally threatening. In addition, the recently discovered ozone hole over Antarctica has likely contributed greatly to the perception of global catastrophe and dread, adding a new sense of urgency. Also, familiarity with the ozone depletion problem is low: the risks are not easily observable, and they are delayed and not well understood by scientists. In other words, the risks associated with ozone depletion are high in dread, low in familiarity, and high in exposure. The problem is global, with a potential for catastrophic impacts on human health and the environment, and it is not well understood by the public or scientists.

“The dread and unacceptable nature of the risks associated with stratospheric ozone depletion have undoubtedly contributed to maintaining political interest in the problem and the search for a solution. The well-documented risk of increased skin cancer has long been a driving force behind efforts to protect the ozone layer: it was central to the SST/ozone depletion debate, and it was the principal reason for the U. S. aerosol ban in 1978.”

This is indeed a major factor. But I believe the seven factors used in the difficult problems table are even more influential. For example, the horrors of lung cancer are well known. But that did not make how to alert the public to the risks of tobacco smoking an easy problem to solve. It took decades. What finally made the problem solvable was the appearance of irrefutable proof of cause and effect. Another example is most of the environmental problems will cause massive famines and deadly conflict, including full scale warfare, if they come to pass. This does not appear to have made them any easier to solve. Finally, even though the ozone depletion problem was high in dread, it remained unsolved until irrefutable proof of cause and effect appeared. Once that happened, DuPont reversed its position and came out in strong support of banning the use of CFCs.

But we could be wrong. Maybe dread should be included in the difficulty table factors. A more thorough study of these factors would be able to determine this.

The Non-environmental Problems
The power of an abstraction increases exponentially with its universality. To more fully flesh this one in, let’s apply it to a few well known non-environmental problems. This will demonstrate how the seven factors can explain the difficulty of a variety of complex social system problems, not just environmental ones.

The urban decay problem – Chapter one described this problem in graphic terms:

“In the 1950s and 1960s, urban decay and the symptoms it caused was America’s biggest problem. It would eventually reach the crisis stage with the Los Angeles race riot of 1965, which left 34 people dead. Other riots occurred in Newark and Detroit. The problem continued to deteriorate, and in 1968 Martin Luther King Jr. was assassinated, which sparked further riots, including some in the nation’s capitol. The riots, high levels of crime, growing discrimination and race hatred, and a host of factors increased white flight from inner cities. Businesses also moved out. This made the urban decay problem even worse, causing a vicious cycle. Despite a plethora of attempted solutions, the problem failed to get better. By the late 1960s the problem looked hopeless.”

Chapter one then proceeded to show how Jay Forrester, using the new tool of system dynamics, was able to model the problem and pinpoint where the low and high leverage points were. Problem solvers had been pushing on the low leverage points, which the system successfully resisted. His model showed how if they pushed on the high leverage points instead, using much less investment than they had been using before on the low leverage points, the problem could be solved. And it was solved in about ten to twenty years, largely by using Forrester’s insights. Today urban decay is still a problem, but it is no longer the crisis it once was. Society has had medium success in solving the problem, as listed in the table on the next page.
Again, please remember the factors, raw scores and weights are all estimated. This is not a definitive study. Its purpose is to illustrate that complex social system problems have a pattern of superficial, easily measured factors that can be used to determine problem solving difficulty. If the process used on a problem does not take its high difficulty factors into account, then the group of problem solvers using that process will be unable to solve the problem, unless they get very lucky.

Let’s examine the difficulty factors for the urban decay problem, to see how they can explain the problem’s difficulty. Looking at the table on the right, we see that (1) High displacement in space scores a 1. It is very low. The physical distance from source to cause in urban decay is very short. Scarcity of jobs or low paying jobs in an area cause that area to become populated with low income households. The same holds for level of parental education, level of crime, and level of illegal drug use. Note that these sources are not the so called root cause source, but are intermediate sources of the cause of the problem.

(2) High displacement in time is medium, so it gets a 3. Forrester’s model showed that it took decades for the structural causes of urban decay to show up as decay symptoms. But these causes were so subtle, and so counterintuitive, that no one before him had noticed them. Thus there was a very (3) Weak perceived proof of cause and effect, so that factor scores a 5.

Once Forrester completed his model of the problem, it became obvious that urban decay was caused by a fairly limited number of types of agent behavior. But it was not caused by only one type of behavior, so it scores a 2 for (4) Caused by many types of agent behavior. The fundamental causes were seen as coming from two policy areas:

“The natural tendency toward imbalance in which housing dominates industry might be corrected by urban policies that encourage industry as well as by policies that discourage construction of excess worker housing.”

Thus the two fundamental causes of urban decay were lack of pushing on these high leverage points. A third cause must be added to this: pushing on intuitively attractive low leverage points. The conventional wisdom was that urban management programs like jobs for the underemployed, training for the under skilled, financial aid, and low cost housing were the solution. Most of the agents in the system passionately believed this solution would work. The poor supported it, because it promised them lower expenses and higher incomes. Employers supported it, because it decreased employee costs and increased their skill level. Urban managers, academics, and the middle and upper class supported it because it made good sense and fit the pattern of transfers of wealth to the poor as a helping hand for getting them on the path to economic equality.

It didn’t work. But because all the major agents strongly believed it would, the (5) Caused by a high percentage of agents factor scores a 5.

The urban decay problem also had a high perceived solution cost. The favored solution was expensive. As a result it was difficult to keep it adequately funded over the long term. But it was not prohibitively expensive, so (6) High solution cost scores a 4 instead of a 5.

Finally, there was a very (7) High influence of agents who perceive they will be made worse off by the solution, so this factor scores a 5. More than anything else, the solution required large expenditures over an indefinite period of time. The money for this came from the middle class and especially the rich. This group, as it usually does, had high political clout. As a result it refused to fully fund the solution long enough for the solution to work.

But Forrester’s model showed that this solution never would work, because it was pushing on low leverage points. Ironically Forrester’s solution, the one that did work, turned out to be so much cheaper than ones that did not work that today urban management programs are in general sufficiently funded.

Weighting these scores and summing them up, we arrive at a total relative rating of 6,400. Problem solving success has been medium, which is what you would expect from a rating in this range.
The Phenomenon of Disappearing Difficulty - The urban decay problem exhibited a common phenomenon. Once the right high leverage points were found and problem solvers knew about them, problem difficulty disappeared because the most important difficulty factors now had a low rating. Let’s examine these to see how this happened, starting with the factor with the highest weight of them all.

This is (7) High influence of agents who perceive they will be made worse off by the solution. When problem solvers were pushing on low leverage points by using conventional wisdom solutions, this factor was very high. It was a 5, because high influence agents perceived that they would have to pay a lot of money for a long time for an expensive solution, one that was not even working. But Forrester’s solution, which pushed on high leverage points instead, was so supremely efficient that it was a low cost solution. In addition the new solution profited industry directly. The policy of encouraging businesses in inner city areas required tax breaks and subsidies. These two aspects caused solution support from the highest influence agents, corporations, to vanish, which changed this factor from a 5 to a 1.

The (6) High solution cost factor fell to about a 2. The (5) Caused by a high percentage of agents fell to a 1, because now most agents supported the right solution instead of the wrong one. (4) Caused by many types of agent behavior also fell to a 1, because once the right solution was known by the agents in the system, only a very low percentage of agents still supported the wrong solution and continued to push on low leverage points. Finally, (3) Weak perceived proof of cause and effect also fell to a 1, because once you understood Forrester’s model, the fundamental causes of urban decay were strikingly clear.

Factors 1 and 2 remained unchanged. But the new raw scores, when weighted and added up, change the total weighted rating from 74 to 32, and the relative rating from 6,400 to 1,024. This is why the sudden discovery of the right high leverage points caused problem difficulty to disappear. Such is the power of the right analytical approach.

It appears the same phenomenon can be repeated on the sustainability problem as a whole, by educating key agents about the presence of high leverage points that have never been pushed on, and how they might be pushed on effectively.

The Civil Rights Problem – According to Wikipedia, “Civil rights are the protections and privileges of personal liberty given to all citizens by law.” The civil rights problem was mostly solved by the civil rights movement of about 1960 to 1980, when new laws granting all citizens full equality and opportunity to reach equality were passed in much of Africa, Europe, and the United States.

Once it became a major issue, this was an easy problem to solve. The cause was systemic discrimination and the absence of laws and programs to actively eliminate discrimination. Let’s identify this cause with the single word “discrimination.” The symptoms of the problem were grossly lower economic and social outcomes of those who were members of ethnic groups who were discriminated against.

The distance in space and time between discrimination and the symptoms was very low, so the first two factors score a 1. It was so obvious that discrimination was the cause of the symptoms that the third factor, Weak perceived proof of cause and effect, also scores a 1. But the fourth factor, Caused by many types of agent behavior, was not very low. It was only low, so it scores a 2. There were dozens of subtle ways to discriminate and still stay within the law. But these behaviors were a small percentage of the total behaviors of society.

The fifth factor, Caused by a high percentage of agents, is medium, so it gets a 3. Somewhere around 30% to 70% of the citizens in power in those countries with a discrimination problem did actually discriminate.

Some complex social system problems have a very inexpensive solution. The civil rights problem was one of them. Enacting new laws, educating the people about them and enforcing them is all that was required. This was such a cheap solution that the sixth factor, High solution cost, scores a 1.

There was, however, change resistance. The seventh factor, High influence of agents who perceive they will be made worse off by the solution, was medium, so this scores a 3. There was plenty of organized, prolonged resistance. But there was also plenty of organized, prolonged support, which is what gradually caused those resisting change to see things in a new light, and change their minds.

These scores add up to a 1,444 for the relative ranking of problem difficulty. This is low, which is why the civil rights problem was so easy to solve. In many countries it was a hard fought battle at the time, but in retrospect it was an easy battle, because it was a relatively easy problem. In fact it was so easy that it could be solved with Classic Activism. But just because the process of Classic Activism can solve one activist problem does not mean it can solve them all.

The Women’s Suffrage Problem – This problem has scores that are identical to those for the civil rights problem, except for one factor: (5) Caused by a high percentage of agents. Since mostly men were in power and
for a long time most of them felt they were superior to women, this scores a 4.

But after the women’s suffrage movement began, this factor fell to a 3. This is part of the phenomenon of disappearing difficulty. Other factors fell too, but to keep this chapter short they will not be described here.

The “This Has Worked Before” Trap

These three non-environmental problems were all solved. The first one, urban decay, was solved using system dynamics. The other two, civil rights and women’s suffrage, were solved using the very popular process of Classic Activism. Notice how they were so easy that they had little change resistance. This is why Classic Activism was able to solve them.

But herein lies the trap that millions of environmentalists have fallen into. Classic Activism, the standard process used by the environmental movement, works beautifully on easy social system problems. It sometimes works on medium difficulty problems. But it almost never works on high difficulty problems. However, if you are unaware that some problems are inherently easy and some are difficult, then you will assume that the process you are using is not at fault when solution failure occurs, because it has worked before. Instead you will assume that somehow the process has been applied improperly, and so you must try again. But this will not work. No amount of clever or muscular application of the wrong tool will solve a problem the tool does not fit. Can a mathematician solve a molecular chemistry problem with calculus? Can a Phillips screwdriver turn a slotted screw? Can a cow jump over the moon using a pogo stick?

The purpose of the next chapter is to make the “This Has Worked Before” trap so visible that environmentalists will never fall into it again, because they will be inclined to switch to a process that works on difficult problems.
An Assessment of Process Maturity

Chapter 8

An Assessment of Process Maturity

The previous chapter established the principle that the more difficult the problem, the more mature the process used to solve it must be. That chapter showed that the sustainability problem is a very difficult problem and the seven factors causing this. The logical conclusion is that if an organization’s problem solving process is immature, it will be unable to solve problems containing high amounts of these factors, such as the sustainability problem.

This chapter builds on these ideas by showing that the current process maturity of the environmental movement is low. This is done with an assessment of ten environmental organizations (this was done in 2006, so it may be a little out of date by now). The analysis is presented in the form of a table rating these entities on eleven key process elements. The entities in the table have been chosen to be as broadly representative of the environmental movement as possible. The table is on the next page.

The purpose of the table and this chapter is to diagnose exactly why the modern environmental movement, including even large organizations like the UNEP, appears to be incapable of solving the sustainability problem in time. The conclusion is that the reason for this is that the process does not fit the problem, because in terms of the process elements needed to solve the problem, the average process maturity is too low.

It is hoped that once the movement accepts this diagnosis, it will want the cure.

Process Maturity

Process maturity is not some wild beastie no one can see and no one can understand. It is not an infinitely subtle concept that only those steeped in years of process training and experience can fathom. Process maturity, once it has been decomposed properly, is a concept so simple and vital that millions of organizations around the world have grasped the very core of the concept. This boils down to one simple rule, which is:

Process maturity is an emergent property of the maturity of the elements that make up the process.

An emergent property is behavior that cannot be predicted by examination of the parts. Emergent behavior is also known as "the whole is greater than the sum of the parts." In other words, the behavior of the whole "emerges" only when the parts are arranged in a certain manner to create the whole.

The parts making up a process are known as process elements. All processes, from the one we use to tie our shoes all the way up to the one we use to run our lives, have distinct steps that we use over and over to execute the process. Each step is a process element. It may be unconscious. And it may be hard to describe to others. But these steps exist. The better they interact to support each others, the greater the multiplier effect, and hence the greater the emergent property of process maturity.

The first step on the road to process maturity is the formal identification of the main steps in a process. These are the ones that form the backbone of the process. They drive its strategy. If they are mature, then so is the process. The rest is a matter of detail.

The overall maturity of an organizational process is not the sum of the individual parts. Merely adding up the assessment scores of a process’s elements does not give the overall process maturity score. Something more is needed. We have handled this by squaring the total of the process element scores, just as we did in the table in the previous chapter. This is because process maturity varies exponentially with the sum of the maturity of its process elements.
To keep the table simple and on one page, we have selected a mere 11 process elements. These are grouped into three areas: those from Classic Activism, Analytical Activism, and the problem domain.

Notice the element weights. These greatly favor Analytical Activism. This chapter argues that these weights and key process elements explain why most environmental organizations have achieved such low mission success.

The ten environmental organizations range from small to as big as they come: the European Union Environmental DG and the United Nations Environmental Program. The criteria for inclusion was that they be influential, well known, and take a wide variety of approaches, so that we can draw conclusions representative of environmentalism as a whole.

We have left room at the bottom for you to write in your organization’s name or several you may be working with. As you read the chapter you can cogitate a little and rate them.

Then comes the real payoff. After you have finished the book, you can come back to this page and start to develop a plan for how to raise their scores one key process element at a time, until they have a high enough process maturity to consistently achieve their objectives.

Good luck!

Next we will discuss the process elements and then use them to rate the list of organizations. We begin with the first four elements, which are the four steps of Classic Activism.
The Four Elements from Classic Activism

Classic Activism was introduced on page 34 with the diagram shown above. It consists of these four process steps:

1. Identify the problem to be solved.
2. Find the proper practices, if they are not yet known.
3. Tell people the truth about the problem and the proper practices. This is all it should take to get them adopted.
4. If that fails, exhort and inspire people to support the proper practices.

This is a very simple process, which allows it to be understood and applied immediately by all activists. We will show that while this simplicity is Classic Activism’s greatest strength, it is also its greatest weakness, because from the viewpoint of a classic activist, these four steps are all it takes to solve all problems. This is a false assumption.

A process is a repeatable series of steps for achieving a goal. Classic Activism is a process used by groups of people to solve social problems that governments are not addressing. If it succeeds then a government assumes solution responsibility. A prerequisite for Classic Activism to work is a democratic government that will respond to activist pressure.

Classic Activism is the problem solving process used by nearly all environmentalists and environmental organizations today. Most other activist organizations also use it. These number in the tens of thousands, making Classic Activism the most popular process in the world for improving the life of the average citizen as a result of the behavior of its government.

A Brief History of Classic Activism

The first notable case of Classic Activism in the Western world occurred long ago in England in 1215, when the issue was the most foundational social problem of them all: the right of the people to have control over their own government. Previously the doctrine of the divine right of Kings and tradition had put the King’s powers beyond the reach of the people. Only the Church had a say in the matter of what the King could or could not do, and the Church, like the King, was a self-perpetuating lineage.

Due to a complex set of circumstances all this began to change after King John succeeded to the throne of England in 1199. His military failures forced him to raise taxes precipitously, which provoked unrest. A further defeat at the Battle of Bouvines in 1214 caused the loss of Normandy, a major source of income for the English crown. This was the last straw for the barons, mini Kings themselves, who saw their King as not only a colossal loser, but as one who, if his powers remained unchecked, would drive them to ruin. Thus it was that on June 10, 1215 the barons of England joined forces and took London by force. Rather than replace one King with another, who would be just as likely to cause them similar problems, the barons made a structural change to the system. In other words, to solve the problem they changed the system, not the person.

On June 15, 1215 the barons forced King John to agree to an agreement that has become known as the Magna Carta. Of its 63 clauses, the most important was the one that established a committee of 25 barons whose
decisions were final and over-ruled those of the King. This became the prototype of England’s later parliament.

This was deep structural change, because the committee could improve the system, which included improving itself. As the centuries went by, this new feedback loop caused the new system of self-governance to become more and more able, until five centuries later in the 18th century, the French and American Revolutions took the system a giant leap forward to the model of democracy. This new model quickly became the new Normal Science in the West.

Once this occurred Classic Activism picked up considerable steam, because the very idea of democracy is that the state exists solely to serve the people. If it is not doing that well, then the people need to bring shortcomings to the state’s attention so that they can be addressed.

For the first few centuries of modern democracy this was done adequately through elected representatives, who were designed to be the spokespersons of the people. The system worked reasonably well at first. But Model Drift began when the system was unable to prevent large, powerful special interest groups from having undue influence. One of these had always been the rich and powerful. Democracy, though, had proven itself capable of keeping them in check. But in the 19th century when a new powerful special interest group, the modern corporation, appeared and allied itself with the rich and powerful (and later the military), the system began to break down. The passage of new laws could no longer keep up with the growth of problems like urban slums, child labor, product safety, and most of all, the broken (some would say impossible) dream that the immense new wealth of society would allow all to move up to at least the middle class if they tried. It was this last issue that permeated the aspirations of the masses. When combined with the growing realization that suffering and oppression need not be allowed to exist any longer in a new world of affluence, the first democratic social movements were born. This was a spontaneous attempt by the model of free market democracy to correct its own Model Drift.

Among the first large social movements were the labor and socialist movements of the late 19th century. These focused on improving the standard of living among the non-rich. Once that problem was somewhat resolved, other problems took center stage and a flurry of new social movements appeared in rapid succession. These include women’s suffrage, civil rights, feminism, and of course, environmentalism.

All these social movements followed the basic process of Classic Activism. By and large, the model of Classic Activism as an effective process for achieving large scale social change has worked more often than not. This explains it perennial appeal.

There have been some variations. Some movements, such as the way socialism evolved into communism, veered away from the standard four steps of Classic Activism when they resorted to violence. At that point they became a different type of activism: violent revolution.

Another variation on Classic Activism is the use of donations, bribes, deals, coercion, and so on. This is so far from the spirit and practice of Classic Activism that it falls into a completely different category of activism, one that is usually dependent on, or degenerates into, corruption. This variation employs the race to the bottom, while Classic Activism takes the high road of the race to the top.

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Next, let’s review the steps of Classic Activism from the viewpoint of process maturity. Below are the four steps and their weights:

<table>
<thead>
<tr>
<th>Key Process Elements</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic Activism Steps 1, 2, 3 and 4</td>
<td>1</td>
</tr>
<tr>
<td>1. Identify the problem</td>
<td>1</td>
</tr>
<tr>
<td>2. Find the proper practices.</td>
<td>1</td>
</tr>
<tr>
<td>3. Tell the people the truth about the problem and the proper practices.</td>
<td>1</td>
</tr>
<tr>
<td>4. If that fails, exhort and inspire the people to support the proper practices.</td>
<td>0</td>
</tr>
</tbody>
</table>

Process Element 1 – Identify the problem

This is tougher than it appears. Too many organizations have identified the wrong problem. The result is so much effort is expended on solving the wrong problem that there is not enough effort left to solve the right problem. For example, many organizations have lumped the poverty problem in with the environmental sustainability problem, and call the combination “sustainability.” We will take this subject up in depth later in this chapter.

Too many organizations have also identified the problem wrongly. They have such a rambling, vague statement (or no written statement at all) of what they are trying to solve that as a result, their efforts run all over them map. An example of this is the definition of sustainable development, which has been taken to mean the same as sustainability. This issue will also covered in detail later in this chapter.
This element carries a weight of 1, as do the two next elements. All three are reference weights and serve to define the lower end of the weighting scale.

**Process Element 2 – Find the proper practices**

All problems have symptoms. All symptoms have a cause. In activist problems the immediate cause is always that people are not following the proper practices. Their behavior needs to change. The goal of activists is to change people’s behavior so that they adopt the proper practices and the problem symptoms go away. For example, if the problem is discrimination, then the proper practice is people should not discriminate on the basis of race, age, gender, disability, etc. If the problem is environmental sustainability, then people should adopt the proper practices (new behaviors) that make their environmental impact more sustainable.

For some problems, such as discrimination and women’s suffrage, the proper practices are obvious. People should not discriminate and women should be allowed to vote. But for other problems the proper practices may be unknown. This applies to part of the sustainability problem, which is why there has been so much research in areas like alternative energy and pollution reduction.

If the proper practices are not yet known, then process maturity for this element is a measure of how well a person or organization goes about finding the proper practices. If the proper practices are known, then this element doesn’t matter and automatically receives a raw score of 3 for moderately productive. In the table this is signified by a 3n, where the “n” means not applicable.

**Process Element 3 – Tell people the truth about the problem and the proper practices**

Once the proper practices are known, the next step is to tell people the truth about the problem and the proper practices they should adopt to solve the problem. The truth can be communicated through the news media, books, demonstration projects, education projects, scientific articles, jawboning with politicians, and so forth. The basic assumption is this step will work, because once people see the truth about the problem and the easy availability of new behaviors that will solve it, they will adopt those behaviors.

But if they don’t, then the next step of Classic Activism is needed, which is:

**Process Element 4 – If that fails, exhort and inspire people to support the proper practices**

This is attempted with eloquent writing, passionate speeches, pleadings with decision makers, demonstrations, marches, confrontational stunts to shock the public into coming to its senses, and so on. This can and has worked for some medium difficulty problems, such as local pollution and reducing acid rain.

However, for more difficult problems exhortation and inspiration have little effect, no matter how well they are implemented. This is due to the high level of change resistance exhibited by the dominant agents in the system. To them, appeals to ethics, reason, responsibility, and love of nature are just so much hot air to be ignored. This is counterintuitive and terribly frustrating to classic activists, who too often assume that everyone thinks the way they do. But it is a proven fact that they don’t, which is why this element carries a weight of zero. It is that effective on difficult problems.

This point deserves emphasis. If the third element, Tell people the truth about the problem and the proper practices fails, then it is time to move on to other approaches beyond the realm of Classic Activism. Except for a small amount, it is a waste of a problem solver’s time to exhort and inspire, when people have already demonstrated they are not going to change their minds based on evidence and logic alone.

In fact, exhortation and inspiration is counterproductive in anything but the lightest dose, because it turns intelligent people off to your message. Once they have turned off, it is now going to be much harder to get them to turn back on to anything you have to say.

The only way to solve difficult problems reliably, affordably, and in time is to increase your process maturity by employing the rest of the key process elements in the table (or other suitable elements from another process). Of these, the four best practices from Analytical Activism must be adopted first, because they form the foundation for the last three.

**The Four Elements from Analytical Activism**

Analytical Activism is the use of the Analytical Method to achieve activist goals. This method is designed to solve problems of any type, particularly those so challenging they are pushing the limits of our abilities to solve them in less than a lifetime.

There is more to practicing the process of Analytical Activism than the list of its nine steps could possibly describe. Analytical Activism, like all powerful tools, must be accompanied by certain strategies or its full power will not be realized. It is these strategies, rather than the steps in the process, that form the four elements from Analytical Activism.
If you elect to adopt Analytical Activism as your principle mission achievement tool, you may find yourself building your new approach around the four elements about to be described. But after you’ve used the tool for awhile, you will probably customize and improve it. At this point you will necessarily veer away from the standard four best practices of Analytical Activism. That’s okay, because you are now performing above the standard. You have raised the bar.

The four key best practices of Analytical Activism are, from my experience, always present in analytical approaches to extremely difficult problems that succeed. According to Wikipedia, “A best practice generally refers to the best possible way of doing something; it is commonly used in the fields of business management, software engineering, and medicine, and increasingly in government.” Let’s delve into these, as listed below:

<table>
<thead>
<tr>
<th>Key Process Elements</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical Activism Key Best Practices</td>
<td></td>
</tr>
<tr>
<td>5. Formal definition, management, and continuous improvement of a process that fits the problem</td>
<td>4</td>
</tr>
<tr>
<td>6. A true analysis of the problem is performed</td>
<td>3</td>
</tr>
<tr>
<td>7. The Scientific Method is used to prove all key assumptions</td>
<td>3</td>
</tr>
<tr>
<td>8. Learning from past failures and successes is maximized</td>
<td>2</td>
</tr>
</tbody>
</table>

Process Element 5 – Formal definition, management, and continuous improvement of a process that fits the problem

A process is a repeatable series of steps for achieving a goal. For example, doctors have a standard procedure for diagnosing many types of illnesses, starting with the symptoms. Other examples of processes are a constitution, Robert’s Rules of Order, the method of long division, and the Scientific Method. All are a much better and more predictable way of achieving a goal than no process or the wrong process.

If the process fits the problem, then if correctly followed and continuously improved it will lead to solution or to discovery the problem is insolvable. No other element can make this claim. Therefore the most important element in the entire process maturity table is the use of process itself. It must be formally defined, formally managed, and continuously improved. Because it is the most powerful process element of them all, it receives a weight of 4. This defines the upper end of the reference range of the weights used in the table, which range from 1 to 4.

If you harbor any doubts about the critical importance of this element, they should vanish once you realize that only after the entire field of science adopted this element did science become science.

It was not the final perfection of the Scientific Method in the 17th century that permanently turned earnest endeavors into scientific ones—it was the meta-strategy behind the method. The Scientific Method itself is amazingly simple and powerful. What provides its real power is not the method’s five easy steps, as is so commonly taught. These are mere tactics. The real power comes from the strategy behind them, which is the formal definition, management, and continuous improvement of the method, so that its power increases with each new generation of scientists.

Let’s pause to prove the assertion that the real reason that science suddenly increased its productivity by an order of magnitude was the adoption of (1) formal process definition, (2) formal process management, and (3) continuous process improvement, rather than a process that finally fit the problem.

(1) The formal process definition was the statement of what made up the Scientific Method. According to the entry on the Scientific Method in Wikipedia:

“The fundamental tenets of the basic scientific method crystallized no later than the rise of the modern physical sciences, in the 17th and 18th centuries. In his work Novum Organum (1620) — a reference to Aristotle’s Organon — Francis Bacon outlined a new system of logic to improve upon the old philosophical process of syllogism. Then, in 1637, René Descartes established the framework for a scientific method's guiding principles in his treatise, Discourse on Method. These writings are considered critical in the historical development of the scientific method.”
It was the “fundamental tenets” that formally defined the new process. Now that it was written down and standardized, it could be taught, learned, and applied uniformly and reliably.

(2) Formal process management took longer to appear, but when it finally did, it made a bigger difference than the invention of the Scientific Method itself.

A prime example of how large this difference could be was the establishment in 1876 of the world’s first invention factory, by Thomas Edison in Menlo Park, New Jersey. Using a factory-like process where he created hypotheses and others tested them in a methodical, closely managed manner, the Menlo Park factory produced the largest steady stream of notable inventions the world had ever seen. Over a six-year period it produced 400 patents and some of the most influential inventions ever, including the phonograph, the carbon telephone transmitter, the first practical incandescent light bulb, and to go with it, the first practical electrical generation and transmission system. Edison continued formal process management of the cycle of hypothesis, experiment design, experimentation, and interpretation after he moved his operations from Menlo Park to West Orange, New Jersey in early 1883. Over his lifetime, the results of formal process management led to an astounding stream of notable inventions the world had ever seen. Over a six-year period it produced 400 patents and some of the most influential inventions ever, including the phonograph, the carbon telephone transmitter, the first practical incandescent light bulb, and to go with it, the first practical electrical generation and transmission system. Edison continued formal process management of the cycle of hypothesis, experiment design, experimentation, and interpretation after he moved his operations from Menlo Park to West Orange, New Jersey in early 1883. Over his lifetime, the results of formal process management led to an astounding stream of notable inventions the world had ever seen.

What Edison really did was make the use of the Scientific Method scalable. The process could now be scaled up to the speed of appearance and quality of the new knowledge desired. One aspect of how he did this may be seen in these quotes from Working at Inventing: Thomas Edison and the Menlo Park Experience:

“The success of the invention factory idea depended on the skills of these craftsmen. Fast, flexible workers, accustomed to high standards of precision work, provided the foundation of the experimental teams that carried out the work of innovation. …the way to do it is to organize a gang of one good experimenter and two or three assistants, appropriate a definite sum yearly to keep it going… have every patent sent to them and let them experiment continuously.

“True to the democracy of the machine shop culture, Edison was always open to the suggestions and ideas of his men when it came to new experiments or inventions. Anyone was free to try a new idea. The machinists did more than act as Edison’s hands—they filled in the details that were omitted in his fast-moving thoughts, and they applied their own expertise in the struggle to get the thing to work.

“Edison had to make sure, however, that his men worked at several formidable tasks at the same time. [His] response was to maintain the machine shop tradition of personal leadership. Each day he would take a stroll about the laboratory buildings, going up to each man at the workbench, questioning him about what he had done, discussing the results, and deciding what to do next. This practice kept him well informed about the progress in each experimental project, giving him the opportunity to make his contribution in the form of suggestions for future experiments. It also preserved the element of personal contact that was the mark of the machine shops when the ‘Old Man’ took a personal interest in the work of the artisans at the benches. Edison fitted easily into the role of the master of the shop and the ultimate authority on the direction of the experimental projects. Believing that the real measure of success is the number of experiments that can be crowded into 24 hours, Edison made his men work as hard and as long as he did. He was a demanding employer who did not suffer fools or poor workmanship gladly.”

Today we call invention factories industrial research labs. But they are really invention factories because they methodically turn out invention after invention in a factory-like manner. This repeatable miracle is due mostly to one central practice: a highly refined approach to formal management of the fundamental process involved, which is the Scientific Method.

(3) The continuous process improvement of the Scientific Method has taken thousands of years. Before the method was established as the foundational tool for all of science, its evolution was informal. But that changed radically once its potential started to become apparent, causing those in the field to begin working on improving the process. Once the maturity of the process passed a certain critical threshold, the method became so productive that the Scientific Revolution became possible.

On the next page is the history of the Scientific Method. This shows the long road of incremental improvement the method has traveled. A quick scan of the years shows that the number of improvements per century peaked in the 17th century, the same century that historians assign to the invention of the Scientific Method.
Improvement fell precipitously after that for two centuries, and then rebounded in the 20th century, though these were much smaller improvements than those of the 17th century. Continuous process improvement continues, and it always will, because if a process serves as the foundation for the ship of progress, then some of those aboard will always be seeking to find a better way at the level with the most leverage of all: process improvement.

It is these three strategies that caused the Scientific Revolution, rather than the newly discovered tactic of the Scientific Method. The same strategies, if properly exploited by the environmental movement, can cause another even bigger revolution: the Sustainability Revolution. Thinking analytically, this is because these strategies serve to maximize process efficiency. As shown in the equation below, this has the emergent effect of minimizing the effort required to solve the problem and maximizing the result. Here process efficiency is the ratio of input to desired output.

\[ \text{Process Efficiency} \times \text{Effort} = \text{Results} \]

From the viewpoint of this equation, solution success is all about process efficiency. And process efficiency is all about how well the elements in one’s process are defined, managed, and continuously improved.

Process Element 6 – A true analysis of the problem is performed

This is almost as important as the previous element: formal definition, management, and continuous improvement of a process that fits the problem. It thus carries a weight of 3. The great benefit of a true analysis is to narrow potential hypotheses down from billions to hundreds, dozens, or one. This changes guesswork into an analytical approach.

Analytical means the use of analysis to solve problems. Analysis is breaking a problem down into smaller problems so they can be solved individually. For a difficult problem, this has the effect of taking a giant Gordian knot of incomprehensible complexity and deftly turning it into a collection of much simpler and therefore potentially solvable problems. In practice this decomposition is so powerful it can transform a problem from insolvable to solvable.

When we say a true analysis of the problem is performed, we mean:

1. Structure – A structured examination of the system with the problem has been performed.

---

**Timeline of the History of the Scientific Method**

800 - The scientific method in its modern form arguably developed in early Muslim philosophy, in particular, using experiments to distinguish between competing scientific theories, citation, peer review and open inquiry leading to development of consensus, and a general belief that knowledge reveals nature honestly.

1000 - First collaborative encyclopedia.

1015 - Muslim scientist Alhazen uses the scientific method to obtain the results in his book Optics. He performed experiments and used the scientific method to show that the intromission theory of vision supported by Aristotle was scientifically correct, and that the emission theory of vision supported by Ptolemy and Euclid was wrong.

1327 - Ockham’s razor clearly formulated, by William of Ockham.

1590 - First controlled experiment, by Francis Bacon.

1600 - First dedicated laboratory.

1620 - *Novum Organum* published by Francis Bacon.

1637 - First Scientific method, by René Descartes.

1650 - First society of experts, the Royal Society.

1650 - Experimental evidence established as the arbiter of truth, again by the Royal Society of London.

1665 - Repeatability established, by Robert Boyle.

1665 - Scholarly journals established.

1675 - Peer review begun.

1687 - Principle of hypothesis and prediction introduced by Isaac Newton.

1710 - The problem of induction identified by David Hume.

1753 - Description of an experiment using two identical populations with only one variable, by James Lind in *A Treatise of the Scurvy*.

1926 - Randomized design, by Ronald Fisher.

1934 - Falsifiability as a principal for evaluating new hypotheses introduced, by Karl Popper in *Logik der Forschung* trans: *The Logic of Scientific Discovery*. If it is not testable, then it is not science.

1937 - Use of controlled placebo trials begins.

1946 - First computer simulation.

1950 - First double blind experiment.


(Timeline adapted from Wikipedia, The History of the S. M.)
2. **Diagnosis** – The fundamental flaws causing the problem symptoms have been found. The patient has been diagnosed.

3. **Resolution space exhaustion** – An exhaustive examination of the full range of solution alternatives to resolve those flaws has been conducted.

If any of these three steps has been omitted or done poorly, a true analysis has not been performed.

Yet when you walk in the door, or the website, of almost all environmental organizations and look for evidence of a true analysis, what do you find? Everything but the presence of the above three steps. Time and time again, in examining website, books, articles, and even attending meetings and conferences, all I have found is the practices of Classic Activism and its instinctive, intuitive approach. It’s as if the entire movement, like a stampeding herd of buffalo, decided *en masse* to rush forward with the same process that does NOT fit the problem, and jump off the cliff together.

Morgan Jones, in *The Thinker’s Toolkit: 14 Powerful Techniques for Problem Solving*, describes this common pitfall: (Italics added)

"As a result [of taking an instinctive, intuitive approach] we unwittingly, repeatedly, habitually commit a variety of analytic sins. For example:

“We commonly begin our analysis of a problem by formulating our conclusions; we thus start at what should be the end of the analytic process.

“Our analysis usually focuses on the solution we intuitively favor; we therefore give inadequate attention to alternative solutions. *Failure to consider alternatives fully is the most common cause of flawed or incomplete analysis.*

“Not surprisingly, the solution we intuitively favor is, more often than not, the first one that seems satisfactory. Economists call this phenomenon *satisficing* (a merging of satisfy and suffice). Herbert Simon coined the neologism in 1955, referring to the observation that managers most of the time settle for a satisfactory solution that suffices for the time being rather than pursue the optimum solution that a 'rational model' would likely yield.

“*Most people are functionally illiterate when it comes to structuring their problems.* When asked how they structured their analysis of a particular problem, most haven't the vaguest notion what the questioner is talking about. The word *structuring* is simply not a part of their analytic vocabulary." 40

The environmental organizations listed in the process maturity table are chock full of these “analytic sins,” as well as “functionally illiterate when it comes to structuring their problems.” We will discuss many of these later in this chapter as we rate each organization.

Next, let’s look at the element that should be part of any process that does not want to depend on guesswork.

**Process Element 7 – The Scientific Method is used to prove all key assumptions**

You might expect that the thousands of solutions that environmentalists and environmental organizations have been proposing for decades would be more than guesswork. The solutions are usually plausible and persuasive. They sound like they are the result of a long and carefully reasoned analysis, especially when they are wrapped in authoritative terms and published in articles or books. But this is a facade. Behind it lies no hard proof whatsoever these solutions will work.

A picture is worth a thousand words. So is the right example.

In 1987 the United Nations World Commission on Environment and Development published *Our Common Future*, a 400 page book on how to go about solving the environmental sustainability problem. Also known as the Brundtland Report, this is the book that, on page 8, famously defined sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

Finally a serious global effort to solve the problem was underway. On pages 313 and 314 the report summarized the solution:
Proposals for Institutional and Legal Change

The ability to choose policy paths that are sustainable requires that the ecological dimensions of policy be considered at the same time as the economic, trade, energy, agricultural, industrial, and other dimensions—on the same agendas and in the same national and international institutions. That is the chief institutional challenge of the 1990s.

There are significant proposals for institutional and legal changes in previous chapters of our report. The Commission’s proposals for institutional and legal change at the national, regional, and international levels are embodied in six priority areas:

1. getting at the sources,
2. dealing with the effects,
3. assessing global risks,
4. making informed choices,
5. providing the legal means, and
6. investing our future.

Together, these priorities represent the main directions for institutional and legal change needed to make the transition to sustainable development. Concerted action is needed under all six.

This summary of the solution is presented in the last chapter. What is not presented anywhere in the book is how these six solution areas were arrived it. They are presented as being intuitively obvious. The closest the book comes to analysis and proof of why this will solve the problem is on pages 308 and 309, which say: (Italics added)

"The previous chapters have described the policy directions required. The time has come to break out of past patterns. Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability. Security must be brought through change. The commission has noted a number of actions that must be taken to reduce risks to survival and to put future development on paths that are sustainable."

Rather than providing proof the proposed solution will work, the report repeats over and over that the solution is “required.” “The time has come” to adopt the solution.” Change “must” be brought about. The list of six actions “must” be taken.

This is the same as saying to solve the problem we must solve the problem. It is a tautology. It is also the fourth step of Classic Activism, which is to exhort and inspire people to support the proper practices. This step is included in the process maturity table as key process element 4. But because it has so little effect it carries a weight of zero.

This is a very important point to understand. Our Common Future provided no scientific proof whatsoever its proposed solution would work. Instead, it substituted exhortation and inspiration. This is THE sign they were following the problem solving process of Classic Activism, rather than the more mature process of Analytical Activism. This is why if we rated it, Our Common Future would score a zero for this key process element, the Scientific Method is used to prove all key assumptions.

Our Common Future is an example of a very immature approach to solving the problem—at the global level. Remember now, this was the United Nations World Commission on Environment and Development. It was the world’s leading solution effort for the 1990s. Now, nine years later in 2006, we can see this solution failed. Why? Low problem solving process maturity.

Let’s return to our discussion of why this process element is so important.

The Scientific Method is the only known method for producing reliable new cause and effect knowledge. Without it problem solvers cannot build conclusion upon conclusion reliably, which prevents building a complex analysis or a complex solution. Only simple analyses or solutions can be built using unreliable knowledge. Thus it carries a high weight of 3.

What past solution efforts like Our Common Future tried to do is skip the use of the Scientific Method to prove all key assumptions, and substitute intuition and common sense. While this works on easy problems, it fails on difficult ones.

Process Element 8 – Learning from past failures and successes is maximized

As George Santayana wrote in The Life of Reason in 1905, “Those who cannot remember the past are condemned to repeat it.” Or, as my 5 year old niece once said, as she watched her mother struggle to solve a problem, “If what you are trying is not working, then try something different.”

If you do not learn from your own experiences, you will make the same mistakes over and over. You and your organization will be unable to grow to meet greater challenges, because you have a poor Cycle of Continuous Improvement. This cycle is shown on the next page.
Chapter 8. An Assessment of Process Maturity

Process element 8 is part of element 5: Formal definition, management, and continuous improvement of a process that fits the problem. The continuous improvement aspect of that element is so vital it has been broken out and turned into a process element of its own. Process element 8 carries a weight of 2. If it had not been broken out, then element 5 would have a weight of 6 instead of 4.

An organization without a **Cycle of Continuous Improvement** is like a child that cannot learn. The child will never mentally mature into an adult. They will forever remain a child, in terms of ability to deal effectively with the world around them.

Looking at the diagram, it is the Quality of Learning step that makes the actual improvement change. By examining past results and the decisions and actions that lead to them, the Quality of Learning step is used to improve the Quality and Quantity of Knowledge. This will have the effect of increasing the Quality of Decisions in the future, which will increase the Quality of Actions, which will increase Quality of Learning again, and so on, as the cycle goes round and round. Because the amount of undiscovered knowledge in the universe is nearly inexhaustible, the cycle can grow indefinitely. Its practical limit to growth occurs when diminishing returns begin to set in, and further improvement is no longer justified.

The diagram shows why all organizations who are serious about helping to solve the sustainability problem must have a formal continuous process improvement program. Without it they will remain forever stuck at the level of the child who cannot learn.

The **Cycle of Continuous Improvement** is the cycle that all people and organizations use to improve their ability to achieve their missions. It is a reinforcing feedback loop. The cycle works best when formalized, so much so that when this first occurred for industry it was considered a monumental step forward.

In 1939 Dr. Walter Shewhart published *Statistical Method from the Viewpoint of Quality Control*. It was a dry title but a dazzling subject. The highlight of the book was what is now known as the **Shewhart Cycle**, also called the Deming Cycle after its main popularizer. A version of the cycle from Wikipedia is shown below:

![Shewhart Cycle](image)

This is also called the **PDCA continuous improvement cycle**. It is so effective and so widely needed that a companion process has evolved to introduce it to organizations. This is the FOCUS-PDCA process, as listed in the Wikipedia entry on the Shewhart Cycle:

1. **Find** a process that needs improvement.
2. **Organize** a team that knows the process.
3. **Clarify** knowledge of the process by flowcharting or data collection.
4. **Uncover** the underlying causes of variation or poor quality.
5. **Start** the P-D-C-A cycle by choosing a single modification to the process.
6. **Plan** a pilot to test the improvement.
7. **Do** the improvement.
8. **Check** that the process actually improved.
9. **Act** to adopt, adjust or abandon the change.

Notice how the FOCUS steps lead smoothly into the first cycle of the PDCA steps. By the time they have reached step 9, an organization has made the leap from adolescence to adulthood. They are now a learning organization, and if they keep it up, they can learn enough to solve any solvable problem.

This completes the four elements from Analytical Activism. But these plus the three from Classic Activism are not enough. We must add three additional elements at a more tactical level if we are to have a reasonably complete way to assess process maturity.
The Three Elements from the Problem Domain

Classic and Analytical Activism are generic processes. They handle any type of problem. But the global environmental sustainability problem is not just any problem. It is a unique problem with specific features that, if not considered by the problem solving process, will cause solution failure. These features are accommodated by the key process elements listed below.

<table>
<thead>
<tr>
<th>Key Process Elements</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. The analysis centers around a social system structural analysis</td>
<td>2</td>
</tr>
<tr>
<td>10. Low and high leverage points have been identified and tested.</td>
<td>2</td>
</tr>
<tr>
<td>11. Why change resistance is so successful has been determined. (Diagnosis of root cause)</td>
<td>1</td>
</tr>
</tbody>
</table>

From the point of view of how to best approach solving it, the defining characteristic of the global environmental sustainability problem is that it is a complex social system problem. This is the problem domain.

Two out of three of these elements carry a weight of 2. This signifies they are much more important than the elements from Classic Activism, and much less important than the ones from Analytical Activism, with one exception: the 8th process element also carries a weight of 2.

Process Element 9 – The analysis centers on a social system structural analysis

A complex social system problem is so complex that its behavioral rules cannot be understood using common sense and informal analysis. Instead, a formal analysis using specialized tools is required. The only known tool for doing this well is system dynamics.

This tool is required because complex social system problems exhibit the following characteristics that make them difficult to solve:

1. **Emergent behavior** – The behavior of the system cannot be determined by inspection of its parts, because its behavior is an emergent property of the structure of the system.

2. **Counterintuitive behavior** – How the system responds to solution efforts is counterintuitive. Our normal rules of how the world works do not apply.

3. **Long term behavior delays** – The large delays in system feedback channels frequently cause solutions to cause the system to behave worse before it gets better, and vice versa.

4. **Tight coupling** – The agents in the social system interact so strongly with one another that you cannot change only one thing. Any change to the system causes additional changes. Everything is connected to everything.

5. **Feedback loops** – The behavior of the system is an emergent property of its structure, which is the feedback loops that dominate the system at any one time.

6. **Nonlinear responses** – In simple systems cause and effect are linearly related. But in complex systems they vary exponentially, due to the amplification of feedback loops. This makes predicting the effect of a solution change much more difficult than we are accustomed to.

7. **Adaptation** – Because social systems are composed of intelligent agents who are continually evolving, the system can adapt to a solution and, over time, render it irrelevant. This can cause a solution to succeed at first and mysteriously fail later.

**System dynamics** is an approach to modeling complex social system problems that emphasizes the feedback loop structure involved. Once this structure is identified correctly, all of the above characteristics can be understood. The system is no longer an unpredictable cantankerous monster. It is now a predictable domesticated kitten, because we have changed our perception of the system from a black box to a glass box.

A **black box model** of a system knows only the relationship between inputs and outputs. For example, society has long known that you must eat to survive. But until modern anatomy and biology explained that food provided the nutrients and energy needed by the body and how these processes worked, no one knew why we had to eat to survive. Or they had theories that were wrong.

A **glass box model** is a model allowing everyone to clearly and correctly see why cause and effect occur. After Newton discovered gravity and the mathematical laws governing the movement of bodies, astronomers had a glass box model of the universe. They could now accurately predict where heavenly bodies would be in
the future (the effect) given their present location, speed, and other bodies whose presence affected them (the cause).

Glass Box Model

<table>
<thead>
<tr>
<th>Causes</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>A correct and sufficiently complete explanation of the relationship between causes and effects.</td>
<td></td>
</tr>
</tbody>
</table>

The tool of system dynamics turns night into day. Properly applied, it can turn a black box model into a glass box model every time.

To accomplish this process element, the analysis centers around a social system structural analysis, problem solvers must perform an analysis using system dynamics. The result will be a glass box model of the structure of the system. In that model will be a sufficiently complete explanation of two main things: why the present structure of the system is causing the problem, and how the system will respond to solution elements. Without the knowledge such a glass box model provides, the problem will tend to remain insolvable.

Process Element 10 – Low and high leverage points have been identified and tested.

This element also works with process element 9, the one that performs a structural analysis. This element introduces the concept of leverage points, and encourages problem solvers to think in terms of low and high leverage points.

*The Folly of Pushing on Low Leverage Points* was presented on page 24. Please reread that section, which used the diagram below:

Leverage point analysis requires these three steps:

1. Model the structure of the system.
2. Find the low leverage points. These are the ones that tend to be intuitively attractive but do not solve the problem, no matter how hard they are pushed on.
3. Find the high leverage points. These are the ones we need to push on to solve the problem.

Identification of low leverage points diagnoses why problem solvers have been failing to solve a difficult problem, because change resistance is always present in a difficult social problem. Once they can see why their best efforts have come to naught, problem solvers have the natural tendency to want to direct the limited amount of force they have elsewhere—to high leverage points.

To summarize, a good structural analysis shows where the low and high leverage points in the system are. If problem solvers redirect their efforts to pushing on the high instead of low leverage points, the problem is solved.

**Process Element 11 – Why change resistance is so successful has been determined. (Diagnosis of root cause)**

The problem domain best practices work together. Element 9 provides a model of why the present structure of the system is causing the problem. This can be used to determine exactly why change resistance has been so successful. Once this problem solving step occurs we have arrived at the root cause of the problem. We have diagnosed why the patient is ill.

This process element could have remained part of element 9, which performs a structural analysis. But it has been broken out so that its importance can be emphasized and more accurately scored.

The chapter on *Assessment of Problem Difficulty* showed that more than anything else, what makes a complex social system problem difficult is the presence of change resistance. *Unless the cause of change resistance is known it cannot be resolved intelligently.* Only guesswork can be used. Because complex social system problems are so complex, it usually takes anywhere from dozens to thousands of guesses to stumble across the solution element that will work.

But this is usually too slow to ever solve the problem, because another characteristic of such problems is they are evolving. The problem to be solved is changing over time. Thus when guesswork finally does find a solution that would have worked, it no longer does, because it solves a problem that no longer exists.

Because a complex social system problem usually cannot be solved until the cause of change resistance has been determined, if an organization scores a zero for this element they will probably be unable to achieve their mission.
This completes the presentation of the process elements used in the process maturity table. Next we use those elements to rate the list of organizations.

As we do this, you will notice a pattern. It is stark and obvious. Because the organizations were selected to be representative of the environmental movement as a whole, whatever patterns they exhibit apply to the entire movement.

The pattern is that all the environmental organizations score high in Classic Activism elements and low in the rest. The exceptions are those that, for one reason or another, are not typical environmental organizations. This pattern shows beyond a shadow of a doubt that the main reason the environmental movement is failing to solve the sustainability problem is because of its reliance on Classic Activism.

Here are the ten environmental organizations, in alphabetical order:

The Alliance for Climate Protection
The alliance was formed to capitalize on the momentum of Al Gore’s 2006 movie, An Inconvenient Truth. Their website is at allianceforclimateprotection.org. The information from this site was collected on August 22, 2006. The “goals of the campaign” are to:

1. Motivate a critical mass of the public and influential constituencies to demand strong and just action to cut U.S. emissions and to make solving global warming a national political imperative.
2. Implement solutions to global warming that cap and cut U.S. global warming pollution emissions in the near term, setting a framework and trajectory to reduce emissions by more than half by mid-century.
3. Develop a political consensus for further international agreements that includes full participation by developing economies in achieving emission reduction targets.

The movie was released in the US in May 2006. This was essentially the kickoff date for the “educational campaign” of the alliance. Now, three months later, is it too early to measure mission success?

For a normal organization, yes. But this is one whose existence is timed to leverage the release of a film. Thus if the organization is going to succeed in the above three mission goals, evidence it is well on the way to achieving them should appear within 90 days of the movie’s release.

As far as I can tell, the movie and the alliance have had no discernable effect on reaching the above three goals. Yes, there was an increase in environmental articles in the media for awhile. But that has not translated into any tangible progress. It may happen after the Fall 2006 US elections if the Democrats gain control of the House of Representatives or the Senate. But this probably would have happened anyhow, give the Democrat’s long history of pro-environmentalism. Thus the alliance receives a low rating for mission success.

KPE 1 – Identify the problem

The climate change problem has already been well identified, so the alliance did not have to do it again. They automatically receive a score of 3.
KPE 2 – Find the proper practices

The alliance also did not have to do this KPE, since the proper technical practices to solve the climate change problem are already known. This KPE automatically receives a score of 3.

Some may argue that the proper practices are not already known. They would point out that they don’t yet have a low cost way to generate electricity from the sun, or to store that energy once captured, or to cut greenhouse gas emissions, and so on.

However, this argument is flawed. Cost is irrelevant because the goal is to live sustainably, not to live sustainably and to do so in the cheapest manner possible. The objection of “we can’t do it because it’s too expensive” is a form of change resistance.

The proper practices ultimately boil down to reducing the PAT factors in the IPAT equation. These are Population, Affluence (consumption per capita), and Technology (environmental degradation per unit of consumption). Simply put, the proper practices are less population, less consumption per person, and less environmental degradation per unit of consumption. If one PAT factor cannot be reduced, then another can be. This negates the argument that because we don’t have the necessary technology, we cannot solve a certain sustainability problem, such as climate change. If the T cannot be reduced, then reduce the A or the P. If people don’t want to do that, then what you have is not the inability to find the proper practices, but change resistance.

KPE 3 – Tell the people the truth about the problem and the proper practices.

This is where the alliance’s effort shines. *An Inconvenient Truth* was a superb documentary and educational effort. It was the third highest grossing documentary ever in the US. It received much publicity. Scientific reviews praised its accuracy. So let’s give the alliance the maximum score for this element: a 5.

The movie and the alliance are outstanding examples of the use of Classic Activism. The image below is from www.climatecrisis.net/takeaction on August 22, 2006. This is the movie website. Note the exhortation to “See the truth,” as well as the title of the movie itself. *This exemplifies the gospel of Classic Activism: to tell people the truth about the problem and the proper practices.* The strategy is that once people know the truth of what’s good for them, they will take the appropriate action needed. So, on the web page the above image was taken from, here’s what we see: (Italics added)

**“Take Action - You have the power to make a difference.** Small changes to your daily routine can add up to big changes in helping to stop global warming.

- Reduce your impact AT HOME
- Reduce your impact WHILE ON THE MOVE
- Help bring about change LOCALLY, NATIONALLY AND INTERNATIONALLY
- Download these 10 SIMPLE TIPS to take with you!

**“Learn about other ways that movies are inspiring people to make a difference at www.Participate.net.”**

Mixed in with the educational data of KPE 2 is the emotional argument of KPE 3. This may be seen in “You have the power to make a difference” and the use of the word “inspiring” in the last sentence. It’s as if the web page was directly saying its goal was to inspire you to make a difference, which is indeed its goal.

But it is the wrong goal if strong change resistance is present, because no amount of emotional appeal is going to change the incentives of agents who have incentives to do something else.

*An Inconvenient Truth* contains a telling line, a quote from Upton Sinclair: “It is difficult to get a man to understand something when his salary depends upon his not understanding it.” The contextual implication is that those working for corporations, who are strongly against solving the sustainability problem, have a disincentive to behave sustainably.

Looking deeper, there is a shocking irony here. The movie producers were obviously well aware of the importance of a person’s incentives. *But why did they not take this rule and abstract it up to include all intelligent agents, and thus corporations?* That would quickly lead to a statement like “It is difficult to get corporations to behave sustainably when maximization of their profits depends on them not behaving sustainably.” Once they arrived at that insight, they would soon arrive at more, such as “It is difficult to get politicians to understand that sustainability must be society’s top priority, when their election and reelection depends on them not understanding it.” This refers to The Dueling Loops of the Political Powerplace.

Why have activists such as Al Gore, the Alliance for Climate Protection, and the producers of *An Inconven-
ient Truth not taken this path? Because they are living, breathing, and working under the influence of the paradigm of Classic Activism, and so there could not possibly be another way.

KPE 4 – If that fails, exhort and inspire the people to support the proper practices.

The movie did very well here too, so it receives another 5 for this element. In fact the move did so well here that syndicated film critic Roger Ebert wrote that: “In 39 years, I have never written these words in a movie review, but here they are: You owe it to yourself to see this film. If you do not, and you have grandchildren, you should explain to them why you decided not to.”

A prime example of this KPE from the movie is “Political will is a renewable resource.” I’ve seen the movie four times, in order to study this original source material more closely and its effect on audiences. This line draws a predictable laugh and nods of agreement. But notice how it does it: with emotion, not logic. Repeated often enough, solution efforts like this have the insidious effect of turning your own supporters into those who also begin to rely more on emotion than logic. These efforts are thus counter productive.

KPEs 5, 6 and 7 – The first three best practices of Analytical Activism

There is not the slightest hint that Al Gore or the alliance is using a formal process, is performing a true analysis of the problem, or is using the Scientific Method to prove all key assumptions. The alliance scores a zero for these three KPEs.

Some readers may object, and point out that the movie was very scientific and much analysis of the causes of the climate change problem have been done. This is true. But what the process maturity table is rating is the overall approach to achieving one’s mission, not what is used in a few isolated components of that effort. Where is the use of the Scientific Method to prove that the movie, combined with an educational campaign, will solve the problem? Where is a true analysis of what to do to achieve the organization’s mission? There is none.

KPE 8 – Learning from past failures and successes is maximized

The alliance scores a 2 here for slightly productive. They have learned that newspaper articles and books are no longer the best place to tell the people the truth about the problem and to exhort and inspire them to solve it. These days television is the king of the media. By producing a movie that will someday probably be a TV staple, Al Gore shows he has learned from the past. In addition, the movie has served to rejuvenate many serious environmentalists, at least for a little while.

The reason this KPE received only a 2 is there was no learning at a higher level. Why have similar educational efforts failed to make a difference on the more difficult environmental problems? There is no attempt to learn why this happened. Thus Al Gore and the Alliance for Climate Protection are doomed to continue what George Santayana warned so forcibly against: “Those who cannot remember the past are condemned to repeat it.”

KPEs 9, 10 and 11 – The problem domain best practices

If you have not adopted the best practices of Analytical Activism, then there is no way you are going to use the best practices required for the particular problem domain that the sustainability problem falls into. These practices are highly technical. They appear only when an organization has made a serious commitment to an analytical approach.

While I have the greatest respect for Al Gore, and greatly admire his long efforts to promote sustainability, we must be honest. Neither he nor the alliance has taken an analytical approach. The result is a zero for all three of these KPEs.

The Core of Classic Activism

Late in the movie Al gets to the very core of what for him is the crux of the problem, when he confides that:

“I guess the thing I’ve spent more time on than anything else in this whole show is trying to identify all those things in people’s minds that serve as obstacles to their understanding this. And whenever I feel like I’ve identified an obstacle I try to take it apart, roll it away, move it… blow it up. I set myself a goal. Communicate this real clearly.

“The only way I know how to do it is city by city, person by person, …family by family… and I have faith that pretty soon enough minds will have changed that… we will cross a threshold.”

This poignant passage is the very core of Classic Activism, whose central strategy is changing one mind at a time. If enough minds are changed then the problem is solved. When Al says “The only way I know how to do it is” what he is really saying is the only way I know to solve the problem is through Classic Activism, “and I have [such] faith [in Classic Activism] that pretty soon
enough minds will have changed that... we will cross a threshold [and the problem will be solved].”

**Process Maturity Rating**

While the alliance scored well in key process elements 1, 2 and 3, it scored a zero in all the rest except for a 2 in KPE 8. This gives them a process maturity rating of 225. Because this is on a scale of 0 to 10,000, 225 is a very low rating. This explains why the alliance has had no discernable effect on system change.

The alliance scored high in Classic Activism and low in everything else. This is the pattern you will see in the rest of the table, except for those with non-typical missions.

**The Club of Rome**

In the 1970s and 80s the Club of Rome was the best known and most effective environmental NGO in the world, due to one phenomenal success: correct identification of what is now widely acknowledged as the biggest, most urgent problem in the world.

That problem is global environmental sustainability. It was described and communicated in easy-to-read format by the runaway best seller *Limits to Growth* in 1972, which went on to become the top selling environmental book of all time, at about 30 million copies. This compares to about 10 million copies for *Silent Spring*. What is even more astounding is *Limits to Growth* was a technical book, written in layman’s language. It was not an easy read. But its basic thesis, that civilization was about to overshoot its environmental limits and that this would lead to collapse unless civilization drastically changed course, was so revolutionary that tens of millions read it anyhow. What they read was a book based on a novel, irrefutable computer simulation model of how society and the environment interacted, complete with simulation run scenarios about what probably would or would not happen depending on what course society chose.

As a result of the two year *Limits to Growth* project, the Club of Rome enjoyed immense prestige and influence for years. But it was a first-time-up-at-bat home run that was never repeated. Subsequent reports, projects, conferences, and work have led to very little of tangible value. Today, while some remember the Club for what it once was, most view it as just another early player in the history of the environmental movement.

However, the Club still maintains branches in about 40 countries and holds an annual conference.

If the process maturity table also included environmental books, it would contain one entry for the Club of Rome and another for the *Limits to Growth* project. This is necessary because while *Limits to Growth* achieved high mission success, the Club of Rome has enjoyed low success.

The Club of Rome’s first project, *Limits to Growth*, identified the problem to be solved in 1972. But identifying a problem does not solve it. Trying to do that is what the Club and the world have been doing ever since.

**KPE 1 – Define the problem**

When the Club soared into preeminence with the release of the *Limits to Growth* project report in 1972, it was focused on what that book focused on. This was the limits to growth imposed on the human system by environmental limits. In the chapter titled *The Limits to Exponential Growth* the first edition of *Limits to Growth* bluntly stated that:

“In this chapter we will assess the world’s stocks of these physical resources, since they are the ultimate determinants of the limits to growth on this earth.”

The chapter noted that the limits to growth fell into two categories: physical and social. But the book made the clear distinction that it is physical limits that civilization is now running up against—not social limits. Therefore overshoot of the earth’s physical limits is the principle problem to solve.

However, four years later in 1976 the Club published another book: *RIO: Shaping the International Order*. Billed as “the successor to *The Limits to Growth* and *Mankind at the Turning Point*,” it focused on a completely different problem:

“The removal of manifest injustices endemic in the present system of relationships between nations and peoples with a view to creating a new international order in which a life of dignity and well-being becomes the inalienable right of all.”

The Club was now redefining the problem as one of social injustice. Fortunately, by 1991 the Club was somewhat back on track, when it published *The First Global Revolution*. According to the back cover:

“The *First Global Revolution* outlines a strategy for mobilizing the globe for environmental security and clean technology by spelling out how to convert from a military to a civil economy, how to tackle global warming and the
energy problem, and how to deal with world poverty and the disparities between North and South…”

Now the problem was defined as “environmental security.” But by 2006 the Club was off track again. Here is the Club’s current mission statement:

“The Club of Rome’s essential mission is to act as a global catalyst of change that is free of any political, ideological or business interest.

“The Club of Rome contributes to the solution of what it calls the world problematique, the complex set of the most crucial problems – political, social, economic, technological, environmental, psychological and cultural - facing humanity.”

Examine the mission statement. What problem is the Club solving?

It appears to be anything that falls into “the complex set of the most crucial problems – political, social, economic, technological, environmental, psychological and cultural.” While it is admirable to focus on the most crucial global problems, if you are not focused on particular ones then your management, members, employees, and followers will work on whatever they find the most alluring. This will be inefficient because it dissipates limited resources.

Due to the lack of a consistent, focused definition of the problem, the Club scores a 2 on this KPE.

KPE 2 – Find the proper practices

As soon as the sustainability problem was discovered there was a rush to find the proper practices needed to live sustainably. Most of these were technical practices, such as the use of renewable energy. Some were system level practices, like approaches to regulation and problem management. This is the area the Club began to focus on, as shown in RIO: Reshaping the International Order, a 432 page book published in 1976. The back cover summarizes the ambitious promise of the book:

“Blueprint for Survival – Today the world faces problems of crisis dimension on virtually every front— with the threats of famine, pollution, resource starvation, economic collapse, social disintegration and political violence crossing every national border to imperil us all.

“To find a way to deal with this state of unprecedented danger, the Club of Rome asked a vast team of experts in virtually every field of knowledge to prepare a blueprint for man’s survival. Their report recommended nothing less than Reshaping the International Order. Literally thousands of scientists, scholars, and officials from the industrialized West, the Socialist States, and the Third World took part in drawing up a fully practical plan for the changes we can and must make if we are to survive.

“The result represents the kind of hope that all humanity has been looking for—a real plan for a real world that we all can live in together.”

The proper practices were what the report recommended. These were listed on page 223 as:

“A. Proposals aimed at removing gross inequalities in the distribution of world income and economic opportunities.

“B. Proposals to ensure more harmonious growth of the global economic system.

“C. Proposals to provide the beginnings of a global planning system.”

Practice B was mostly concerned with controlling inflation and avoiding recessions.

Practices A, B and C do not solve the global environmental sustainability problem. They solve the poverty problem, which is the wrong problem. As discussed in the previous key process element, the Club’s goal was drifting around, and so was its solution.

But sometime in the 1980s the Club got its mission back on track, and its recommended proper practices followed. The First Global Revolution had a multitude of them, so many that I found it difficult to figure them out. They are loosely grouped under “the three immediacies,” which on page 140 are:

“1. The reconversion from a military to a civil economy

“2. Global warming and energy problems

“3. The problems of world poverty and disparities”

An example of the detailed proper practices is the ones given for area 2. These are:

“Reduction of the global emission of carbon dioxide which will necessitate less use of fossil fuels

“Reforestation, especially in the tropics

“Development of alternative forms of energy

“Conservation of energy and development of greater efficiency in its use”

At the higher level the proper practices for area 2 were given as:

“A worldwide campaign of energy conservation and efficiency
“The setting up in each country of an Energy Efficiency Council
“A competent high-level body to consider indepth and over a long time frame the implications of the macro pollution phenomenon on economy, society, and the individual”

And so on. The solution, which takes up the entire second half of the book, rambles over all sorts of territory. It is disorganized. It is impossible to understand as a coherent whole. The authors may have felt the same, because the final chapter opens with these words:

“We shall make no attempt to summarize our conclusions; indeed the very nature of the problematique precludes such a possibility.”

This is shoddy thinking. The ability to summarize one’s conclusions is mandatory if one is to communicate them clearly and consistently. It is also required when looking back on one’s work, to analyze it for conceptual integrity, completeness, and above all, correctness.

Due to such a weak set of proper practices, which do not seem to have improved in later works, the Club of Rome scores a 2 on this KPE, find the proper practices.

KPE 3 – Tell the people the truth about the problem and the proper practices.

The Club of Rome has done very well here. They have regularly published books and articles. Due to their many highly placed members, they have been able to circulate their ideas into academia, international institutions, and governments. They score a perfect 5 on this KPE.

KPE 4 – If that fails, exhort and inspire the people to support the proper practices.

The Club scores another 5 on this one. The level of exhortation and inspiration in their printed works is admirable, and even of occasional high literary quality. For example, the back cover of Aurelio Pecchi’s One Hundred Pages for the Future, published in 1981, had this testimonial on the back cover:

“I read this book from cover to cover and found packed in its pages more wisdom, original concepts and ideas, and intellectual stimulation than in any other book I have recently read. – US Senator Claiborne Pell”

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

Now we move into the four key process elements from Analytical Activism. The first is the most important one of them all. If the Club scores well here, it will probably score well in the remaining process elements.

It is with great sadness that I convey the finding that the Club of Rome, like nearly all environmental organizations, shows not the slightest sign of this practice. It thus scores a zero.

I can say this with some confidence, because I was once a member of the US branch of the Club of Rome, USACOR. But that relationship lasted only a few months. Because I practice Analytical Activism, the first thing I did was to assess the process maturity of the Club of Rome. The results were published in the Club’s internal newsletter as a paper titled Can These Best Practices Make the Club Effective Once Again?

Seldom have I received such a strong reaction to my work. To make a long story short, the powers that be at USACOR were so upset about the conclusions in the paper (and what they implied) that I was booted out of the Club, on the pretense that my membership was approved at a board meeting that lacked a quorum. Well, what really happened is this is another case of shooting the messenger, combined with a heavy addiction to Classic Activism. Shooting the messenger is a form of change resistance.

The international Club was fine to work with. But the US branch was not. However, it is the Club as a whole that this assessment covers.

When I began the assessment that led to the Best Practices paper, I requested historic documents and received some very good ones. These are private documents, so I will quote sensitively from them.

One document, A Future for the Club of Rome, 2004, does say “a renewed mandate and a rejuvenated process would yield something the world rather urgently needs.” So there is some awareness of the importance of process. But when we look for evidence that the Club is following a formal process, there is none. There is only an informal one that varies greatly over the years. It is not written down. People are not trained in it. Planning documents such as A Future for the Club of Rome do not center on communicating the results of a formal process. If they did we would see the process prominently mentioned, what its main steps had found, what the status of the process was, etc. If the Club was process driven, convincing members that a proposed plan for the Club’s future should work would involve explaining how the process used had covered critical steps like a failure
analysis, examination of alternatives, experimental testing of the leading alternatives, and so on.

If an organization’s overall problem solving process is not formalized, it cannot be easily continuously improved. All (well, almost all) organizational processes start out immature. They are continuously improved over the years, as organizations adapt to the world around them and figure out how to achieve their missions. *Organization maturity is really process maturity.* Thus when you look at an organization that is having repeated trouble achieving its goals, either its process is inadequate or its goals are impossible to achieve. 45

* A Future for the Club of Rome * makes a valiant attempt at the right process with the section on The Processes Needed. This says “The activities by which the Club of Rome takes its work at the global level forward should, broadly, remain the same as in the past: Annual meeting, special conferences, media events, publication of reports, publication of occasional special statements, and projects by members or in collaboration with other organizations.” However, this is not a problem solving process. It is merely the things that the Club would like to do as part of routine operations. Where is the problem solving process itself, the one that defines the mission level problem to be solved, performs an analysis and necessary experiments, converges on a solution, and then evolves that solution as it is implemented? Where is the process function in the organization? Where are the process managers, at the international and national levels?

The Club has fallen into another one Morgan Jones’ analytic sins (see page 91 for an introduction to these), which he describes this way:

> “We tend to confuse ‘discussing/thinking hard’ about a problem with ‘analyzing’ it, when in fact the two activities are not at all the same. Discussing and thinking hard can be like pedaling an exercise bike: they expend lots of energy and sweat but go nowhere.

> “Like the traveler who is so distracted by the surroundings that he loses his way, we focus on the substance (evidence, arguments, and conclusions) and not on the process of our analysis. We aren't interested in the process and don't really understand it.”

From this perspective, what *A Future for the Club of Rome* is really proposing is lots more “discussing/thinking hard about a problem,” in the form of meetings, conferences, reports, newsletters, etc. But there is no real process for determining the correct strategies and the most advantageous opportunities to drive those activities. Thus the Club has been expending “lots of energy and sweat” on attempts to reinvent itself, but has gotten nowhere. There is no conception within the Club of a formal continuously improved process that fits the problem, so there is no practice of one.

It is for these many reasons that the Club scores a zero on this key process element.

**KPE 6 – A true analysis of the problem is performed**

Access to management documents allows a deeper look at the Club of Rome than any other organization. Let’s use this opportunity to look at another important KPE in depth.

* A Future for the Club of Rome * is a proposal for how to become effective once again. If a true analysis was performed, there should be evidence of it in this document, which is well written and contains many potentially helpful insights.

On inspection, however, *A Future for the Club of Rome* contains no real analysis. Instead it is a long statement of intuitively preferred actions with rationales to support why they should work. For example, the 14 page paper opens with these three paragraphs: (Boldings and italics added)

> “In the 30-odd years since the Big Bang created by the Club of Rome with the publication of Limits to Growth, many new stars and even supernovae have come (and some have gone) in the constellation of institutions that deal with the world’s major problematiques. The Club can no longer claim monopoly of the issues or of the most effective ways to deal with them. Yet, it still appears to have a special status in the minds of many, particularly people of influence and leaders of opinion.

> “Moreover, the predicament of today’s world is not really better than that of 30 years ago; and a new and striking message that shakes up people’s conscience could again create a worldwide resonance and incite constructive reaction.

> “Talk about worldwide issues such as poverty, pollution, conflict, north/south digital divide, illiteracy, the inequitable world economic and financial order, etc, is meaningless unless it comes with credible prescriptions for solutions, an attitude that has distinguished the Club of Rome from many other initiatives that have attempted to address the predicament of human-kind.”

The paper is an honest, sincere attempt to help solve the world’s major problematiques.” But notice the
assertion (in bold) in the second paragraph. There is no decomposition of the problem or any proof supporting this key proposition, which later forms the basis of the proposed solution. There is only a plea that it should work.

I was not alone in noticing this. Dennis Meadows, project manager for the Limits to Growth project, one of the four authors of the first edition of the book, and manager and coauthor of the second and third editions, noticed the problem too. In his five page review, titled Reflections on the revised draft, A Future for the Club of Rome, he had this to say:

“I totally disagree with the next statement, ‘a new and striking message that shakes up people’s conscience could again create a worldwide resonance and incite constructive reaction.’ The world is a very different place than it was in the early 1970s. The circumstances that produced LTG were unique to that time; they will not be repeated. It is sterile for the COR to orient any efforts to rejuvenate itself on a model derived from the phenomenon of LTG. There is not going to be another blockbuster book on the world problemataque.”

The solution to how the Club can become effective once again is presented this way, intermingled with an elegant mix of emotionally appealing reasons for why it should work, instead of a true analysis: (Italics added)

“The broader concern under which we propose that the Club of Rome makes a quantum jump onto a trajectory that brings it back to its former position of preeminence is the Ethics of Human Solidarity. This overarching concern places primary emphasis on the role of people, and on the need for global solidarity. It is, in fact, simply a broader statement of the original focal concern of ‘Limits’: the moral platform that enables humanity to choose between narrowly-defined, selfish, competitive-market profits on the one side, and the mutuality and cooperative endeavor needed to live together on a finite planet on the other. Indeed, it simply tantamounts to ‘Limits to Material Growth and No Limits to Ethical Development’.

“For the Club of Rome to maintain its standing, the issues it deals with must transcend the simplistic socio-political problems that occur in the usual shopping lists of problems that organizations come up with. By bringing such issues within the concept of ‘Ethics of Human Solidarity’ and tying them to the metaphor of ‘Limits’, the Club uses its USP to maximum advantage and also further builds its positioning in the marketplace of ideas as an entity that adds significant gravitas to the issues it deals with. The ‘Limits’ metaphor is a fundamental element in the ‘brand identification’ of the Club of Rome. However, it should not be seen as a dogma that restricts the Club to propagating messages of ‘doom’ – the Club of Rome’s uniqueness lies in formulating positive solutions and paths of hope that can evoke worldwide debate and lead to corrective action.”

This is intellectual conjecture rather than a well-reasoned, analytically sound argument. Simply saying that “the issues it deals with must transcend” is not a form of analyzing why A will cause B. It is only an emotional plea that A should cause B. Saying “By bringing such issues within the concept of … the Club uses its USP to maximum advantage” glosses over any analysis and proof of why that is going to work. It only argues that it should. If you read the above two paragraphs closely several times, you will see they are no more than a naive, emotional plea to try this solution because it makes intuitive sense. It has no more chance of working than any other similar exhortation for “a quantum jump into a trajectory that brings [the Club] back to its former position of preeminence.”

A true analysis would employ a structured examination that has discovered the fundamental flaws causing the Club’s lack of success in the last few decades. After discovery of those flaws, there would be an exhaustive examination of the many possible solution alternatives to correct those flaws. But there is no hint of this approach in A Future for the Club of Rome.

Earlier (on page 91) Morgan Jones described the “variety of analytic sins” that problem solvers commonly commit. They can be found in nearly all environmental organizations. The Club of Rome is but one small example.

For example, Jones says “We commonly begin our analysis of a problem by formulating our conclusions; we thus start at what should be the end of the analytic process.” The Club falls right into this trap when A Future for the Club of Rome opens with the foregone conclusion that “a new and striking message that shakes up people’s conscience could again create a worldwide resonance and incite constructive reaction.” Thus the paper starts at the end of the analytic process instead of the beginning.

Jones also says “Not surprisingly, the solution we intuitively favor is, more often than not, the first one that seems satisfactory. Economists call this phenomenon satisficing.” The Club satisfices all too well when A Future for the Club of Rome states that “The activities
by which the Club of Rome takes its work at the global level forward should, broadly, remain the same as in the past.”

_A Future_ also contains no listing of the alternative solutions that were considered. Instead the paper makes a big point of listing how many people input to the paper, thus confusing examination of alternatives with consideration of suggestions. 34 names were listed. But where is the list of the other alternatives that were considered, with a summary of why they were rejected? The paper presents its conclusions with not even a hint that a structured analysis was performed.

A true analysis of the problem would use a formal highly structured approach. The Club is currently using just the opposite: an intuitive unstructured approach. Here’s what Morgan Jones has to say about the difference between the two: (Bolding added)

“In the _instinctive approach_ the mind generally remains closed to alternatives, favoring instead the first satisfactory decision or solution. Consequently, the outcome is frequently flawed or at least less effective than would be the case with the structured approach.

“In the _structured approach_ the mind remains open, enabling one to examine each element of the decision or problem separately, systematically, and sufficiently, ensuring that all alternatives are considered. The outcome is almost always more comprehensive and more effective than with the instinctive approach.”

Here’s an example of how the instinctive approach has caused the Club to remain closed to alternatives. This is from _The COR’s First 35 Years_, a 34 page history of the Club written in late 2005: (Italics added)

“As a logical extension of the Salzburg meeting, Peccei asked Jan Tinbergen to produce a followup report on global food and development policies... The basic thesis was that the gap between rich and poor countries (with the wealthiest roughly 13 times richer than the poorest) was intolerable and the situation was inherently unstable. What would be required to reduce the gap to 6:1 over 15 to 30 years? ...The main Report argued that people in the rich countries would have to change their patterns of consumption and accept lower profits, _but a dissenting group saw consumption as a symptom rather than a cause of the problems, which stemmed rather from the fundamental power structure._”

This is not dissension. It is a promising alternative that needs to be thoroughly explored. _46_ Calling this dissension shows how the Club’s mind was, as Jones describes it, “closed to alternatives, favoring instead the first satisfactory decision or solution.”

There is another reason the Club chose the solution they did. Because no real analysis was used, they fell back on common sense and their own experience to pick a solution. The founder of the field of system dynamics, Jay Forrester of MIT, has this to say about that trap: (Bolding and italics added)

“Social systems are inherently insensitive to most policy changes that people select in an effort to alter behavior. In fact, a _social system draws attention to the very points at which an attempt to intervene will fail_. Human experience, which has been developed from contact with simple systems, leads us to look close to the symptoms of trouble for a cause. But when we look, we are misled because the social system presents us with an apparent cause that is plausible according to the lessons we have learned from simple systems, although _this apparent cause is usually a coincident occurrence_ that, like the trouble symptom itself, is being produced by the feedback loop dynamics of a larger system.” _47_

Thus the so called “dissenting group” rightly saw consumption as a coincident occurrence rather than a cause. They wanted to explore the fundamental power structure involved, and see if that was causing excess consumption. If it was, then the Club should focus on resolving the problems in the power structure, not on telling the world over and over that it must reduce consumption or pay the price. But because most Club members were following an instinctive problem solving approach and were fully committed to the paradigm of Classic Activism, they refused to see things any other way, and so rejected what could have become a valid analysis, followed by a viable solution.
To make these two opposing viewpoints crystal clear, please see the diagram blow. Conventional wisdom was thinking in terms of excess consumption causes environmental unsustainability. This is true, so it has great appeal. It seems like a sufficient analysis. But there is a deeper truth that only the so called dissenting group saw: Only the addition of the underlying cause of the coincident occurrence gives a correct analysis.

Based on A Future for the Club of Rome, the history paper, and other readings, it would be safe to say that the Club deserves a very low rating on key process element 6, a true analysis of the problem is performed. Since it at least tried to consider a few options and ran the A Future for the Club of Rome paper through rounds of improvement, let’s give the Club a 1 instead of a zero. This may sound unfairly low, but it is time for environmentalists to engage in some long overdue honest self-examination. Once you have seen a good analysis of a previously misunderstood problem, you will realize that it is entirely possible to do much better.

KPE 7 – The Scientific Method is used to prove all key assumptions

A glaring problem with A Future for the Club of Rome and the Club’s history is the persistent pattern of deciding what to do with no real proof it will work. While you can rarely prove a solution will work with 100% certainty, you can usually prove that it is more likely to work than other solutions.

Nowhere in A Future for the Club of Rome is there any discussion of experimental proof that “the Ethics of Human Solidarity” is going to work. Simply saying that “This overarching concern places primary emphasis on the role of people, and on the need for global solidarity,” and “It is… the moral platform that enables humanity to choose between narrowly-defined, selfish, competitive-market profits on the one side, and the mutuality and cooperative endeavor needed to live together on a finite planet on the other.” is not going to make it work. All this paper is doing is saying this solution will work because it should.

As another example, Dennis Meadows, in his review of A Future for the Club of Rome, argues:

“The proposal by Khosla and Körber ignores the essential roles of money and intellectual brilliance. You get the impression from their proposal that slight changes in meeting schedules by the current members [will cause the COR to] suddenly generate ideas that galvanize the world. They offer no evidence to support this idea, and indeed, I do not think there is any such evidence.”

Without evidence that something will work, you can only guess whether it will. A Future for the Club of Rome was followed by 7 Steps to Implementation: of the strategy paper A Future for the Club of Rome, a five page plan for implementing the ideas in A Future in seven steps. How many guesses does 7 Steps to Implementation take? Seven big ones. As far as I know, none are supported by experimental proof or even a comparative analysis of how they have worked for similar organizations with similar missions. Indeed the words test, proof, hypotheses, alternative, and experiment never appear in the document, nor its predecessor A Future for the Club of Rome, even once.

Certainly many of the Club’s reports employ the Scientific Method in tactical areas. But the Club’s overall approach to achieving its mission does not. Thus there is no fundamentally correct stream of decisions driving what its reports and other activities should be. The inevitable result is that each report is an educated guess at what it should focus on. If that hypothesis is wrong, as it appears to have been except for the first report, then even the most brilliant and heroic work on the report has only a low probability of making a major contribution to the Club’s mission. Whether a report uses the Scientific Method becomes irrelevant.

Thus the Club scores a zero on key process element 7: Use of the Scientific Method to prove all key assumptions. This is ironic, given that A Future for the Club of Rome says “[The Club’s] work is based on scientific methods” and “Talk about worldwide issues… is meaningless unless it comes with credible prescriptions for solutions.”

KPE 8 – Learning from past failures and successes is maximized

If you do not learn from experience, you will make the same mistakes over and over. It appears the Club has fallen into this trap and doesn’t even know it.
Once you start thinking in terms of process, you will see that all problem solving efforts have these three main steps:

1. Identify the problem to be solved.
2. Develop a solution somehow.
3. Implement the solution.

The Club has learned the wrong lesson from the extraordinary success of *Limits to Growth*. All LTG did was step one of the above meta-process. LTG identified the sustainability problem, a problem so huge and threatening that it grabbed the world’s attention in a heartbeat. *But once a problem is sufficiently identified, it does not need to be identified again or identified any better.* Instead, problem solvers should move on to the second meta-step, develop a solution. Particularly for large difficult problems, the second step requires a totally different process from the first step. But what is the Club doing? It is desperately trying to continue the process that worked so well for identifying the problem, by more reports, more models, and so on that call the world’s attention to the problem and its many symptoms. Thus whenever the Club invokes the memory of LTG, as it so frequently does, what the Club is really doing is recommitting itself to the same process the LTG project used, with the blind hope it will achieve the same success. Dennis Meadows, in his review of *A Future for the Club of Rome*, saw the same trap:

“The report is preoccupied with the once-in-a-lifetime phenomenon of *Limits to Growth*. Such a book will never happen again. It should not be the basis for a strategy for future development of the Club of Rome.”

One of the right lessons to be learned from the success of LTG is that the right process, the right tools, and the right sharp people can solve difficult problems in record time. What would the right process be? Not one that is tuned to identifying problems, but one that is designed to solve problems of the type that was identified.

This is a complex social system problem. But the Club is treating it as if it was a technical problem that had no serious dynamic social complexity beyond what LTG discovered, even though *A Future for the Club of Rome* says “The unique strength of the Club of Rome lies in its systems approach.”

If the Club has been using a process that fit the problem, the process would be something like the System Improvement Process, which has these four main steps:

1. Problem definition
2. System understanding
3. Solution convergence
4. Implementation

*Limits to Growth* performed the first step by identifying the problem. And then, because it had no real process, the Club dashed right into step 4, implementing lots of solutions that intuitively looked like they would work. They did not, except on easy problems where change resistance was small. When it is large, as it is for problems like climate change, only a process which accommodates change resistance will work. The System Improvement handles this with steps 2.1, 3.1, and 4.1. (See page 22)

*It is my hypothesis that if the Club (and other environmental organizations) adopted a process tailored for solving this type of problem, they would increase their chances of helping to solve it by over an order of magnitude.*

Meanwhile, the Club has not learned much at all from its past failures and successes. However, it has learned enough to be slightly productive, so it scores a 2 on this key process area.

**KPEs 9, 10 and 11 – The problem domain best practices**

The Club scores a zero in all of these. There is absolutely no analysis that centers on a social system structural analysis. There is no identification and testing of low and high leverage points. Nor is there any attempt to determine why change resistance has been so successful. But this is exactly what you would expect if the entire organization is not driven by a process that fits the problem.

**Process Maturity Rating**

Like most environmental organizations, the Club of Rome scores well in the KPEs of Classic Activism, and low in the rest. The result is a process maturity rating of 256 on a scale of 0 to 10,000. They did much better than the Alliance for Climate Protection, which received a 121. But 256 is only 2.56% of 10,000, which is far too low to be mature enough to solve the global problem.
The European Union Environment Directorate General (Environment DG)

As of 2006, the European Union stands in a class by itself on environmental sustainability. The EU is fully committed to achieving full sustainability in all areas as fast as is necessary, and has already made sizable, on schedule gains to prove its commitment. No other large country or region of the world is even close to this level of sustainability. They rate high in mission success.

A notable difference between the EU and the rest of the world is the EU has solved the change resistance part of the problem, and has moved into the proper coupling stage. Proper coupling is the structural changes required for the human system to be properly coupled to the greater system it lives with in, the environment, so that the system as a whole can function sustainably.

Several key factors appear to have allowed the EU to solve the crux of the sustainability problem: change resistance.

One factor relates to the prime reason for the formation of the EU: to avoid any more catastrophic wars. According the Wikipedia entry on the EU, after the Second World War the “impetus for the founding of (what was later to become) the European Union greatly increased, driven by the determination to rebuild Europe and to eliminate the possibility of another war.” This put the EU into the mindset of taking proactive action to avoid future catastrophes. Thus as soon as the sustainability problem was identified as a new catastrophe if it remained unsolved, the EU gave it a high priority and solved it. Sustainability is now just another EU responsibility.

A second factor is the much smaller influence of for-profit corporations on EU countries and the EU Commission, compared to other countries.

A third factor is the EU has passed through the demographic transition, causing it to shift its cultural focus from industrial growth to quality of life. A demographic transition occurs when population growth falls to maintenance (no growth) levels or less, after a period of growth due to industrialization. The phenomenon occurs because once industrialization has given a population economic security, a high level of well being, and long life spans, birth rates fall to replacement levels or below. The cultural emphasis changes from one focused on industrial growth (development) to one more concerned with quality of life. Once quality of life is people’s top priority, anything endangering it, such as environmental degradation, automatically receives a high priority.

Because the EU has solved the change resistance part of the problem, they are solving a different problem from the rest of the environmental organizations in the process maturity table. They are now solving the proper coupling problem. But there is still much to be learned from how they are solving that and how they arrived at that point.

The European Union is a group of 25 democratic states that have transferred considerable areas of sovereignty to the union. One of these is environmental quality. This responsibility is managed by the European Union Environment Directorate General, or Environment DG for short. This directorate is one of 36 that compose the European Commission, which is what runs the EU. In 2006 the Environment DG had a staff of about 550 and a budget of 275 million euros.

We will take a broad view and rate the EU’s approach to solving the sustainability problem as a whole whenever possible. However, it is the Environment DG that this assessment mostly applies to, because it does the actual work.

KPE 1 – Define the problem

At the topmost level, the problem is defined by the Environment DG’s mission statement, which is: “Protecting, preserving and improving the environment for present and future generations, and promoting sustainable development.” This is too vague to be sufficient for a well defined problem. To make the problem definition more precise, The Sixth Environment Action Programme of the European Community, which runs from 2002 to 2012, lists the “four priority areas for action” for this period as: (Bolding and italics are in the original)

“Tackling climate change - Objective - to stabilize the atmospheric concentrations of greenhouse gases at a level that will not cause unnatural variations of the earth’s climate.

“Nature and Bio-diversity - Protecting a unique resource - Objective - to protect and restore the functioning of natural systems and halt the loss of biodiversity in the European Union and globally. To protect soils against erosion and pollution.

“Environment and Health - Objective - to achieve a quality of the environment where the levels of man – made contaminants, including different types of radiation, do not give rise to significant impacts on or risks to human health.

“Sustainable use of natural resources and management of wastes - Objective - to ensure
the consumption of renewable and non-renewable resources does not exceed the carrying capacity of the environment. To achieve a de-coupling of resource use from economic growth through significantly improved resource efficiency, dematerialization of the economy, and waste prevention.”

This is a world class problem definition. While it is not presented in fully quantified terms, which would make it even more precise, it sets a standard the rest of the world can aspire to. Note the total absence of including the poverty problem or trying to balance environmental degradation goals with economic growth. The environment comes first, and everything else comes second. The Environment DG scores a perfect 5 for problem definition.

**KPE 2 – Find the proper practices**

For most of the environmental organizations in the process maturity table the proper practices are at the low nuts-and-bolts level, such as better approaches to renewable resources and more efficient consumption technologies. But the Environment DG is working at a higher level. Its task is to find, implement, and enforce the proper practices necessary to properly couple a human system containing 460 million people to the environment. *Thus it is more concerned with setting up the high level mechanisms that automatically generate the low level nuts-and-bolts proper practices.* This is the same structure oriented strategy that other organizations in the table should also be using, but are not.

The sixth action programme “sets out the environmental objectives and targets that need to be met and describes how the instruments of Community environmental policy will be used to tackle these issues while pointing to the need for further action in other policy fields.” Thus the Environment DG is more concerned with creating the proper infrastructure required to generate the proper practices.

The sixth action programme document elaborates on how this will be done:

“Whilst the Programme focuses on actions and commitments that need to be made at the Community level, it also identifies actions and responsibilities that need to be addressed at the national, regional and local levels and in the different economic sectors. In selecting these actions, full account is taken of the need for the highest possible level of harmonisation and approximation of laws to ensure the functioning of the internal market. This includes a limited number of Thematic Strategies (which may include a range of instruments from proposals for legislation for adoption by the European Parliament and the Council of Ministers through to dissemination of information) in areas where only a package of co-ordinated measures will yield results. The Thematic Strategies will set out the overall policy approach and the proposed package of measures needed to achieve the environmental objectives and targets in a cost-efficient way— which themselves will be determined on the basis of sound scientific and economic cost-benefit analysis and on open dialogue and consultation with the various parties concerned.”

As an example of how detailed and how state-of-the-art the sixth action programme document is on the proper practices, here is one on:

**“Helping Consumers Make Informed Choices** - People, as consumers, need to be given relevant and readily understandable information about a product's environmental credentials if they are to make choices that support environment-friendly initiatives by companies. Public and corporate procurement officers also need this information. The Commission will look at options to ensure that companies provide the necessary information to consumers via their websites and other communication channels.”

The Environment DG scores another perfect 5 on this KPE, find the proper practices.

**KPE 3 – Tell the people the truth about the problem and the proper practices.**

The Environment DG does an excellent job of this. The proper practices are policies and legislation. These are communicated by the EU through its member states to their administration, citizens, corporations, and other organizations. The Environment DG is highly concerned with how well this communication goes, because if people don’t know what they should do then they can’t do it. The Environment DG also measures what actions have been taken, and what the actual response of the environment to these measures has been.

The 2005 Environment Policy Review 50 analyzes how well KPE 3 is being performed in terms of results. For example, it reports that “By implementing existing and additional domestic measures and by using the Kyoto mechanisms, 17 out of the 23 Member States with a Kyoto target and the EU as a whole, are currently projected to meet their targets.”

The Environment DG is having so little trouble achieving this KPE that it expends most of its efforts at
a higher level: measurement of variance between goals and results, and action if the results are not good enough. Thus it scores another perfect 5 on this KPE.

**KPE 4 – If that fails, exhort and inspire the people to support the proper practices.**

EU member states do not always meet their goals. The system the Environment DG has set up to monitor goal attainment handles early detection of goal failure well. This allows the DG to step in and help the member state in whatever ways are necessary. The result is very little need to exhort and inspire. Instead, deviation from expectations is seen as a deficiency in education or assistance. This is provided, and the deviations are resolved.

**KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem**

The Environment DG is solving the coupling problem, not the change resistance or complete problem. Thus it does not require the same problem solving process that most other environmental organizations do.

Despite hours of searching, I could not find documents describing the process that the Environment DG was using to manage itself and achieve its mission. My conclusion is there is none. Instead, the DG is using an undefined, informal process. Their administrative procedures are defined. But the overall process used to achieve their mission is not.

However, even so, it is pretty good. It fits the problem very well and its gets excellent results, which is evidence of a good fit. But since there is no formal definition, they score a 3 on this KPE instead of another perfect 5.

A formal definition of the process will be needed as the Environment DG starts to encounter diminishing returns. It will become harder and harder, for example, to achieve each 10% reduction in greenhouse gas emissions. The DG’s “long term target” is “a 70% cut.” Going from 60% to 70% will be about an order of magnitude harder than going from 0 to 10%. Furthermore, 70% is insufficient. 90% is more realistic. Going from 80% to 90% will be even harder, probably by another order of magnitude.

**KPE 6 – A true analysis of the problem is performed**

The hallmark of a true analysis is the decomposition of a problem into smaller problems, each of which is much easier to solve. Earlier we wrote:

“When we say a true analysis of the problem is performed, we mean (1) a structured examination of the system with the problem has been performed, (2) the fundamental flaws causing the problem symptoms have been found, and (3) an exhaustive examination of the full range of solution alternatives to resolve those flaws has been conducted. If any of these three steps has been omitted or done poorly, a true analysis has not been performed.”

A true analysis was not performed. Instead, an intuitive leap was taken from objectives to solutions. The absence of analysis can be seen in this paragraph describing how the Seven Environmental Thematic Strategies were chosen: (Italics added)
“Each strategy is founded on thorough research and science, and follows an in-depth review of existing policy and wide-ranging stakeholder consultation. The aim has been to create positive synergies between the seven strategies, as well as to integrate them with existing sectoral policies, the Lisbon Strategy and the Sustainable Development Strategy. Each Thematic Strategy will thus help achieve the long-term goal of environmental sustainability while contributing to the Lisbon goals of enhancing growth and employment and promoting eco-innovation.”

Note the phrase “follows an in-depth review of existing policy and wide-ranging stakeholder consultation.” This was the analysis that preceded development of the strategies, which are the high level solution. A review of existing policy is not an analysis of the system. It is an analysis of past attempts to solve the problem, to see what went wrong, what went right, and what can be improved. While this can be productive, it is not nearly productive as a true analysis, because a true analysis yields a model of how the system behaves. The model can then be used to generate solution hypotheses that have a much higher probability of being true than ones generated with no model. Without a model you are forced to guess at what will work, and if it doesn’t, all you can do is review existing policy.

Substitution of “review of existing policy” for true analysis will work on easy problems, ones that yield to educated guesses. It will fail on more difficult problems. These are the ones the European Union will face as it draws closer to attempting to achieve 100% sustainability.

In four short years, starting in 1946, the US Manhattan Project invented the atomic bomb and a delivery system. Despite the horrors of the Cold War that followed, the bomb worked so well that the Japanese front of the Second World War ended in a matter of days instead of years.

Suppose the Manhattan Project has used “review of existing policies” as its analysis technique. How could it possibly have solved the many subproblems it faced? It would have failed. Solving these problems requires a model explaining how the constituent elements involved work. The model can be used to generate insights for where experimentation would be most productive. The results are then fed back into model improvement. Once the model is mature, so are the experiments, which can then be scaled up to the real thing, which solves the real problem.

The sustainability problem dwarfs the Manhattan project, the Apollo project, the English Channel project, the Panama Canal project, the Concorde project, and every other project known to the history of civilization. It is a project stuffed with unknowns. Dozens of major discoveries are required, and they must be integrated into a coherent, workable solution in a short amount of time. Judging by the fact that ALL of the above projects relied heavily on explanatory models of the problem they were solving, the sustainability problem must do the same.

But you would never know this from the approach nearly all environmental organizations take. They sail right over a true analysis and into solution hypothesizing, with all the confidence of a gambler on a nine day hot streak. And then, when their solutions fail altogether or come up short, what to they do?

About what the Environment DG does. They engage in “review of existing policies.”

Here is another example of the weakness of this key process element. When the Environment DG wanted to begin to solve the resource management side of the sustainability problem, what did they do? They commissioned the Analysis of the Fundamental Concepts of Resource Management, a 54 page study published in 2000. This analyzed the proper coupling aspect of natural resources, not by modeling the system and the coupling, but by study of existing studies and literature. The result is the study came up with very little of value. This was so low that the study itself ended with a call for “The Need for New Concepts.”

But here the study, and possibly the Environment DG, went astray. The section concludes that: (Italics added)

“Research is necessary to understand the relationship between production and consumption, environment, technological adaptation and innovation, economic growth and development, and demographic factors: How can economies grow and prosper while reducing the use of energy and material and the production of harmful material?”

This is a bias towards continued growth. It says the solution must include continued economic growth. But what if the sustainability problem cannot be solved without holding growth constant or reducing it? Or what if the problem cannot be solved unless growth is stopped while we work on ways to reduce environmental degradation?

This bias is the result of the mantra of Sustainable Development. But that is a subject best taken up elsewhere.

Still, the Environment DG is using a moderately productive approach to analysis, considering that the
proper coupling problem is so much easier to solve than the change resistance one. Thus they score a 3 on the key process element of a true analysis of the problem is performed.

KPE 7 – The Scientific Method (SM) is used to prove all key assumptions

The Environment DG scores a 3 here for moderately productive. It certainly uses the SM to determine if individual technical approaches will work, which is the bulk of its decisions. But because it is not process driven and has not performed a true analysis, it completely skips the use of the SM on several strategic hypotheses:

Unproven hypothesis 1: Continuous improvement of quality of life is possible – For example, a page on the EU’s Sustainable Development Strategy (SDS) makes this claim: (Italics added)

“The overall aim of the renewed EU SDS is to identify and develop actions to enable the EU to achieve continuous improvement of quality of life both for current and for future generations, through the creation of sustainable communities able to manage and use resources efficiently and to tap the ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion.”

The implicit hypothesis is that “continuous improvement of quality of life” is possible. This has never been proven, and of course has a limit. This limit may have already been exceeded, given current system constraints. There does not appear to be any effort in the Environment DG to prove this hypothesis. Instead, it is taken as a given, as part of the dogma of Sustainable Development.

What about the options of accepting no improvement in quality of life, or even reducing it, in return for making environmental sustainability a much easier goal to achieve? Wouldn’t that help tremendously? Shouldn’t holding quality of life constant be seriously considered, given that quality of life is already so high in Europe?

Unproven hypothesis 2: The solution must include continued economic growth – A similar unproven implicit hypothesis was mentioned in the previous KPE, which made the assumption that the solution to the sustainability problem must include continued economic growth. This is an even more important hypothesis to test, because economic growth impacts the environment much more than quality of life growth.

Unproven hypothesis 3: Extreme micromanagement will work – However, the largest unproven hypothesis is the overall approach the Sixth Environmental Action Programme takes. Study of the documents describing the program show it to be one of extreme micromanagement. The solution elements involve targets, regulations, taxes, subsidies, information transfer, research on new technologies, social pressure like “name, fame, and shame,” and many more. Hundreds of specific actions to be taken are listed. The implicit hypothesis is that extreme micromanagement will work.

I suspect this is a false hypothesis. Extreme micromanagement is the same as a command and control economy. This is a thoroughly discredited form of human system management. It fails because large human systems, such as countries, are too complex to be centrally managed. Only a decentralized self-managing approach will work in the long run. Like communism, command and control can work in the short run. But it has never worked in the long run, because the inefficiencies of centralized planning, decision making, communication, enforcement, and information collection cause the effort required to do all that to eventually exceed the capacity of the system.

Why then is the Environment DG pursuing the extreme micromanagement route? Because due to lack of a process that fits the problem and a true analysis, they have failed to find a better alternative.

For an example of the application of a process that fits the problem and a true analysis, please see the chapter on The Proper Coupling Package. This shows that it is entirely possible to engineer a self-managing solution that is NOT dependent on a command and control approach.

The Environment DG is not the only environmental organization falling into this error. They all are.

Due to not using the Scientific Method to prove these three critical hypotheses, the Environment DG deserves a score of 1 for this KPE. But we will be lenient and increase it to a 3 for moderately productive, because at this early stage of the hundred year effort it will take to solve the problem and implement the solution they are doing very well. They are setting the standard for the rest of the world to follow. It is probable that eventually they will correct the falsity of the three strategic hypotheses reviewed here, and arrive at ones that are sound and will lead to a solution that will work.

KPE 8 – Learning from past failure and successes is maximized

I was so impressed with how well the Environment DG learned from experience that they score a perfect 5 here. They are world class.

The best indicator of this is the continuous improvement seen between action plans. There is a serious, formal review process of what worked and what didn’t.
This occurs as often as is feasible and economical. The Environment DG is so good at this that it has the world’s largest and best collection of best practices for managing The Transition to the Age of Sustainability.

**KPE 9 – The analysis centers on a social system structural analysis**

Now we come to the three problem domain KPEs. These become very analytical and specific to the sustainability problem.

As we argued in KPE 8, the Environment DG is pursuing a solution based on three false hypotheses. No social system structural analysis was performed. Thus they deserve a zero for KPE 9.

However, we could say that the Environment DG is solving the proper coupling part of the problem rather than the change resistance part. This is mostly a technical problem and requires no social system structural analysis. Thus it does not apply and they should receive an automatic score of 3.

But it does apply, for the reasons discussed in dealing with the third false hypothesis. But again we will be lenient, say it does not apply, and give them a 3, because they are in the early stage of solving the problem. They are doing very well for this stage.

**KPE 10 – Low and high leverage points have been identified and tested**

There is no explicit concept of leverage points in the Environment DG’s work. But there is an intuitive one. Instead of the use of structural analysis to identify the system’s leverage points, they have used trial and error. In the micromanaging approach they are using for this early stage, they are doing very well on this KPE. Progress in actual system change is so good they are highly productive here, and score a 4 for this KPE.

**KPE 11 – Why change resistance is successful has been determined**

This does not apply since the Environment DG is solving the proper coupling problem. They score an automatic 3 for this KPE.

**Process Maturity Rating**

Of all the environmental organizations, the Environment DG stands in a class by itself. Europe has solved the change resistance problem and has moved on to the proper coupling problem. The Environment DG is a well managed agency with high quality staff, using state of the art approaches, and getting world class results.

For these reasons you might expect them to score very high. But they don’t. As mature as the Environment DG is, it has a long way to go on the scale of process maturity. This will become evident as the agency moves from small changes in Europe’s sustainable behavior to big ones. These will be an order of magnitude more difficult to solve, even with low change resistance. As so many industries have shown, such as software, the military, and electronics, only a highly mature process can achieve the very highest results.

Thus the Environment DG scored only modestly well in the Analytical Activism and Problem Domain key process elements. Their process maturity rating is 5,184. On a scale of 0 to 10,000 this is a 52%. If they were trying to solve the change resistance part of the problem this would be inadequate. But it is more than adequate for solving the proper coupling part, which explains why they have a high overall mission success.
The Natural Step

The Natural Step is unique. It is a comprehensive scientific philosophy on how to solve the sustainability problem, complete with a consensus approach to get past change resistance. It achieved great success at first in the country where it started, Sweden, in the 1990s. Since then the philosophy has spread around the world. Here is an overview:

"[The Natural Step is] an international non-profit research, education and advisory organization that uses a science-based, systems framework to help organizations, individuals and communities take meaningful steps toward sustainability. The mission of The Natural Step is to act as a catalyst to bring about systemic change, by making fundamental principles of sustainability easier to understand and effective sustainability initiatives easier to implement.

"Founded in 1989 in Sweden by Dr. Karl-Henrik Robèrt, the organization now has offices in 12 countries and has a large team of professionals working with hundreds of corporations, municipalities, academic institutions and non-profit organizations to help them achieve their sustainability goals. The Natural Step has received numerous awards from around the world for its work in sustainability including Mikhail Gorbachev’s Millennium Award in 1999, The Blue Planet Award in 2000, considered the “Nobel Prize of the Environment”, and in June, 2005, Dr. Robèrt was honoured with the first Laureate Medal for Social Responsibility issued by the new Global Centre for Leadership and Business Ethics.”

Like most environmental organizations, The Natural Step uses Classic Activism as its central process. Because it is so science based and is managed by technical types, it has been able to implement the steps of Classic Activism quite well. Let’s see how it did this.

KPE 1 – Define the problem

The Natural Step defines the problem this way:

“In a sustainable society, nature is not subject to systematically increasing:

1. concentrations of substances extracted from the earth’s crust;
2. concentrations of substances produced by society;
3. degradation by physical means; and, in that society. . .
4. human needs are met worldwide.”

These four requirements have been taken up by many environmentalists. One example is shown in the image below.

These four requirements are the tightest, most analytical attempt to define the problem of all the entities in the process maturity table. At first glance they deserve a perfect 5.

But the definition is flawed. Notice the use of “is not subject to systematically increasing.” What if a society has overshot its environmental limits and then stops increasing its environmental impact? By the above definition, the society would now be sustainable, because it is no longer increasing its impact. Thus items 1, 2, and 3 are a flawed definition.

Item 4 is also flawed. This mixes environmental sustainability with social do-goodism. The goal of item 4 is to meet the “needs” of everyone. What exactly are these needs? How can they be agreed upon for 6.5 billion people? What if these needs are constantly changing? What about the fact that there has never been a society that met all its members “needs,” even before the sustainability problem appeared?

The Natural Step has fallen into the trap of mixing environmental and social sustainability. The two must
be separated so that the first can receive higher priority. The second is a problem that has been around every since *Homo sapiens* first appeared. To try to solve it now, when there is a much more pressing problem, is counterproductive.

However, when you examine the emphasis The Natural Step places on the four items in practice, nearly all of it is on the first three, and it is intuitively understood that the human system needs to be below environmental limits in these three areas. Thus they get a 3 instead of a 1 for the first KPE, define the problem.

**KPE 2 – Find the proper practices**

The four items have been expanded into:

“*The Four Systems Conditions for Sustainable Human Society According To The Natural Step [are]:*

**“1. Eliminate our contribution to systematic increases in concentrations of substances from the Earth's crust.”** – This means substituting certain minerals that are scarce in nature with others that are more abundant, using all mined materials efficiently, and systematically reducing dependence on fossil fuels.

**“2. Eliminate our contribution to systematic increases in concentrations of substances produced by society.”** – This means systematically substituting certain persistent and unnatural compounds with ones that are normally abundant or break down more easily in nature, and using all substances produced by society efficiently.

**“3. Eliminate our contribution to systematic physical degradation of nature through over-harvesting, depletion, foreign introductions and other forms of modification.”** – This means drawing resources only from well-managed eco-systems, systematically pursuing the most productive and efficient use both of those resources and land, and exercising caution in all kinds of modification of nature.

**“4. Contribute as much as we can to the goal of meeting human needs in our society and worldwide, going over and above all the substitution and dematerialization measures taken in meeting the first three objectives.”** – This means using all of our resources efficiently, fairly and responsibly so that the needs of all people on whom we have an impact, and the future needs of people who are not yet born, stand the best chance of being met.”

By stating the proper practices in this higher level, strategic format, The Natural Step has been able to help a wide variety of people and organizations derive the lower level, tactical proper practices they need to follow. In the first three items they have done very well, and score a 5.

But in the fourth item they fall short. Notice the contradiction between “contribute as much as we can” and “human needs are met worldwide” in the earlier version of item 4 in KPE 1. “As much as we can” is not the same as “met.”. Or suppose you ignore number 4 in KPE 1 and try only to “contribute as much as we can.” This is a vaguely defined goal. It is a very poor system condition. It is also a symptom of how slippery the idealistic goal of meeting “human needs” is.

Because The Natural Step falls so short in the fourth item, they score only a 4 for this KPE, find the proper practices.

**KPE 3 – Tell the people the truth about the problem and the proper practices.**

The Natural Step has done very well here. They have disseminated their philosophy worldwide so well that most educated environmentalists are aware of it. Many corporations and even some governmental units have picked it up and are practicing it. They score a perfect 5 for this element.

**KPE 4 – If that fails, exhort and inspire the people to support the proper practices.**

Like most organizations practicing Classic Activism, The Natural Step does well here. The founder of The Natural Step, Karl-Henrik Robèrt, writes and talks in an engaging inspiration manner. Here is a typical passage:

“**ON CONSENSUS-BUILDING**

“To me it's just obvious that there must be some truth about our environmental problems that is true for everyone, whether they're left- or right-wingers. There must be some truth that we could define together based on knowledge, and I wanted to know where this knowledge was. How much could we agree upon from the facts?

“But all I saw was this arguing going on - it was like watching a house burn down while the fire brigade was arguing about how the fire brigade should be organized. I felt, ‘God! Couldn't we agree upon something, and see how much we could start doing on that basis?’

“That was when I became a slave to what became The Natural Step. I started to write the consensus report - which was only a consensus in my own brain, but I tried to foresee the problems that people had when they wanted to reach consensus. For example, if I wanted to get rid of nuclear power, I tried to understand how intelligent people who want nuclear power would argue. I did my best, then I sent this report to the best scientists in Sweden - communists as well as conservatives. I asked them, ‘Could you please find the errors in this for me?’
“If there is anything that unites professors, it's that they can't help finding errors in what others have done, so they helped me very well. I got the document back, solved the problems they had pointed out to me, and sent out a second version.

“I did this 21 times.

“The final report is the 22nd version of the first consensus report. This was very challenging to industry and to a lot of organizations, because at last somebody had gathered a consensus about what we should do. I managed to raise money to distribute this report to every Swedish household and every school - 4.3 million copies. The package comes with an endorsement from the King, and it employs a very simple pedagogical method: an audio cassette talks along with the pictures and explains what is wrong - the systemic errors that make up the trunk and the branches of the pollution tree - and finishes by explaining what we must do if we want both to survive and to keep our wealth, which really amounts to the same thing.”

This style of inspiration and exhortation got results and was repeated by followers. The Natural Step scores a perfect 5 for this key process element.

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

While The Natural Step scores high in Classic Activism elements, it scores low in all the rest. This may be surprising, given the philosophy’s strong scientific basis. But even scientists and doctors are not immune to the tendency of most problem solvers to stick to the processes they are accustomed to, no matter what the problem. Most problem solvers are habit driven, not process driven.

When confronted with a widespread problem, a common habit of scientists and doctors is to write a report, communicate it to others, and use the report as the foundation for the solution. This is a process. It is the process that Karl-Henrik Robèrt used to found The Natural Step. While this process did very well in getting some initial attention and small amounts of system change, it fared less well outside of Sweden, where it achieved only modest success. This reason is the process did not fit the problem from an Analytical Activism point of view. From a classic activist’s viewpoint, it’s a great process. But not from the eagle eyes of an analytical activist, who sees far more of what should be in a process for solving complex social system problems with a high amount of change resistance.

Not only was the wrong process used, it was not formalized, it was not managed, and it was not continuously improved. However, at least there was a process and it led to the four conditions of sustainability. Thus instead of a zero, The Natural Step scores a 1, very low productivity, on this process element.

KPE 6 – A true analysis of the problem is performed

There is not the slightest sign of a true analysis, which would have these aspects: (1) a structured examination of the system with the problem has been performed, (2) the fundamental flaws causing the problem symptoms have been found, and (3) an exhaustive examination of the full range of solution alternatives to resolve those flaws has been conducted.

Instead, Robèrt performed an intuitive analysis. He assumed that if he came up with the proper practices in solid scientific terms, got consensus on them, and spread the word, that the problem would be solved. This is so far from what a true analysis really is that The Natural Step scores a zero.

KPE 7 – The Scientific Method is used to prove all key assumptions

Robèrt began his quest by assuming that a scientific based consensus report would solve the problem. But this has never been proven. Robèrt fell into the same trap that all classic activists do—he blindly assumed that his key hypothesis of all it takes to solve this problem is find the truth and spread it to others was so obviously sound that it needed no testing.

The hypothesis held for Sweden, because Sweden was already on board the sustainability bandwagon. And it worked well in a neighboring country, the Netherlands, for the same reason. But in the rest of the world The Natural Step barely made a ripple. There was some initial enthusiasm. Hundreds of companies, including big ones like IKEA, Electrolux, and Interface, committed themselves to The Natural Step way. But while they have made substantial sustainability improvements, there are millions of other companies who were unaffected.

Because there was no attempt whatsoever to prove his key hypothesis, The Natural Step receives a zero for this process element.

KPE 8 – Learning from past failure and successes is maximized

While reading the literature on The Natural Step, I noticed that there was no significant change in their problem solving strategy over time. The guiding philosophy shot out of a cannon and never changed course. Even today in 2006, a full 17 years after The Natural Step organization was founded, no strategies have changed. Tactics have, but strategies have not.
A look at the masters program in Strategic Leadership Towards Sustainability, at the Blekinge Institute of Technology in Sweden, proves this point. This program was created by The Natural Step and Sweden. Clicking on “Guiding Philosophy” on the website, at www.bth.se/tmslm, leads to this:

“Society within the biosphere is inherently a highly complex system. This program is founded on the basic premise that to achieve ‘success’ – i.e. a sustainable society – within such a complex system, success must be understood at a fundamental level. Achieving success requires a systematic and structured approach to planning and decision-making. In particular, there must be a focus on an imagined principle outcome of success as a ‘sustainable society in the biosphere.’ From this understanding, one can ‘backcast’ to the present and begin to take action as part of a clearly focused strategy.

“The entire program will revolve around an intellectually strict model for making systematic progress towards an attractive and sustainable society. Built on a total systems perspective and a scientifically relevant worldview, it is widely known as The Natural Step framework, an internationally recognized methodology for guiding strategy towards sustainability. It is a generic and therefore widely applicable approach to sustainable development at multiple scales (e.g. global, national, business, corporate, community and individual).”

The above guiding philosophy sounds good. It has all the right buzzwords: complex system, basic premises, fundamental level, systematic, structured approach, backcast, clearly focused strategy, intellectually strict model, total systems perspective, scientifically relevant world view, methodology, generic, and multiple scales. But the presence of the right buzzwords does not make a problem solving approach correct. Only the presence of the right key process elements and proven hypotheses can do that.

The guiding philosophy says that “The entire program will revolve around an intellectually strict model for making systematic progress towards an attractive and sustainable society.” This model is The Natural Step framework. But as we have argued, that framework is flawed for a number of reasons. It has remained so ever since it was created. The material in the above program shows no sign the basic framework has improved, even though it has failed to significantly help solve the problem. All that has changed is The Natural Step has improved its ability to tell more people about itself, and to teach itself at a university.

The above quote is a shining example of pseudo systems thinking. This occurs when problem solvers think they are using true systems thinking but are not. On page 21 this book introduced the term “structural thinking,” which to us is what true systems thinking is.

The people behind The Natural Step firmly believe they are systems thinkers. But they are not, using the definition from the sequel to the book that popularized the phrase and brought it to the business world. This was The Fifth Discipline, by Peter Senge in 1990. Here is the definition from The Fifth Discipline Fieldbook:

“Systems thinking [is] a way of thinking about, and a language for describing and understanding, the forces and interrelationships that shape the behavior of systems. This discipline helps us to see how to change systems more effectively, and to act more in tune with the natural processes of the natural and economic world.”

Or there is our own definition from page 21, which is:

“Structural thinking sees the world as a complex structure composed of nodes, relationships, and interacting feedback loops. Once this structure is modeled, simulated and understood the fundamental behavior of the system becomes plainly obvious, making the system’s response to solution efforts predictable.

“We prefer this term to the more common one of ‘systems thinking,’ which too often only implies thinking of the system as a whole. This is not enough.”

What would The Natural Step have to add to their approach to be true systems thinkers?

First, they need to work in “a language for describing and understanding the forces and interrelationships that shape the behavior of systems.” This requires causal flow diagrams or system dynamics simulation models. For a problem as difficult as the sustainability problem, the latter is mandatory.

Second, they have not analyzed the whole system. They have studied only the technical side of the problem and missed the social side, which is where change resistance is coming from. True systems thinking would see that overcoming change resistance is the crux of the problem, and study that.

Third, this is a complex social system problem. All such problems revolve around the behavior of the system’s dominant social agents. The Natural Step has failed to focus its efforts on finding out who these are,
why they are behaving sustainably, and what can be done to reengineer the system so that their natural behavior is sustainable.

But this is a common error. Nearly all environmentalists and environmental organizations are pseudo systems thinkers. But a few, including those who have taken up the message in *The Fifth Discipline* or the field of system dynamics, are the real thing.

It appears that because The Natural Step uses pseudo systems thinking and no process that fits the problem, it has been unable to learn from past experience at the strategic level. Because of this it is still promoting the same strategic message that has failed for over 15 years to solve the problem. However, their tactics have improved, such as the idea of teaching their philosophy as a master’s level degree. So instead of a zero, they score a 1 on this key process element.

**KPEs 9, 10, and 11 – The problem domain key best practices**

There is no evidence of any of these whatsoever. The Natural Step scores a zero on all three of these KPEs.

**Process Maturity Rating**

The Natural Step scored high on the process elements of Classic Activism and low on the rest. The result is a process maturity rating of 289. This explains why it has been unable to achieve more than low mission success.

This low rating is not what most might expect when they first read about The Natural Step. Its founder is a doctor. He used feedback from the best scientists in Sweden to develop The Natural Step framework. Aren’t scientists and doctors pretty good at solving problems?

Yes, if the problem is in the domain they have been trained in. But no if the problem is so different from what they are used to that it demands a completely different problem solving approach. This holds for the global environmental sustainability problem, and goes a long way to explaining why, despite an ample supply of brilliant comets and an enormous supply of effort and eloquence, the environmental movement has failed to move the elephant.

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**The Natural Resources Defense Council**

The About page on NRDC’s website says:

“NRDC is the nation's most effective environmental action organization. We use law, science and the support of 1.2 million members and online activists to protect the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things.”

There is some agreement on this. The Wall Street Journal writes that “NRDC is by many accounts, the most effective lobbying and litigating group on environmental issues.” Eco Magazine chimes in with “By almost any measure, the most influential national environmental organization is NRDC.” Many more say about the same thing.

But it is a grand illusion. The terms *most effective* and *most influential* do not mean that NRDC is effective or influential. It only means that on a relative basis, it is the *most* effective or influential. The real question is how effective is NRDC or any environmental organization at protecting “the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things”?

The humbling truth is that none are effective at all. This can be seen by examining graphical proof that the environmental movement has had no substantial effect on the global environmental sustainability problem, as seen in the ecological footprint versus carrying capacity graph.

Notice how the footprint has continued marching steadily upward, all through the 1970s, 80s, and 90s. Nothing stopped its relentless growth. The efforts of environmentalists, including those in governments and international agencies, have had only a negligible effect on this curve. 59
The same phenomenon may be seen in the graph below of the steady rise of atmospheric carbon dioxide, the main greenhouse gas. This is the black sawtooth line. Once again, the environmental movement appears to have had no significant effect on a highly critical trend.

Thus NDRC has achieved low mission success, no matter how much praise they may receive. The same is true for all the environmental organizations and book authors working on solving the sustainability problem. They have all failed. Yes, some progress has been made. Yes, we might still solve the problem in time. But the fact remains that the problem is not solved. And, because the problem has grown much worse since it was first identified in 1972 by *Limits to Growth*, mission success has actually gone backward, from low to super low.

The point of the process maturity table is that if NDRC and other very capable organizations want to achieve their missions, there is only one way to do it. They need to pause, do quite a bit of self-reflection, and transform themselves into organizations that score high on process maturity. Anything less is a continuation of the grand illusion.

**KPE 1 – Define the problem**

Here is NDRC’s mission statement as it appeared on their website on September 13, 2006:

“We work to restore the integrity of the elements that sustain life -- air, land and water -- and to defend endangered natural places.

“We seek to establish sustainability and good stewardship of the Earth as central ethical imperatives of human society. NRDC affirms the integral place of human beings in the environment.

“We strive to protect nature in ways that advance the long-term welfare of present and future generations.

“We work to foster the fundamental right of all people to have a voice in decisions that affect their environment. We seek to break down the pattern of disproportionate environmental burdens borne by people of color and others who face social or economic inequities. Ultimately, NRDC strives to help create a new way of life for humankind, one that can be sustained indefinitely without fouling or depleting the resources that support all life on Earth.”

What is their exact goal? Are natural places more important than people? What does “the integral place of human beings in the environment” mean? How is “long-term welfare” defined? Are they in the business of “the fundamental right of all people to have a voice in decisions that affect their environment,” or are they in the business of saving that environment? Are they in the business of correcting “disproportionate environmental burdens borne by people of color and others who face social or economic inequalities,” or are they in the business of saving the environment? Which is it? What does “a new way of life for humankind” mean?

Here is what Peter F. Drucker has to say about missions statements like this:

“One of the most common mistakes is to make the mission statement into a hero sandwich of good intentions. It has to be simple and clear. You can only do so many things. [If you] are trying to do fifty things, it won’t work.”

Drucker gives a few examples of crisp, clear mission statements. The mission of the US Girl Scouts is “to help girls grow into proud, self-confident, and self-respecting young women.” For the Salvation Army it is “to make citizens out of the rejected.” An even finer example comes from “Arnold of Rugby, the greatest English educator of the nineteenth century, who created the English public school, defined its mission as making gentlemen out of savages.”

Drucker says his “favorite mission statement is not that of a non-profit institution, but of a business. It’s a definition that changed Sears from a near-bankrupt,
struggling mail-order house into the world’s leading retailer within less than ten years: ‘It’s our mission to be the informed and responsible buyer—first for the American farmer, and later for the American family altogether.’

He points to the problem caused by a poor mission statement, using as an example the common one for hospitals: “Our mission is health care.” The problem is “nobody can tell you what action or behavior follows from” that.

Neither can anyone tell what follows from NDRC’s well intentioned but sprawling, let’s-do-it-all mission statement. Because an organization’s mission statement is its problem definition, NDRC scores a 3 here for only moderately productive. The statement has been productive enough to attract donors and employees and focus them in a general direction.

A more focused mission statement would be something like “Our mission is the promotion and enforcement of laws that will lead to a healthy environment for all living things, indefinitely.”

KPE 2 – Find the proper practices

The proper practices are the same as the rules a society must live by to achieve a goal. NDRC seeks to promote and enforce these rules rather than find them, which it does not have to do, because many of the proper practices are already known and others are developing the ones that remain unknown. They score an automatic 3 here.

KPE 3 – Tell the people the truth about the problem and the proper practices.

Promoting the laws a society needs to live by is the same as promoting the truth about a problem and the proper practices needed to solve the problem. Selectively enforcing the laws a society already has in an area of interest is the same as forcibly spreading the legal truth. The NDRC does all this so well that it scores a 5 for world class. It has set the standard on this process element.

KPE 4 – If that fails, exhort and inspire the people to support the proper practices.

NDRC wisely does not engage in this at all, and so scores a zero. This does not affect their rating, because this element has a weight of zero.

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

Examination of the NDRC website shows no hint of an overall process to achieve its mission. There is only evidence of lots of structured activity to promote the proper practices needed to live sustainably, as well as to promote and enforce laws to do this.

The total lack of a formal process seems to stem from the assumption that if NDRC just promotes and enforces the right laws, then it can achieve its mission. This of course is just another variation of the central tenant of Classic Activism: If we can just promote and enforce the right proper practices, the problem is solved.

For total lack of a process to solve the problem of how to achieve their mission, the NDRC scores a zero on this key process element.

KPE 6 – A true analysis of the problem is performed

I wish it weren’t so, but there is no indication that any analysis has been performed, much less a true analysis. The NDRC scores another zero here.

KPE 7 – The Scientific Method is used to prove all key assumptions

The key assumption at NDRC is that the promotion and enforcement of the right laws will lead to solution of the environmental sustainability problem. This assumption towers over all others. It is the very core of their strategy and specialty.

But sadly, it has never been tested. What if a society doesn’t want to adopt the proper laws specifying the proper practices? Then what do you do? What if this is what has happened for decades? Should you not question your key assumption, and ask if perhaps it is false?

For not even questioning their key assumption, even in the face of several decades of proof it is not enough to solve the problem, the NDRC receives another zero.

KPE 8 – Learning from past failure and successes is maximized

The NDRC has done very well here in one respect, and poorly in another. In strategy execution of a legal approach, it has refined and improved its approach over the years, to where it is now the force to be reckoned with if the US administration attempts to misinterpret or simply not enforce existing laws. The same can be said of its learning curve on promoting new laws and changes to existing ones. It is clearly world class here.

However, like nearly all environmental organizations, the NDRC is winning battle after battle but losing the war. Being the best at a legal approach is not enough to solve the sustainability problem. This is a lesson that seems to have escaped the legal eagle’s eyes. The NDRC is blind to the noblest truth of them all: that legal pressure is a low leverage point, because the opposition can, and has, pushed back just as hard. The result is
modest progress on the easy problems and abject failure on most of the rest.

For example, the NDRC has had no effect at all on the passing of the most important law of them all on the most important problem of them all: climate change. In 1999 the US Senate rejected the Kyoto Protocol treaty by a shocking 95 to zero. It has not been brought back to the floor since. If the NDRC was learning from experience, then it would by now have discovered that there are other higher leverage places in the human system to be pushing, and it would be pushing there. But it is not.

On mission strategy execution the NDRC gets a 5. But on learning from past experience that this is the wrong strategy they get a zero. This averages out to a 3 for moderate productivity, which is the score they receive.

KPEs 9, 10, and 11 – The problem domain key best practices

Because the process does not fit the problem, there is no awareness of the need for any of these practices. The result is they are not done even in small amounts. The NDRC scores a zero on all three of these KPEs.

Process Maturity Rating

Like so many other environmental organizations, the NDRC scored high in the steps of Classic Activism and low in the rest. The result is a process maturity rating of 289. Because this is on a scale of zero to 10,000, it is embarrassingly low. Once again, low process maturity has explained why even a well respected, well funded organization has failed to make a substantial contribution to solving the sustainability problem.

What might be the easiest improvements that legal organizations could make to improve their process maturity and become tigers instead of kittens? Obviously the first is a process that fits the problem. The process would reflect the chief strategy of legal pressure. It would allow determination of where that pressure is best applied, and more importantly, what else must be done for legal pressure to work. The process would lead to identification of the proper high leverage points to push on, so that the leverage point of legal pressure would finally work.

For examples of identified high leverage points and how they were found, please see the chapters on The Dueling Loops of the Political Powerplace and The Proper Coupling Package.

The Nature Conservancy (TNC)

The mission of The Nature Conservancy is not to solve the environmental sustainability problem. Instead, it is a conservation organization:

“The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive.”

The bolding is theirs and is a nice capsule summary of their mission. It points to the goal of preserving enough of the biosphere to save the diversity of life on earth, while ignoring the rest. This is a save-the-representative-ecosystems strategy, and is nearly identical to the first form of environmentalism: the conservation movement of the 19th and early 20th centuries. The idea was that if we set aside enough areas of the world as protected parks or managed renewable natural resources, such as forests, then that would keep enough of the earth in pristine condition for the average condition of the earth to be acceptable. This did not work, however, because it had no effect on pollution and environmental degradation elsewhere. It was a naive solution.

Still, The Nature Conservancy is doing a superb job of conservation. As of 2005 they have protected an impressive 17 million acres in the US and 117 million acres in other countries. They have achieved high mission success.

Or so it seems. But there is a dark cloud hanging over every protected acre. It is the brutal fact that if the rest of the biosphere is not protected, it will soon degrade to the point where the human system collapses. That in turn will cause the islands of conservation that The Nature Conservancy has so lovingly set aside to be impossible to maintain, and they too will fall to the irresistible forces of collapse.

The Nature Conservancy has attained high mission success in the short term but low mission success in the long term. Rather than grade them only on the long term, as we really should do, we will take the average and call it medium mission success. This is because out of all the environmental entities studied, The Nature Conservancy is the only one with a defined process that fits their problem. They are such a shining light that every environmental organization that is serious about achieving its mission should study this process, called
Conservation by Design. It is discussed at length in KPE 5. The process is so good, and used so widely throughout The Nature Conservancy (TNC), that it is possible that the continued improvement of the process may carry TNC into two critical discoveries: The first is how to achieve sustainability in the rest of the world too. The second is that they must figure out how to do that if they are to achieve their own mission on a long term basis.

TNC has done a small amount of work in this area. It “has five priority conservation initiatives to address the principal threats to conservation at the sites where we work, focusing on fire, climate change, freshwater, marine, invasive species and forests.” But their efforts here are minor and only slightly effective. Their approach is much like other organizations, though a bit better because it is process driven.

KPE 1 – Define the problem

The Nature Conservancy has defined their problem as one of conservation, as shown by this statement: “The Nature Conservancy’s vision is to conserve portfolios of functional conservation areas within and across ecoregions. Through this portfolio approach, we will work with partners to conserve a full array of ecosystems and viable native species.”

Currently their goal is “By 2015, The Nature Conservancy will work with others to ensure the effective conservation of places that represent at least 10% of every major habitat type on Earth. The percentage goal is provisional. The Nature Conservancy will launch a longer-term, collaborative process that will articulate explicit outcome and activity objectives for each major habitat type; identify key strategies to abate threats; and take Conservancy action. We will engage the world’s leading scientists, conservationists, and private and public officials in developing these goals.”

Compared to most environmental organizations, this is world class productivity. The Nature Conservancy scores a 5 for defining the problem so well, including quantification of the goal state.

KPE 2 – Find the proper practices

The proper practices needed for conservation differ from those needed for sustainability. Conservation has not been practiced very well, with the exception of large parks in a few countries. Even these have been subject to poaching and illicit or excessive timbering. To achieve its mission, The Nature Conservancy must develop a coherent set of practices that it can replicate over and over to conserve enough habitats to meet its goal of “at least 10% of every major habitat type on Earth.”

TNC’s perspective is that the proper practices are:

1. Conservation by Design
2. Nature Travel
   - Conservation Journeys
   - Ecotourism
   - Nature Lodging
3. Conservation Methods: Conservation-Friendly Public Policies
   - Public Land Management
   - Parks in Peril Program
   - Convention on Biological Diversity
   - Conservation and SD Forums
4. Conservation Methods: Funding for Conservation
   - Debt for Nature Swaps
   - Conservation Trust Funds
   - Ecosystem Services Payments
   - Resource Extraction Fees
   - Public Finance Campaigns

Additional items are listed for private lands conservation and partnering. The above list shows how TNC has a large suite of mature practices for achieving its mission. These have been carefully improved over the years by good management and application of their process, Conservation by Design. Overall, their conservation practices are more oriented to getting lands into a conserved status than managing them once they are there. This is okay, because the former is where they are making their greatest contribution.

TNC has become a model for others to emulate. Its conservation practices are world class, so they receive a perfect 5 for this key process element.

KPE 3 – Tell the people the truth about the problem and the proper practices.

This element refers to how TNC tells the world about the need to put ecosystems under conservation management and the process required to go about doing that. They receive another perfect 5 for this because they have done it so well for decades. In fact, they have done it so well that others have adopted their approach, as seen in this passage from the history of TNC:
“In fact, the Chinese government is basing its new national-level conservation and development plans on Conservation by Design; and in Madagascar, all national parks are going through the 5-S planning process. In the United States, Conservation by Design has been infused into state wildlife management planning in all 50 states, with important ramifications for budgets and places on the landscape.”

KPE 4 – If that fails, exhort and inspire the people to support the proper practices.

TNC invests little in this area, which is a good sign. They seem to realize that many people require a frequent environmentalist’s inspirational fix, via warm and fuzzy pictures to get you to reaffirm your love of nature, and a steady stream of articles backing those pictures up. This is also a good way to get donations. Their literature is strewn with this sort of thing, which the field of eco-marketing: selling the public on the need to protect nature. They could probably not do without eco-marketing, even though most of it is purely an emotional argument, one that those who are objectively sold on sustainability do not require.

For example, the lead article on their website on September 17, 2006 began with this appeal:

“Learn how the Hook and Bullet Crowd is a Powerful Force for Protecting Nature – When a hunter dreams of a trophy elk, thoughts run to frozen mornings deep in the Rocky Mountains. Minnesota seldom comes to mind, and there’s little reason why it should, since the state issued only five permits to hunt elk last year. Nonetheless, when The Nature Conservancy needed help acquiring a critical 800-acre piece of Minnesota grassland, it was the hunters of the Rocky Mountain Elk Foundation, based in faraway Montana, who stepped up.”

The article ended with this appeal to the reader’s self-esteem. The final sentence is the one they want readers to remember and practice:

“Part of the strategy is to get nonhunters to buy the stamps. Says Scott Sutherland of Ducks Unlimited, ‘Anyone who cares about wild places and spaces should care about this program.’”

TNC scores a 3 for moderately productive on this process element. But because this KPE has a weight of zero, this doesn’t affect TNC’s total score at all.

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

Now we arrive at the crown jewel in The Nature Conservancy’s approach to achieving its mission: Conservation by Design. Here is the story of its creation, as told by Steve McCormick, their current President and CEO as of 2006:

“In the 1990s, advances in large-scale conservation planning and The Nature Conservancy’s own five decades of experience led us to create Conservation by Design, a framework through which we set out to fulfill our mission in the face of mounting assaults on the natural world. Our late president John Sawhill challenged a small group of staff to devise a new vision and approach that would help us to be as strategic, effective and efficient as possible in our work to conserve biodiversity. I was privileged to lead the team that developed Conservation by Design: A Framework for Mission Success, first printed in 1996 and updated in 2001.

“In the intervening years, Conservation by Design has come to be our touchstone for action. It tells us where to work, what biodiversity to conserve, what strategies we should use, and how effective we have been.

Conservation by Design instantly became the process driving the Conservancy’s core work. As the above passage above explains, “It tells us where to work, what bio-diversity to conserve, what strategies we should use, and how effective we have been.” That is precisely what a good process should do.

There is absolutely no doubt the Conservancy is world class in this key process element, so they get a perfect 5 here. Their core process, Conservation by Design, is so superior that the Chinese government and all 50 state wildlife management agencies in the US have incorporated it into their own processes. The process is so good and so central to the Conservancy’s work that a diagram of the process appears on many of their web pages, as reproduced on the next page.

Clicking on the five areas of the diagram takes you to a web page about that step in the process. This clicking is one way to get people to start thinking in terms of process. The process is introduced on the How We Work: Conservation by Design pages with: “To fulfill our long-term vision and achieve our goals, The Nature Conservancy employs an integrated conservation process comprised of four fundamental components.” These are the four nodes in the loop in the diagram.
Notice how the process is a closed loop. “Measuring Success” allows the continuous improvement necessary to turn a waterfall process into an iterative one that is continually self-improving, using the very strong reinforcing loop shown in the diagram.

KPE 6 – A true analysis of the problem is performed

The Conversancy has two main types of problems: its overall mission and its conservation projects. A true analysis is routinely performed on projects. On the mission, I can’t tell from examination of their website. But a read of their history page and numerous other pages shows there is a strong informal analysis rather than none at all, so at least it’s not zero. An educated estimate is better than none at all here, so I’d score them high on project analysis and low on mission analysis. This would give them a 3 on this element. But because they have such a good project process, their mission seldom needs analysis any more. So if we weight the importance of their project analysis as high and their mission analysis as low, we get much more than a 3. Let’s go with a 4.

KPE 7 – The Scientific Method is used to prove all key assumptions

This follows the same pattern as the previous KPE. The Scientific Method is rigorously used to test key assumptions in conservation projects. But at the level of their overall approach to solving the problem of how to best achieve their mission, it seems to be low. This appears to be no conception of testing the idea the Conservation by Design will achieve their long range mission. It will only achieve their short term goals. For the same reasons as the previous KPE, they receive another 4.

KPE 8 – Learning from past failure and successes is maximized

The Nature Conservancy is the only environmental NGO I’ve examined that has a formal process for learning from experience. This is the Measuring Success step in Conservation by Design. Here is a short description of the step:

“For purposes of assessing progress toward our mission, The Nature Conservancy defines conservation success as the combination of three outcomes: the maintenance of viable biodiversity, abatement of critical threats, and effective protection and management of places where we take action with partners. These outcomes are measured in a variety of ways and at multiple scales, from local conservation areas to global habitats within the framework of both the 5-S approach and our ecoregional assessment methods. The results are used to guide management actions, resource allocation and future investments.

“Collectively, these measures seek to quantify our conservation impact—the direct contribution of the Conservancy and our partners to conserving biodiversity. To hold the organization accountable for results, we aspire to measure success across the full portfolios, not just the areas identified as priorities for conservation action. We are working with a wide range of partners to develop linked monitoring systems that employ common types of biological, physical, social and economic indicators.”

Non-profit organizations have no bottom line. They must create one, as TNC has done. For doing this so well they would seem to deserve a perfect 5. But once again, they have done well only at the tactical level of projects and creating islands of conservation. The real problem of global environmental sustainability problem remain mostly unaffected by their work, which puts the long term viability of all their conservation work in jeopardy. But again, their superior process may lead them to make a substantial contribution to solving the long term part of their mission. They thus score a 4 instead of a 5.

KPE 9 – The analysis centers on a social system structural analysis

This element is necessary if it would greatly help achieve the mission in some way, such as if change resistance is present. How might this element help The Nature Conservancy?

It would probably help conservation projects. As good as TNC is, if it knew how the social system it interacts with worked in much more detail, it would be able to spot new ways to better achieve its mission, both short and long term. For example, why is an organization like TNC even required? Why doesn’t the human system automatically conserve enough ecosystems to
protect the species and representative living systems they contain? What if TNC was putting a hefty chunk of its 600 million dollars in income a year toward structural change that made conservation a self-managed part of the human system? That would seem to be a much higher leverage point than the more direct points that TNC has been pushing on, although it has done some indirect work by encouraging laws favorable to conservation.

Because there appears to be a large potential gain if this KPE was performed, and it was not, TNC scores a zero on it.

KPE 10 – Low and high leverage points have been identified and tested

If no social system structural analysis has been performed, then it is impossible to identify the system’s low and high leverage points. TNC scores another zero on this element.

KPE 11 – Why change resistance is successful has been determined

Change resistance is present. People, businesses, and governments do not like to practice ecosystem conservation. TNC and many other organizations have had to wage a long, expensive battle to get as far as they have. Why is such strong change resistance present? If the details of that were known, they would go a long way to helping TNC better achieve its mission.

For complete lack of any serious analysis of why change resistance has been so successful, TNC scores a zero on this element.

Process Maturity Rating

Like all environmental organizations, The Nature Conservancy scores high in the first four key process elements, which are the four steps of Classic Activism. They are classic activists. But to a limited extent because of being process driven, they are also analytical activists, so they do well in the key best practices of Analytical Activism. But then they fall down in the last three key process elements, because they did not take Analytical Activism far enough to incorporate the Problem Domain Key Best Practices. This results in a process maturity rating of 4,489. This is quite good compared to most organizations in the table. It is a medium rating, which explains The Nature Conservancy’s medium mission success.

But it could be so much better, with only a small amount of effort. TNC has already taken the biggest step to process maturity, by becoming formal process driven. This allowed them to score 52 out of 60 points in the Analytical Activism Key Best Practices, which is outstanding. All they have to do is go a little further, by extending their process to the Problem Domain Key Best Practices. These appears to hold the key to achieving their long term mission success.
mean? Questions like these are unanswerable or controversial. As Peter F. Drucker wrote earlier in this chapter:

“One of the most common mistakes is to make the mission statement into a hero sandwich of good intentions. It has to be simple and clear. You can only do so many things.”

The mission statement could be improved by separation of goals from means and a clear statement of its goal. Top goals seldom change. The means to achieve them changes frequently. Until this occurs, the Sierra Club scores a 2 for slightly productive in defining the problem.

KPE 2 – Find the proper practices

Let’s assume the Sierra Club’s goal is helping to achieve global environmental sustainability, at a high level of quality of life. This is the same assumption we’ve been making for all environmental entities, unless they have a different stated goal.

The general proper practices to achieve this goal are already well known, so the Sierra Club need not find them. It can focus on seeing them followed. Thus this KPE does not apply. The Club receives an automatic 3 for this element.

KPE 3 – Tell the people the truth about the problem and the proper practices.

The club scores a perfect 5 for this element. It has done very well in keeping the truth about the problem and the proper practices alive over the decades. Even now, due to its large membership and influence on the press, it continues to do well here.

KPE 4 – If that fails, exhort and inspire the people to support the proper practices.

But KPE 3 has failed to work, so the Club is forced to exhort and inspire the people to support and adopt the proper practices. Nothing else need be tried, because there are no alternatives in Classic Activism when KPE 3 fails. How well has the Club done in exhortation and inspiration?

The Club is world class here and scores a 5. Mixed in with its steady stream of telling the people the truth about the problem and the proper practices is a large dose of exhortation and inspiration. For example, one of its members and long-time directors was Ansel Adams, whose black and white photos of epic natural beauty inspired millions to want to protect what they saw in those images. The Club’s founder, John Muir, left behind voluminous writing that continues to inspire environmentalists a hundred years later, with passages like:

“Nothing can be done well at a speed of forty miles a day. The multitude of mixed, novel impressions rapidly piled on one another make only a dreamy, bewildering, swirling blur, most of which is unrememberable. Far more time should be taken.

“Climb the mountains and get their good tidings. Nature’s peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves.”

Sierra Magazine, the Club’s bimonthly sent to all members and available on countless newsstands, sounds the inspirational call with articles like:

“My Low-Carbon Diet: From gluttony to fuel fitness in three weeks

“Fall Fashion: Photographer Christopher Griffith turns his lens from the latest Parisian styles to the elegance of autumn

And so forth. This is the same approach taken by nearly all environmental NGOs, because they all use the same process: Classic Activism. But the Sierra Club is better at implementing the process than most, because it’s been doing it the longest and has found a formula that draws a large membership year after year.

But once again, even world class inspiration doesn’t matter because it is simply not enough to solve difficult sustainability problems. This KPE has a weight of zero, which says that all the effort the Sierra Club and other organizations put into this area is wasted. Better would be to allocate it to key process elements 5 to 11. The most important of these is:

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

I was privileged to work with the Greater Gwinnett County Group of Georgia in late 2005, in an effort to introduce some of the ideas at Thwink.org to the Sierra Club. What I discovered about the organization’s approach to process was an eye opener.

At the time the Club was engaged in its annual Direction Setting Process. This sets the action areas the organization and its 750,000 members will work on for the next year. If this is well designed, then it’s a process that fits the problem.

Unfortunately, it was not designed well and did not fit the problem at all. Interestingly, the group of seven people I worked with agreed. There was a 100% consensus that what they were being asked to do was not very
productive. But the members of the group pointed out that few others felt that way. They were the “radicals.”

At the group level the process took about two hours. It involved following the instructions in a 20 page document. The general pattern was of two types: One was to brainstorm the factors that might be affecting something, and then vote on which were the most important. The other was to vote on choices offered by the national planning committee. There was great emphasis on everyone having an equal opportunity to speak up and input into the process.

However, there was no emphasis on insuring that those inputting into the process had expertise in the area. There was no emphasis on first studying a subject and then later, after days or weeks of analysis, arriving at a conclusion. Instead, everyone was asked to make snap judgments. And finally, the eight conservation approaches the group was asked to rate in importance was essentially the same as what the Sierra Club had already been doing for the last few decades. There was no option to take an innovative approach.

While this is a defined process, it is the wrong process. Asking thousands of members to vote on what are the critical things an organization should do is like NASA taking a poll of the population to decide how it should build a rocket ship. This is nuts, because difficult problems require highly specialized expertise and long analysis if good decisions are to be made. It appears that the Club is emphasizing democracy and egalitarianism instead of sound decision making.

After the two hour process was over, we sat around and discussed what had happened, where it was weak and where it was strong. Then we discussed the ideas of Thwink.org, and how they seemed to be a much better way of making decisions, because it is an analytical approach instead of an intuitive one. The group decided to submit a long description of this alternative approach with their process results report, which asked for “comments.” But guess what? The long description, in the form of a 30 page document, had no affect whatsoever on Club management. The group never heard from them about it, apparently because all management wanted was the prescribed lists and vote counts.

Now, a year later as I write this, nothing has changed. It’s all still about the same: very democratic instead of very effective. This, I suspect, is a common pattern for grassroots environmental organizations.

The Sierra Club has a defined process to achieve its mission. It does not fit the problem, however. The Club scores only a 1 for very low productivity on this element.

KPE 6 – A true analysis of the problem is performed

There appears to be no sign of this in the Club on the environmental sustainability problem as a whole. Instead, the Club continues to perform nothing but the four steps of Classic Activism.

For example, as I was writing this, I took a quick look at the Club’s “Energy Vision and Policy” action area. Here is how the Club is solving the unsustainable energy problem: (Bolding added)

“It is clear that Sierra Club leaders want to provide America with a vision of an energy future that inspires and that does not consider our current social, political and economic systems as immutable.

“For each of these pathways we will document the degree to which various energy sources, beginning with the most desirable, can be combined to meet America’s economic needs safely, cleanly, fairly, and at affordable prices for everyone. We will lay out the degree to which each of these pathways exacerbates, or minimizes, the risk of global warming and climate collapse. We will also describe the economic, public health, national security, and innovative benefits of Best Practices over Business as Usual, and of America as Leaders over Best Practices. The Board will then choose its preferred roadmap.

“So in October we will begin to train, plan, and design together the regional plans and roadmaps. Each group, chapter, and in some cases region, will be asked to take responsibility for promoting and implementing the Club’s preferred energy demand and supply solutions within their boundaries. These workshops will be the primary mechanism through which the Global Warming and Energy Committee, the Smart Energy Solutions Conservation Initiative Committee and Field Staff will work with grassroots leaders to dovetail our national energy work and vision with their local, state, and regional energy work and vision.” 63

There is no analysis behind this policy decision that examines the problem as a whole and arrives at a solution, one that has been experimentally tested to have a high probability of working. Instead, this is steps 3 and 4 of Classic Activism, promotion and inspiration to adopt the proper practices, or the “best practices” as the Club calls them. But the best practices have been known and promoted for decades, and it has not solved the problem. Is there any reason to believe that trying the same thing
again is going to lead to a different outcome? Isn’t this Einstein’s definition of insanity, which he said was “doing the same thing over and over and expecting different results”?

This is part of the strong belief among classic activists that if we can just tell enough people the truth about the problem and the proper practices they should be following, then sooner or later they will adopt them, because it is in their best interests. But this paradigm fails to consider that there may be strong reasons that certain agents are not adopting the proper practices. It would be much better to direct your analysis and solution efforts there.

Because of no true analysis whatsoever, the Club scores a zero on this key process element.

**KPE 7 – The Scientific Method is used to prove all key assumptions**

The Sierra Club follows the herd here. They do use the Scientific Method at the tactical level, like determining what types of renewable energy are most efficient. But at the strategic level, where the key assumptions lie, there is no conception of the need to confirm those assumptions. Instead, there is simply blind adherence to the belief that the Club knows what its doing, and that it will work, and if it doesn’t, then let’s just try it again next year a little harder and a little better. The Club scores a zero on this element.

**KPE 8 – Learning from past failure and successes is maximized**

The Sierra Club is, in theory, organized like all grassroots organizations. How the Club works in the large is shown in the diagram below:

![Diagram of the Standard Grassroots Organization Work Flow Process](image)

It is the Measurement of Results step that allows an organization to learn from past failures and successes. But examination of the Club shows this is poorly done. For example, in their Direction Setting Process that I observed in late 2005, the first step in the planning cycle was to intuitively list the goals the Club wanted to achieve at the tactical level, such as “Build a New Energy Future.” Then management asked everyone how the Club could achieve them.

But the first question to ask should not be how to achieve future goals, or even what they should be. It should be why have we failed to achieve them in the past? Or if there were some successes, they should be examined for clues to how to replicate that success. But this practice does not exist on anything approaching a formal basis. It is probably there on a very informal basis, so instead of a zero the Club scores a 2 for slightly productive.

**KPEs 9, 10, and 11 – The problem domain key best practices**

There is no sign of any of these in the Club’s process. It receives a zero on all of them.

**Process Maturity Rating**

Despite its stellar history and prominent reputation in the United States, the Sierra Club scores very low in process maturity. The rating is 424 on a scale of zero to 10,000. This explains why the Sierra Club has had little effect on public policy on difficult problems.

The Club would not have to change very much to drastically improve its process maturity. The overall management structure is fine. It is the emphasis on a mature process that actually fits the problem that is missing. My impression of the various documents and work efforts of the Club is that they were committing two of Morgan Jones biggest analytic sins every day. The first occurs when:

“"We commonly begin our analysis of a problem by formulating our conclusions; we thus start at what should be the end of the analytic process.”

The Club commits this analytic sin every time it lists more visions of what the world should do to be sustainable. It needs to realize that lack of these proper practices is a symptom of a deeper fundamental cause. Until that cause is found, the patient is undiagnosed, and no amount of treating the symptoms will work, unless the disease goes away of its own accord. This is not likely to happen here, according to the analysis of the Dueling Loops.

The second analytic sin occurs when:

“"We tend to confuse 'discussing/thinking hard' about a problem with 'analyzing' it, when in fact the two activities are not at all the same. Discussing and thinking hard can be like pedal-
ing an exercise bike: they expend lots of energy and sweat but go nowhere.”

I saw hours and hours of “discussing/thinking hard” in the group I worked with. And I saw thousands more hours on the work that went into documents and decisions on the Club website, including over 5,000 hours on a single study that my own analysis showed was not productive. But when I looked for a real analysis to support any of these decisions, I found nothing.

The Club would do well to learn from the world of for-profit business, where formal process and true analysis is the norm.

The United Nations Environmental Program (UNEP)

By now you may be thoroughly convinced that Classic Activism is the dominant paradigm of environmentalism. But does this hold even at the international level of the United Nations?

It does. Even civilization’s supreme cooperative effort to solve the problem is not immune to the intoxicating appeal of Classic Activism. It’s as if Homo sapiens has tied one hand behind his back and said “I’m totally confident I can solve this problem using the same process I’ve always used. If it doesn’t work, that’s not a sign I did a poor job. It’s a sign it’s a tough problem. Some problems cannot be solved.”

Let’s see if this line of reasoning is true or not.

KPE 1 – Define the problem

The UNEP’s mission is:

“To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.”

This is a vague mission statement. It is more the product of consensus and idealism than one that is so finely focused everyone knows what it means, and progress towards it can be unambiguously measured.

For example, what is leadership? There is no standard definition. Can good leadership be measured? No. Only the outcomes of good leadership can be measured. It is outcomes that must be in an organization’s mission statement. What is partnership? It too is vague and immeasurable.

What if a little bit of leadership and partnership is provided? Has the UNEP fulfilled its mission? This is impossible to say, because the mission statement does not say how much of it must be provided. However, it does imply that enough of it must be provided to see some “caring for the environment.” Well, how much “caring” must be achieved? Again, we have another term that is vague and immeasurable.

Next in the statement is the phrase “inspiring, informing, and enabling.” This is not a goal. It is a means to a goal. But it is a telling phrase, because it reveals the bias toward how the UNEP expects to reach its goal of “caring for the environment.” All this will apparently take is lots of “inspiring, informing, and enabling.” Will this work? That doesn’t matter. As long as the UNEP engages in “inspiring, informing, and enabling” about “caring for the environment” then it has achieved its mission.

Finally, at the tail end of this hero sandwich of good intentions, we come to the phrase “to improve their quality of life without compromising that of future generations.” What does this mean? Isn’t improving quality of life a completely separate issue from taking care of the environment? Is the UNEP also in the business of “enabling nations and peoples to improve their quality of life?” Apparently so. Well, which has more priority: the environment or quality of life? Can this be discerned from the phrase “without compromising that of future generations?” Most seem to think it can, because this is part of the standard definition of sustainable development. But actually it cannot. There is no agreement among economists on this. There is even less among nations. The developed nations seem to think that their quality of life is sacrosanct. Its present level is a rock bottom minimum and cannot be lowered. Meanwhile, the developing nations feel they absolutely must achieve the level of quality of life of the developed nations, and soon. Neither feels that their goal should even consider the quality of life of future generations. If they did, we would see developed countries saying it’s fine for our GDP per capita to fall (because that it the quickest and surest way to reduce negative impact on the environment), and we would see developing countries saying our GDP per capita only needs to grow a little, until we are past the starvation level and have our dignity. Therefore what we have here is an impossible goal: “to improve their quality of life without compromising that of future generations.”

All these glaring weaknesses add up to one thing: a problem definition so vague, immeasurable, and contentious that to a results-oriented manager trying to achieve it, it is worthless. It receives a score of 1 for very low productivity.

The above may sound unfairly harsh. After all, some would say, the UN and the UNEP are doing the
best they can. They are under funded, have few powers of enforcement, and so on.

To which I would reply, that is part of the problem to solve. The UN has a budget of about three billion dollars a year. It should not be hard to realize that environmental sustainability should be the UN’s top priority, because if it is not solved then no other problems will matter—and all other problems will get worse. Where are the leaders with the insight and courage to see this, and steer the UN on a course that does not take the nations of the world over a cliff?

**KPE 2 – Find the proper practices**

Once again, the general proper practices to achieve this goal are already well known, so the UNEP need not find them. It can focus on seeing them followed. Thus this KPE does not apply. The UNEP receives an automatic 3 for this element.

When we say proper practices, we mean the behavior that directly reduces negative environmental impact. Examples are the use of renewable energy, conservation (using less of anything), and population control. Excluded are indirect behaviors like tradable permits and pollution penalties.

In other words, the improper practices are the immediate cause of unsustainability. This causes problem solvers to come to the intuitive snap judgment that the proper practices are the solution. They are not. Following the proper practices is the symptom of a good solution. How do you cause the agents in the system to follow the proper practices as a normal part of their everyday behavior, and not be constantly trying to thwart and circumvent them? The answer is you must make deep fundamental structural changes in the human system. If the changes are not deep, fundamental, and structural, then they will not solve anything but easy problems and the occasional medium difficulty problem.

We must avoid the trap of requiring continual large amounts of effort and expense, which is itself unsustainable. Presently a large amount of effort goes into jawboning, persuading, enticing, cajoling, and using every trick in the book to get agents (people, corporations, and governments) to behave sustainably. But if that effort must be continued forever to cause the solution to work forever, sooner or later those expending the effort will turn their attention to other problems, lose interest, run out of time and money, and so on. This is the very predictable phenomenon that Jay Forrester of MIT cautioned against when he wrote that a viable long term solution must overcome:

"The tendency of a [social] system to resist and counteract an applied force... Compensating counteraction can be disastrous if the applied programs are expensive. Only applied programs of intrinsic low cost are feasible."  

The deep foundational structural changes needed to engineer a sustainable solution of low intrinsic cost are what it takes an analytical approach to discover. They will never be found using Classic Activism, because that paradigm simply does not have the conception that anything more than the proper practices necessary to solve the problem.

**KPE 3 – Tell the people the truth about the problem and the proper practices.**

But the UNEP, like all Classic Activist organizations, does not know this. And so, like soldiers marching in lockstep to the beat of the same dogma, they pursue a “tell the people the truth about the problem and the proper practices” solution strategy. This is so central to the UNEP it is enshrined in their mission statement, which says they will solve the problem “by inspiring, informing, and enabling nations and peoples” to follow the proper practices. Here “enabling” seems to be seen as giving nations the means to follow the proper practices, such as financial aid, education, technology transfer programs, and so on. As far as I can tell it does not have the deeper implication of finding the correct deep foundational structural change that would “enable” agents to naturally and efficiently live sustainably.

So, even though telling the people the truth about the problem and the proper practices is relatively worthless on difficult sustainability problems, the UNEP does it anyhow. And it does it very well, with hundreds of projects and programs over the years. It scores a perfect 5 on this process element.

But it is a pyrrhic 5, because by putting all their eggs in the intuitive basket of Classic Activism, there are none left to put into the analytical basket of Analytical Activism.

**KPE 4 – If that fails, exhort and inspire the people to support the proper practices.**

Actually the UNEP has a few eggs left after telling the people the truth about the problem and the proper practices. Since that doesn’t work on the more difficult problems, it then raises the decibel level of its message and attempts to exhort and inspire the people to support the proper practices. After all, “inspire” is in their mission statement. They must do it.

The UNEP does this reasonably well, by using emotional appealing pictures in its literature, such as the one below:

**65**
Don’t you just cringe at the sight of poor children living in a world of poverty and environmental blight? Such emotional arguments work. Sometimes.

But we are not determining whether exhortation and inspiration work. We are only assessing how well the UNEP has done in trying to make it work. Since better literature exists that is more inspiring, let’s give them only a 4 for highly productive.

But this doesn’t matter in the final process maturity rating, because KPE 4 has a weight of zero. This means that on difficult problem, pictures and verbal appeals like the above have little effect on solving the problem. Why? Because on difficult problems systemic change resistance is present. It cannot be resolved by warm and fuzzy pictures, which tend to not work on the agents in the system who have incentives to make the problem worse. Only by reengineering the system to remove those incentives can difficult complex social system problems be solved. They will not be solved by pictures and appeals like the above.

KPE 5 – Formal definition, management, and continuous improvement of a process that fits the problem

Examination of the UNEP shows that it spends very little time on a process that fits the problem, and lots of time on a process to perform its stated mission. The two are not the same.

The list below is from “About UNEP: The Organization.”}

“How UNEP Works - UNEP has eight divisions to promote and facilitate sound environmental management for sustainable development:
1. Early Warning and Assessment
2. Policy Development and Law
3. Environmental Policy Implementation
4. Technology, Industry and Economics
5. Regional Cooperation
6. Environmental Conventions
7. Communications and Public Information
8. Global Environment Facility Coordination”

Notice the bias in the process towards sustainable development. As we have argued elsewhere, “development” means economic growth, and economic growth that is sustainable is impossible using present technology, or even that available in the next 20 to 50 years. So right away we can see that the process is deeply flawed, because it is designed to achieve an impossible goal.

But that is irrelevant, because sustainable development is an implied solution in the UNEP’s mission statement, and the statement has been approved. It is also an explicit solution supported by their constituents, as seen in this quote from the same publication: “2002: World Summit on Sustainable Development reaffirms UNEP’s central role in international efforts to achieve sustainable development.” (This approval and support was easy, because the majority of members of the United Nations are developing countries, and most of the rest are developed countries whose most important goal is maximum GDP growth.) So how could a process built around encouraging sustainable development possibly be wrong?

A process that fits the sustainability problem must include these seven characteristics:

1. A complex social system problem viewpoint.
2. Change resistance as the crux of the problem.
3. A structural analysis of the problem.
4. Identification of low and high leverage points.
5. The use of the Scientific Method to prove all key assumptions.
6. A formal, written procedure for integrating all of the above into a coherent, efficient and effective process.
7. Continuous improvement of all of the above.

The UNEP does very well in creating and managing a large, typical bureaucracy to achieve its stated mission. But this is not what is needed. The mission is wrong, and needs to be rewritten from scratch, as described earlier. And the present bureaucratic process needs to also be redesigned from scratch to incorporate the above.
seven characteristics. Until then, the UNEP is only capable of achieving the easy parts of its mission.

There is a mindset in large public bureaucracies that all we have to do to achieve our mission is push push push, organize lots of relevant projects and programs, publish lots of slick publications, and lobby others like mad, and that somehow we will achieve our goals. They are addicted to it because it works so well. Sometimes. Then when it fails, do they ask why? No. They, like all classic activists, then proceed to execute the same process harder and somehow better. This is the pattern the UNEP has followed over the years. For example, read any of its annual Global Environmental Outlook books, which run about 400 pages each. Nowhere will you find the above seven characteristics. Instead, you will see nothing but Classic Activism steps 1, 2, 3, and 4.

For a complete lack of any of the signs of a process that fits the problem, in any of its eight divisions, the UNEP scores a zero on this key process element.

KPE 6 – A true analysis of the problem is performed

Recall that the three characteristics of a true analysis are: (1) a structured examination of the system with the problem has been performed, (2) the fundamental flaws causing the problem symptoms have been found, and (3) an exhaustive examination of the full range of solution alternatives to resolve those flaws has been conducted.

There is no hint of any of these on the problem as a whole. The UNEP scores a zero on this element.

KPE 7 – The Scientific Method is used to prove all key assumptions

If your process is so poor or non-existent that you don’t even know what your key assumptions are, then you certainly cannot test them. This is the case for the UNEP, whose process is non-existent. The UNEP scores a zero.

Here are the untested key assumptions (that I am aware of) the UNEP has made on difficult problems like climate change. Each, I strongly suspect, is false:

1. Sustainable development is a good solution.
2. Inspiration and education are a good way to get people and nations to adopt the proper practices.
3. A good definition of sustainability is the standard one from the Brundtland Report. This defined sustainability as sustainable development, and sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

We have already discussed why the first two are fallacious. On the third, here’s what Herman Daly, a widely respected ecological economist, wrote in Beyond Growth: The Economics of Sustainable Development, in 1996:

"Sustainable development is a term that everyone likes, but nobody is sure of what it means. The term rose to the prominence of a mantra—or a shibboleth—following the 1987 publication of the UN sponsored Brundtland Commission report, Our Common Future, which defined the term as development that meets the needs of the present without sacrificing the ability of future generations to meet their own needs.

"While not vacuous by any means, this definition was sufficiently vague to allow for a broad consensus. Probably that was a good political strategy at the time—a consensus on a vague concept was better than disagreement on a sharply defined one. By 1995, however, this initial vagueness is no longer a basis for consensus, but a breeding ground for disagreement. Acceptance of a largely undefined term sets the stage for a situation where whoever can pin his or her definition on the term will automatically win a large political battle for influence over our future."

Which is just what happened. Daly defines sustainable development as "development without growth beyond environmental limits." But economists like him were unable to get others to see things this way. He describes the dire results:

"One way to render any concept innocuous is to expand its meaning to include everything. By 1991 the phrase [sustainable development] had acquired such cachet that everything had to be sustainable, and the relatively clear notion of environmental sustainability of the economic subsystem was buried under 'helpful' extensions such as social sustainability, political sustainability, financial sustainability, cultural sustainability, and on and on. Any definition that excludes nothing is a worthless definition."

Which is why we define sustainability as the ability to continue a defined behavior indefinitely.

For more practical detail, the behavior you wish to continue indefinitely must be defined. For example, environmental sustainability is the ability of the environment to support a defined level of environmental quality and natural resource extraction rates indefinitely. Then there is economic sustainability, which is the
ability of an economy to support a defined level of economic production indefinitely. And we must not forget social sustainability, which is the ability of a social system, such as a country, to function at a defined level of social well being and harmony indefinitely. An alternative definition of sustainability, one that is close to the popular meaning of the word, is environmental, economic, and social sustainability.

There is a bird's nest of interdependencies between these types of sustainability. Social sustainability depends on economic sustainability, and vice versa. Social and economic sustainability depend on environmental sustainability. To a much smaller extent, environmental sustainability depends on economic and social sustainability. But the dominant dependency is that from a system structure viewpoint, the human system is a subsystem of the larger system it lives within: the environment. Therefore, of the three, environmental sustainability must be society's top priority.

However, this priority is anything but clear in the standard Brundtland definition of sustainability.

KPE 8 – Learning from past failure and successes is maximized

The UNEP has many failures and a few successes. It has done well in encouraging nations to create their own environmental agencies. It has played a major role in creation of international environmental treaties. Some of these have solved major global environmental sustainability problems, like the Montreal Protocol. But overall, its failures outweigh its successes by a landslide.

The UNEP is not alone here. Because the UNEP is the world’s leading agency for solving the global environmental sustainability problem, we will take some time to examine its lack of success and what can be learned. We start with a description of the UNEP’s problems:

"Many of UNEP's problems go back to the run up to the 1992 Earth Summit, when its role was never properly clarified. The result was a mess, nay a compounded mess. By 1992 a number of Multilateral Environmental Agreements (MEAs) had been established with their own secretariats and Conferences of the Parties (COPs) based in various capitals. Their allegiance to the small catalytic agency that had parented many of them was unclear. Then at Rio the governments agreed to a climate convention, a biodiversity convention and eventually a desertification convention, all with their own secretariats - and that the Global Environment Facility should help with finance. Again the relationships were not clear. To compound the difficulties, the Commission on Sustainable Development (CSD) was created with a small secretariat in New York, to follow up on the Earth Summit and report (along with UNEP) to the United Nations Economic and Social Council (ECOSOC). It might have worked if all these bodies had been sited in Nairobi, Geneva or New York - but not when they were scattered across three continents.

“So what was UNEP to be for? In the past, it had had a patchy record. On the plus side it had spawned many of the key environmental conventions, a number of useful regional processes and an arm in Paris that was setting about reforming industry. But it had failed to inspire in its central task of monitoring and evaluating environmental trends, and it was constantly hamstrung in advancing capacity building - a vital ingredient of national and regional progress. Discontent among governments had reduced the annual budget to below $50 million a year; too little to count and far less than the amount spent by many an environmental non-governmental organization (NGO). It all got to crisis proportions by late 1996/early 1997, when some donor countries froze their contributions. Something had to change."

The reaction of the UN was to create “The UN Task Force on Environment and Human Settlements” as part of “a program for reform.” The purpose of the task force was “to review the whole operation for the environment in the United Nations.” But the task force was biased from the start, because: (Italics added)

"The report of the UN Task Force on Environment and Human Settlements is an attempt at addressing the commonly held conviction that the institutional fragmentation and lack of policy coherence over the last twenty years had resulted in a loss of effectiveness in the work of the UN in the area of the environment and human settlements.”

So rather than a complete review and overhaul of the UNEP, the task force focused on fixing the problems of “institutional fragmentation and lack of policy coherence” and ignored everything else. This commits one of Morgan Jones’ analytic sins (see page 91):

“"We commonly begin our analysis of a problem by formulating our conclusions; we thus start at what should be the end of the analytic process.”
Sure enough, this first attempt at reform failed. The second try turned out this way:

“The first session of the Global Ministerial Environment Forum (GMEF), held in Malmö (Sweden) in May 2000, was the scene of protracted negotiations on global environmental issues and the need for a reformed structure of international environmental governance. The session adopted, as its main outcome, the ‘Malmö Ministerial Declaration’ which is regarded a significant milestone in the evolution of international environmental governance. The Declaration stated that ‘the 2002 Conference (the World Summit on Sustainable Development) should review the requirements for a greatly strengthened institutional structure for international environmental governance based on an assessment of future needs for an institutional architecture that has the capacity to effectively address wide-ranging environmental threats in a globalising world.’ It added that ‘UNEP’s role in this regard should be strengthened and its financial base broadened and made more predictable.’

“The outcome of the intergovernmental group was ... the Cartagena Package, which [contained these priorities]:
1. strengthening UNEP’s role, authority and financial situation;
2. addressing universal membership of the Governing Council;
3. strengthening UNEP’s science base;
4. improving coordination and coherence between multilateral environmental agreements (MEAs);
5. supporting capacity building, technology transfer and country-level coordination; and
6. enhancing coordination across the UN system, as well as the role of UNEP’s Environment Management Group.”

The second reform also failed. This time the reasons were more subtle. The UN, like all large institutions, sees itself as a large institution whose chief challenge is efficient throughput. When decisions are made by UN members, the decisions need to be efficiently implemented by its agencies, such as the UNEP. The above priorities focus on efficient throughput, so there is no focus on the quality of decisions that are being implemented. It is a garbage in, garbage out agency. That is, bad treaties or no treaties (MEAs) equal bad results.

Better would be to do the same thing science and business does: Set an objective, design a process to achieve it, and execute the process, while continually improving the process. But the UNEP has no conception of an approach like this. Instead, they see their objective as supporting treaty building and implementation with the above activity areas. The UNEP does not see itself as a problem solving agency, but as a bureaucratic support and implementation body.

Note the three time use of the phrase “international environmental governance.” This in itself is solution bias. It implies that a strong, international governance mechanism is mandatory. But is a strong, international governance mechanism required for democracy, or private property rights, or corporations, or literacy, and so on? No. Each of these system behaviors is self-managing. None require any special strong central governance mechanism, beyond the normal need for standard auxiliary systems like the judicial, legislative, and executive branches of government, because they are so well designed they govern themselves.

Self-management occurs when a subsystem runs itself without continual outside guidance. Examples in the human body are the way each cell runs itself, the way the autonomic nervous system runs independently of the need for conscious control, and the homeostasis of organs. Self-management of subsystems is the only way large complex systems can be constructed. If central management of subsystems is used, this puts a ceiling on total system complexity, above which the system cannot go.

Thus when the UN takes the perspective that “international environmental governance” is required to solve the environmental sustainability problem, it is ignoring the proven fact that large complex systems, such as global civilization, cannot be built without a very high degree of self-management of subsystems. Sustainability is one such subsystem. If it is not engineered to be self-managing it will fail.

As indeed it has under the approach the UN has taken. The first reform was tried in 1998. It failed. The second reform, using the above six points, was tried in 2002. It also failed. Now, in 2006 there is another wave of reform being called for, under the “improved” moniker of “global environmental governance.” One example is Global Environmental Governance: Mapping a Reform Agenda, 2006, 124 pages, by the International Institute for Sustainable Development. The Introduction opens with: (Italics added to all the quotes from this source)

“We understand global environmental governance (GEG) as the sum of organizations, policy instruments, financing mechanisms, rules, procedures and norms that regulate the processes of global environmental protection.”
Part 2. First Things First: Solving the Transformation Problem

This definition of Global Environmental Governance is a nice start. But “regulate the processes” already has a slight regulatory, command and control bias. Let’s see how this played out in the rest of the book. The Introduction continues with:

“Even though the GEG system has achieved much in the way of new treaties, more money and a more participatory and active system than anyone might have imagined three decades ago, environmental degradation continues. … Given increasing evidence of environmental degradation, the system needs reform urgently. However, it should be noted that the system needs reform not because it has “failed,” but because it has outgrown its own original design.”

The final chapter on Elements of a Reform Agenda concludes that: (Bolding is in the original)

“There does seem to be an unstated but robust consensus on what should be the central goals of the GEG system. Five goals, in particular, stand out as being particularly important and command broad-based support:

“Goal #1. Leadership. The GEG system should grasp the attention and visible support of high-profile political leaders. The key institutions within the system should be managed by leaders of the highest professional calibre and international repute; all working together towards the best interests of the GEG system as a whole.

“Goal #2. Knowledge. Science should be the authoritative basis of sound environmental policy. The GEG system should be seen as a knowledge-based and knowledge-producing system.

“Goal #3. Coherence. GEG should operate as a coherent ‘system’ with reasonable coordination, regular communication and a shared sense of direction among its various elements.

“Goal #4. Performance. The institutions that make up the GEG system should be well-managed; they should have the resources they need and should use these resources efficiently; and they should be effective in implementation. The ultimate purpose of the GEG system is to improve the global environmental condition.

“Goal #5. Mainstreaming. The GEG system should seek to incorporate environmental concerns and actions within other areas of international policy and action, and particularly so in the context of sustainable development.

“We believe that these goals can be the basis of a shared global vision for the global environmental governance system.”

Notice the consensus on reform does not touch on quality of input or decision making at the strategic level. Instead, it continues to focus on institutional efficiency, which is how well an institution does what it is told. It is international treaties that “tell” the UNEP what to do, so following the paradigm of Global Environmental Governance, all it can do is the above five things.

This is not true reform. It is doing the wrong things better. The right thing would be to take an analytical approach and engineer a self-managing subsystem that causes the human system to behave sustainably. Such an approach would not require any mega-agencies. Do we have a United Nations Democracy Program? Or a United Nations Honesty Program? Or a program for thousands of other subsystems? Absolutely not, because these system behaviors will not work on a large scale unless they are self-managing. Each of them evolved over a long period of time. Our challenge now is to engineer the accelerated evolution of the environmental sustainability subsystem, so that it can perform its role in time to solve the problem, and then continue to perform that role indefinitely.

The UN, the UNEP, and most environmental organizations and scholars are not thinking in this new paradigm, which is based on Analytical Activism. They are trapped in the old one of Classic Activism, which has no analysis step and no selection of a process that fits the problem step. The result is a well-intentioned but grossly misguided consensus on Global Environmental Governance as the solution.

But this is basically a command and control approach, using more and more and more treaties and enforcement mechanisms. It is not working. For example, in the climate change problem the sustainability subsystem is not self-managing. The dominant system agent, the modern corporation, has caused so much resistance to doing anything seriously constructive about solving the problem that the UNEP has no effective treaties to manage. The US is not on board. Neither is China and India. Europe, with Japan, stands mostly alone in support. Where is the analysis of the complete problem from a system structure perspective? Where is the identification of the low leverage points that the UN and the UNEP have been pushing on for so long, with poor results? Where is the identification of the high leverage point they need to push on to create a self-managing environmental sustainability subsystem? Where is the focus on change resistance as the crux of the problem? They are nowhere to be found. Nor is there a trend to find them.
The UN and the UNEP have failed to learn from past failures. The three waves of reform briefly described above show how there is commendable effort to try to learn from experience, but little successful learning. Thus the UNEP scores a 2 for low productivity in key process element 8: learning from past failures and successes is maximized.

This score does not apply just to the UNEP. It applies to the whole world.

There is another way to look very quickly at this KPE. Due to no true analysis, the UNEP is entirely dependent on a black box model of what would solve the problem. But black box models are so poor in helping to understand the behavior of complex social systems that they cannot be used much at all to learn from experience. Where are you going to put what you have learned? You can’t put it into the model, because there is none. How are you going to analyze a detailed cause and effect factor if you have no detailed cause and effect model? You can’t. Therefore, because they have no glass box model, the best the UNEP can possibly do in learning from experience is low productivity.

KPEs 9, 10, and 11 – The problem domain key best practices

There is not the slightest conception of these three elements in the UNEP’s work, at the level of the complete problem. The UNEP scores a zero in all of them.

Process Maturity Rating

Due to medium scores in Classic Activism and low scores in everything else, the UNEP receives a process maturity rating of 169 on a scale of zero to 10,000. The UNEP is the world’s leading combined effort to solve the global environmental sustainability problem, so this is cause for alarm. We conclude that civilization’s process maturity is far too low to solve the problem.

Could true reform based on the concepts of Analytical Activism turn the UNEP into a totally transformed organization, one now capable of solving the global problem? This is the right question, because it is the only path forward that offers a defensible, rational method of solving such a difficult problem.

Personally I doubt this can be done. The UNEP is a product of its parent, the United Nations. This organization manages by consensus on everything but the most urgent security related concerns, which are settled by the Security Council. But the US and China, both permanent members of the Security Council and the two most influential countries in the world, are against solving the problem. In addition, most members of the UN are poor or developing. They thus have a strong bias toward making solving their problems of poverty and economic growth a much higher priority than environmental sustainability. The net result is the UN is inherently incapable of giving the environmental sustainability problem the priority it needs to be solved in time.

This does not mean the problem cannot be solved by other organizations, however, particularly since no central Global Environmental Governance is required. Thus it is probably other environmental entities with already relatively high process maturity, like the EU Environmental DG and The Nature Conservancy, who will lead the way to a solution that finally works.

* * *

By now two patterns should be clear: Process maturity is low unless the organization is driven by a process that fits their mission or change resistance is low. The higher the process maturity, the higher the mission success. We have seen this pattern in small, medium, and large organizations. It continues in the rest of the process maturity table. Therefore, to reduce the size of this chapter, the remaining assessments will be more compressed.
and sustainable manner. We strive for a future that is free from the threats of global warming and nuclear war, and a planet that supports a rich diversity of life.”

Ensuring that all people have energy, transportation, and food, and are free from the threat of nuclear war are not environmental issues. They are social issues. This includes solving the global poverty problem, because poor people do not have the food they need. Is this what the Union of Concerned Scientists is really trying to solve? Not according to the first sentence of their mission statement, which is contradicted by the second and third sentences. This introduces ambiguity. Which has the greater priority, environmental sustainability or social issues? Furthermore, what are “practical environmental solutions”? That is too vague to be of any real value. Finally, what if someone doesn’t want to work or is undereducated? Is the USC going to provide them with energy, transportation, and food anyhow? The UCS scores a 2 on KPE 1, identify the problem, for such a poorly focused problem definition.

But because they are such good classic activists, the UCS does better in the next three KPEs. The UCS scores a perfect 5 on KPE 2 and 3, find the proper practices and tell people the truth about the problem and the proper practices. They have done quite well here. On KPE 4, exhortation and inspiration to get people to support the proper practices, they score only a 3, because their literature is not that strident. It is factual and appeals more to the intellect than emotion.

But the use of an intuitive, informal process on solving the complete sustainability problem causes the UCS to score low in all the rest of the key process elements. This is surprising, given that the rest of the mission statement is: (Italics added)

“Sound science guides our efforts to secure changes in government policy, corporate practices and consumer choices that will protect and improve the health of our environment globally, nationally and in communities throughout the United States. In short, UCS seeks a great change in humanity’s stewardship of the earth.”

This illustrates a key point that those laboring under the paradigm of Classic Activism may find hard to see: Sound science in finding and promoting the proper practices to live sustainably is not the same as using sound science to solve the complete problem. This is because the complete problem must include the three subproblems identified by the System Improvement Process as present in all difficult complex social system problems. The three subproblems are:

1. Overcoming change resistance.
2. Moving from the present to the goal state.
3. Staying in the goal state indefinitely.

Classic activists see only subproblem two. Because they cannot see that subproblem one must be solved first, their efforts fail repeatedly. This causes them to try KPEs 2, 3, and 4 again and somehow better so that they succeed. But they never will, until the change resistance subproblem is solved.

In addition, it is not sound science to use an informal process on a difficult problem. Only a defined, formal process can solve difficult problems, such as the way science approaches its problems with iterative experimentation, and the way business uses planning and review cycles combined with accounting. Nowhere on UCS’s website could I find anything even approximating a formal process, much less one that fits the problem, so the UCS scores a zero for KPE 5, the formal definition, management, and continuous improvement of a process that fits the problem.

Because of no awareness of the complete problem, it cannot be analyzed. The UCS scores a zero for KPE 6, a true analysis of the problem is performed. This is ironic because MIT is where system dynamics was invented, by Professor Jay Forrester in the 1950s and 60s. MIT is also where Dennis Meadows, the very capable manager of the Limits to Growth project, came from.

MIT has the strongest system dynamics program in the world. UCS’s national headquarters and MIT are both located in Cambridge, Massachusetts, US. We can only wonder what might happen if the UCS someday applied system dynamics to the complete problem. They might produce the best analysis in the world.

Next comes KPE 7, the Scientific Method is used to prove all key assumptions. The key assumptions of any work effort are always at the strategic level. If top strategy is correct, the tactics needed to execute it tend to be relatively easy. Conversely, the best tactics cannot save bad strategy.

The UCS has done well in using the Scientific Method to prove that various proper practices will work. But it is relying on the key assumption is that all it takes to move the system to the goal state of sustainability is to directly promote those practices via a vast variety of methods. This assumption is false. Until change resistance is overcome, the humans system will continue to reject adopting the proper practices, no matter how well they are presented, and no matter how high the decibel level is on exhortation and inspiration. This pattern of system behavior has become clear over the last several decades of strong, systemic change resistance.
In other words the UCS is solving the wrong problem. It needs to focus on solving the change resistance problem, not the moving from the present to the goal state problem. Once change resistance is overcome, the system will rapidly move to the goal state on its own accord, because the system’s dominant agents will now want to solve the problem as fast and as well as they can. Using existing technology, conservation, and sound population control, most of the sustainability problem can already be solved. The rest will come quite easily, because the system will be eager to discover the rest of the practices needed to go the last mile. For these reasons the UCS scores a zero on this KPE.

Next is KPE 8, learning from past failures and successes is maximized. It is at the strategic level that this applies. Again, the UCS has not done well here, due to lack of a process that fits the complete problem. This may be seen in:

**A Tale of Two Histories**

“It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair…” So begins Charles Dickens’ *A Tale of Two Cities.*

The *Death of Environmentalism* memo of 2004, as presented in chapter one, confirmed that the winter of despair has descended on the entire environmental movement. To see why, all we have to do is compare the Union of Concerned Scientist’s history to that of The Nature Conservancy. Today is the best of times and the season of Light for The Nature Conservancy, because they eventually became driven by a process that fit the problem. But it is the worst of times and the season of Darkness for the UCS and nearly all other environmental organizations, because they never have.

The Nature Conservancy’s history began in 1915, when The Ecological Society of America was founded. In 1946 a small group of scientists left to form the Ecologists Union, resolving to take “direct action” to save threatened areas. In 1950 they changed their name to The Nature Conservancy, which began life as a typical classic activist organization.

So did the Union of Concerned Scientists. “UCS was born in 1969 out of a movement at the Massachusetts Institute of Technology, where an ad hoc group of faculty and students joined together to protest the misuse of science and technology. They put forth a Faculty Statement—the genesis of UCS—calling for greater emphasis on the application of scientific research to environmental and social problems, rather than military programs.” That same year the UCS took its first direct action when it issued its first report criticizing President Nixon’s proposed Safeguard antiballistic missile system.

The USC has stayed firmly on the path of Classic Activism ever since. Its highly technical analyses and reports set it apart from other environmental NGOs, and it has had significant impact on US government policy. The UCS also has an ace up its sleeve, and has played it often. Being scientists themselves and remaining well connected to the scientific community, over the decades they turned out a string of statements signed by large numbers of highly respected, well known scientists. In 1977 an astounding 12,000 scientists signed the USC sponsored “Scientists’ Declaration on the Nuclear Arms Race. Additional signed statements occurred in 1985 on the testing and deployment of weapons in space, on climate change in 1990, on environmental sustainability in 1992, and again on climate change in 1997.

These statements are forms of Classic Activism steps 3 and 4: promote the truth about the problem and exhort and inspire the people to take action. The best scientists in the world should certainly know the truth. Their massed signatures should certainly exhort and inspire leaders to take action. And they did. But it was not enough to solve any significant environmental problem, with one exception: a nuclear war never occurred.

Meanwhile The Nature Conservancy’s history encountered a fork in the road, one that 40 years later led
to their embracing being process driven. In 1955, thinking hard about how to best finance a conservation purchase, the Conservancy invented a new tool: the revolving loan fund. A 60 acre tract along the Manus River Gorge was financed by the Conservancy with $7,500, on the condition that the loan be repaid for use in other conservation efforts. The revolving loan fund became the Land Preservation Fund. Today it is the Conservancy’s “foremost conservation tool.”

This innovation is a process mechanism, though it was not called that at the time. The pattern of creating process innovations took hold rapidly, because they were so productive. In 1961 the Conservancy embarked on its first partnership with a public agency: the Bureau of Land Management, in order to co-manage an important old-growth forest. That same year another process improvement occurred, when the Conservancy received its first donated conservation easement on 6 acres of salt marsh. The easement was a win-win. The property owner retained full rights to everything of importance to them. And the Conservancy gained the right to enforce restrictions on certain types of ecologically harmful activities—forever. Then in 1966 the Conservancy purchased a tract as part of a plan to later sell it to the US government. This was their first “government co-op” transaction.

At this point the Conservancy had not yet adopted a formal mission achievement process. But it was intuitively sensing that it needed to improve the way it methodically did its work. One way was the series of innovations for protecting land, as illustrated by those mentioned above in 1955, 1961, and 1966. But this was not enough and the Conservancy knew it. So in the early 1970s a biological inventory of the US was created, to improve the scientific prioritization of land acquisition. This soon became the Natural Heritage Network, covering all 50 states with the sophisticated databases containing the most complete information on the location of species and ecosystems in the US. It was so good it became the US national standard in 1974.

Meanwhile the Union of Concerned Scientists was struggling along with direct action on a case by case basis, with no string of process innovations to improve their efficiency. It continued its technical analyses and reports on dire issues as they arose. In 1979 the UCS called for shutdown of the Three Mile Island reactors and 15 other nuclear power plants, on the grounds that the Nuclear Regulatory Commission had grossly understated the likelihood of an accident. Nothing happened. Two months later, the USC was vindicated by the near meltdown of Three Mile Island Unit Two.

Note the sharp difference between the Conservancy and the UCS. At first the Conservancy did what all classic activist organizations do: it pushed hard on particular issues as they arose, plus a steady background stream of general education. But after 1955 the Conservancy’s main accomplishments became process innovations that led to fundamental system changes. By contrast, the UCS’s history of accomplishments never evolved past individual efforts to resolve particular issues and general education. What is really happening is that:

The Conservancy is changing the system, while the UCS is treating the same symptoms over and over.

This is the crucial point of the tale of two histories. It explains why over its life cycle the Conservancy evolved into an organization that today is living in the best of times, while the UCS, along with almost all other environmental NGOs and governmental organizations, is living in the worst of times. The UCS never evolved into a higher life form, because it remained stuck where it started: a classic activist organization, through and through.

Because the Conservancy was gravitating more and more towards changing the system and process innovations, in 1995 it made the ultimate leap: it formalized a process for achieving its mission. This was:

“Conservation by Design, a cutting-edge eco-regional approach for setting conservation priorities and taking action. Drawing on the lessons learned through the Last Great Places initiative and guided by scientific data from the Natural Heritage Network, the Conservancy began to employ this framework for identifying the suite of sites that must be protected to conserve the biological diversity of the Western Hemisphere.”

At this point the Conservancy’s productivity jumped by an order of magnitude. In 1999 its membership passed one million. In 2000 the Conservancy began a drive to raise an ambitious one billion dollars for The Campaign for Conservation. By now the organization was so efficient that by the end of 2003 the campaign had raised 1.4 billion dollars.

And on the story goes, all the way up to September of 2006, when I was writing these words. Today the Conservancy is a giant of environmentalism. It has protected over 117 million acres of land, which is more than most governments have. Its process innovations have been so effective that:

“The Nature Conservancy has been invited to help guide a nationwide assessment of China’s conservation priorities based on our conservation work in northwest Yunnan Prov-
inence and the success of our partnership with the Chinese Government. This Conservation Blueprint will consist of a comprehensive, scientific map of the country’s important biodiversity, along with a plan to redesign and expand China’s nature reserve system—giving us the tools to protect the country’s natural treasures for future generations.

“As technical advisors to this ambitious project, the Conservancy is using their science-based methodology, Conservation by Design, in collaboration with Chinese Partners to develop extensive databases for assessing and monitoring the biodiversity of China, and outline a set of conservation priorities, and associated strategies for conserving the biodiversity in all of China.”

The scope of the Conservancy has become international. With income of about 900 million dollars per year, it is now so large and successful that it has become a quasi government agency that partners around the world are eager to work with. *All because of one little thing: it is driven by a process that fits the problem.*

But not so with the Union of Concerned Scientists. Today it is but a bit player in the field, with a staff of 86 and income of about 11 million dollars per year, compared to the Conservancy’s staff of 3,200 and income of about 900 million dollars per year. The UCS’s mission of achieving “practical environmental solutions,” which I assume means environmental sustainability, has not been achieved. Why? Because unlike the other organization in our tale of two histories, the UCS never adopted a process that fit the problem. Instead, it continued to try the same failure prone strategies again and again, with no significant learning from experience at the mission achievement level. Its best work appears to have occurred long ago when it helped avoid nuclear war. It thus scores a one on KPE 8, learning from the failures and successes of its own history.

**Union of Concerned Scientists, Continued**

We only have a little left to complete our assessment of the Union of Concerned Scientists. On KPEs 9, 10, and 11, they score all zeros, because without a process that fits the problem they cannot possibly address these key process elements.

This gives the UCS a process maturity rating of 196 on a scale of zero to 10,000, which is very low. They scored well on Classic Activism process elements. This explains their success in solving problems that have low change resistance and do not require a process that fits the problem. But they scored low in everything else, which explains why they have won a few skirmishes but lost the war. Until the UCS does what The Nature Conservancy did in 1995, and adopts a formal process that fits their mission perfectly and drives the entire organization, they will remain unable to breakout of the pack.

There are some clues in the UCS’s history on how they could do that. They have a consistent streak of highly scientific reports presenting convincing arguments on what the proper practices to follow are on a particular issue. For example in 2000:

“**UCS’s Countermeasures report, which demonstrated that the proposed national missile defense system could be defeated by missiles equipped with simple countermeasures, convinces President Clinton not to deploy the system.**”

This is a great success. But avoiding nuclear contamination of the environment solves only part of the overall environmental sustainability problem. What might happen if the UCS applied its scientist’s formidable analytical skills to diagnosing why the UCS and the entire environmental movement has failed for over thirty years to achieve its mission? Then we might see the following milestones in its timeline of history:

“2007 – The USC takes the lead in working with other prominent environmental organizations and MIT to found the **Institute for Advanced Human System Analysis**. Its mission statement is ‘to provide decision makers with analysis models of why the human system works the way it does in key areas of concern, using the most efficient and effective methods available.’”

“2008 – USC perfects and adopts the **Human System Engineering Process (HSEP)**, a sophisticated process for solving human system problems in what it now widely perceived as the most efficient way known to science. Working with a coalition of organizations, universities, the Institute for Advanced Study, and the Institute for Advanced Human System Analysis, the first large-scale application of HSEP leads to election of top politicians in key countries, including the US, Australia, Canada, and Europe, who recognize the extreme priority the global environmental sustainability problem deserves, and a model legislative bill that reengineers parts of the government of these countries. Once the bills pass, the legislative and executive branches of these countries, like the UCS, become driven by the Human System Engineering Process on a self-managing, self-improving basis that works so well that the big-
gest surprise of the UCS’s history occurs. Its job is done. Its mission, like that of most environmental activist organization around the planet, is now largely completed. Realizing this, the USC begins to revise its mission to select another area of the human system to help improve.”

Such is the power of engineering in the hands of the masters….

World Resources Institute (WRI)

WRI’s mission is “to move human society to live in ways that protect Earth’s capacity to provide for the needs of current and future generations.” This is noble but unclear. What are these needs? What do you do if one influential group feels their needs are more than you suspect they really should be? Who decides what the needs should be? What does “protect” mean? And so on. WRI scores a 2 for low productivity on KPE 1, define the problem.

This mission statement is derived from the Brundtland Report’s definition of sustainable development. Better would be to acknowledge that definition is hopelessly flawed. As Herman Daly wrote, “Sustainable development is a term that everyone likes, but nobody is sure of what it means.” Please refer back to the assessment of the UNEP on page 131 for a discussion of why this definition is flawed.

WRI’s 2005 Annual Report says:

“We don’t believe that what is happening is either sustainable, or inevitable. To the contrary, we are moved by a passionate conviction that change is possible, knowledge is powerful, and people can make a difference.”

While I have the greatest admiration for the people at WRI, this is the gospel of Classic Activism. Classic activists believe that people can make a difference. All activists have to do is find the right proper practices and promote them, because knowledge is powerful. That will somehow lead to solution of society’s problems, because change is possible. It is a simple and appealing activist process. 74

WRI executes the process so well that we must give them a perfect 5 in steps 2, 3, and 4 of Classic Activism. They have made significant inroads in helping to solve the environmental sustainability problem.

Furthermore, as of late 2006 change resistance is decreasing due to the recent accumulation of more shocking proof that climate change is already underway, in larger amounts than expected. It is possible that the human system is approaching a tipping point, and governments will soon join environmentalists in trying to solve the problem.

But that’s the way it’s been for decades. There has long been irrefutable proof that the world needs to drastically change course now to avoid catastrophe later. This has long been true even on the climate change problem. The only thing that has changed is we now have more proof. More proof will cause more agents to want to live sustainably. But as long as the system’s dominant agent, for-profit corporations, has the fundamental incentive of maximizing the net present value of their competitive advantage, the inherent tendency of the present human system will be to behave unsustainably. Large amounts of force to make the system behave sustainably, such as that exerted by WRI and many other organizations, will have some effect. But it will not be enough.

Let’s assess how well the World Resources Institute has done on the most important KPE of them all: number 5, the formal definition, management, and continuous improvement of a process that fits the problem. WRI is evolving towards this. Their 2005 Annual Report says:

“Virtually everything that we do includes four elements:

1. Analytical excellence – Our reputation is built on the quality and impact of our analytical work;
2. Practical solutions – We provide realistic ideas to remove obstacles and creative incentives for more efficient and less destructive practices;
3. Partnerships – We work with more than 300 partners in 80 countries including companies, NGOs, and governments;
4. Ideas into action – We build those partnerships to achieve outcomes on the ground.”

These four areas of work are WRI’s current de facto process. But compare it to The Nature Conservancy’s Conservation by Design process or the System Improvement Process. Both of these are a formal, well designed process that fits the problem. WRI is getting closer to this, but it is not quite there.

Element 1, analytical excellence, is nowhere applied to the complete problem. Instead it is applied to many subproblems, like what are the proper practices for reducing greenhouse gas emissions or technology transfer to developing countries. WRI demonstrates analytical
Chapter 8. An Assessment of Process Maturity

excellence here. But since its process is not looking at the complete *problematique*, it misses the fact that proper practices like these are not the crux of the problem—systemic change resistance is. WRI’s process also misses the model drift part of the problem: Why has the model that civilization is using to run itself been unable to self-correct and adjust itself to the discovery that civilization must live within the limits imposed by the biosphere?

Because WRI’s process lacks these concepts, the process is unable to lead WRI to a full and correct analysis of the total problem. This forces WRI to resort to intuitive leaps as to what will most likely work. The result is a flurry of educated guesses, as can be seen in pages 16 and 17 of their 2005 Annual Report. This lists “WRI Projects at a Glance.” It contains 35 projects organized into four groups. These are Government and Access, Climate and Energy, Markets and Enterprise, and People and Ecosystem.

But where is the most important project of them all? *Where is the establishment of a project to diagnose the root causes of why the human system is living unsustainably?* Without a correct diagnosis, WRI can only guess at what the proper treatment should be. As a result, there will be a natural tendency to treat the symptoms and not the underlying cause. For example, the first project is:

“The Access Initiative: A global coalition of civil society groups, convened by WRI, working to promote national-level implementation of access to information, participation, and justice in decisions affecting the environment.”

But isn’t lack of “information, participation, and justice in decisions affecting the environment” a symptom of a deeper issue? What is it in the human system that is causing poor decisions affecting the environment? My own work argues that the root causes of poor decisions like these are manifold. They include a dominant race to the bottom in The Dueling Loops of the Political Powerplace and the lack of the proper reinforcing feedback loops to allow quality of group decision making. This is the diagnosis. This is the root cause of the symptoms of unsustainability. Until WRI focuses its work on treating the underlying causes instead of the symptoms, its efforts will be mostly in vain, and will require huge, prolonged investments to make small amounts of progress, because it is pushing on intuitively attractive low leverage points.

Let’s examine the second element of WRI’s process. This is “*Practical solutions* — We provide realistic ideas to remove obstacles and creative incentives for more efficient and less destructive practices.”

There is some good intuition here. It would help to remove the obstacles and create the right incentives for agents in the system to behave sustainably. But when we examine how WRI has gone about doing this, we do not see a high level of structural thinking. Nowhere is there a structural analysis of the social system to identify the obstacles and wrong incentives that are driving independent intelligent social agents, like for-profit corporations, politicians, and governments, to unsustainable behavior.

Instead, all we see is a flock of intuitive solutions: 35 of them to be exact. There is no evidence that any of these are the result of a structural analysis of the system. Therefore they can only be intuitive hunches based on years of experience. This will lead to the occasional breakthrough. But the history of science and medicine has shown that unless you have a model of explanation that explains the fundamental reason the problem you want to solve exists, you will stumble around in the dark for a long time or forever. This is where science and medicine were before they adopted a process that fit their problems. For science it was the Scientific Method. For medicine it was a more complex process, one that depended on a model of how the human body operated, the theory of disease, the experimental results of thousands of different treatments, and so on. Nevertheless, it was a defined, repeatable process, one that could be taught to each new generation of medical problem solvers, or doctors as they are more commonly called.

Now we can see that steps 3 and 4 of WRI’s process are irrelevant. They are implementation oriented. *Without a process that fits the problem and a correct analysis that diagnosis the fundamental causes of the problem and finds the high leverage points needed to treat the problem, implementation will never succeed, because there is no correct solution to implement*. Partnerships can be useful in process development and true analysis. But that is not what WRI’s partnerships do. They are efforts to perform steps 2, 3, and 4 of Classic Activism, over and over, until that somehow solves the problem.

The World Resources Institute appears to be sitting on the cusp of change. Buried in the 2005 Annual Report, on the page on Our Values, are the statements that:

“We encourage examination of our methods, analyses, and conclusions” and “We nurture and reward new ideas and excellence in pursuing them” and best of all “We reinvigorate our own ideas and approaches through continuous learning.”

Furthermore, looking at the annual reports for 2001 through 2005, there is a clear recent trend to perfect a problems solving process that works, though the word
“process” has not yet been used to describe this trend. Instead, in the 2005 report we see “virtually everything we do includes [these] four elements.”

The evolution of process in the reports shows how WRI is essentially reinventing the concept of a process that fits the problem. Page 2 the 2002 report states WRI’s mission, which is the same as it is today. Then, under Ideas for Action it has three categories: Problem, Goals, and Strategy. This is a very simple intuitive, informal process. You state your mission. Then you describe the problem you are trying to solve in some detail. Then you intuitively pick some goals, that if reached would solve the problem. Then you develop a strategy to meet the goals. But this is all so informal, and so lacking in the analytical rigor that a formal process would provide, that the results are too loose and vague to be productive. For example, the Strategy is this:

“In pursuit of these goals, WRI focuses on the following areas: the global environment, where the cumulative weight of human activities is undermining the integrity of the environmental systems that sustain us; developing countries, where environmental deterioration is dimming development prospects and swelling the ranks of the poor; and industrialized countries, particularly the United States, which are consuming natural resources at an unsustainable pace and have enormous impact on the global environment and on economic opportunities in developing countries.”

This so called strategy contains not the slightest sign of a bona fide plan that will work. It is more of a promise to work real hard in the three italicized areas and hope something happens.

WRI must have recognized this, because in the next annual report, for 2003, the Strategy paragraph was thrown out and replaced with How We Work. This is the birth of process awareness. The actual “process” word has not yet appeared, but the intuitive realization that it is needed is apparent, because “How We Work” is the same as “the process we use to achieve our mission.” How We Work says that:

“WRI’s strength is our ability to catalyze permanent change through partnerships that implement innovative, incentive-based solutions that are founded upon hard, objective data. And we know that harnessing the power of markets will ensure real, not cosmetic change. Therefore, WRI’s strategy rests on three pillars:

“Research. WRI provides the scientific and analytical underpinning so necessary to move people and their institutions, both public and private, to the difficult decisions that lead to change.

“Partners. WRI works closely with governments, the private sector, and civil society groups around the world to enhance our collective ability to catalyze permanent change.

“Results. Providing authoritative research, getting it to those who need it, and engaging a broad spectrum of stakeholders in decision-making are all means to the ultimate end: permanent changes that protect the planet and improve people’s lives.”

But this is still weak. “Our ability to catalyze change through partnerships” is more of an activist’s dream than a method, because “catalyze change” is a buzzword. It doesn’t say how the change will be accomplished. And so on with the rest of the statement, which is buzzword compliant but totally lacking in a structured, cohesive approach to solving the problem.

This weakness went completely untouched in the 2004 annual report, which contained the identical page. But something must have happened around 2004, because the 2005 annual report completely revised the page by splitting it into two pages. One is titled Ideas into Action: a Commitment to Results. The other is Mission and Goals. The Ideas page contains the four elements we presented earlier. There are Analytical Excellence, Practical Solutions, Partnerships, and Ideas into Action. Notice how they have evolved from the earlier How We Work three pillars of Research, Partners, and Results. Research has become Analytical Excellence and Practical Solutions. Partners is now Partnerships. Results is now Ideas into Action.

Thus we can see that WRI is desperately searching for a better way to achieve its mission, by tinkering with how it goes about doing that. Once it goes through the epiphany of discovery that a formal process that fits the problem is what it is trying to perfect, it will probably embrace the concept of being formal process driven with open arms. It may even go all the way and become the first ISO 9000 certified environmental NGO, though I suspect this would lead to the trap of seeing a defined process as a checklist of what to do, rather than as a guidebook. But even considering certification would be evidence that true process awareness has finally come to WRI.

The progression of process awareness in these annual reports shows that WRI is inches away from examination of its own methods and the momentous discovery that they are not working, for a simple, easily corrected reason: the process does not fit the problem.
When that happens, we may see a radical change in WRI’s annual reports. For example, the 2005 report has these main topics in its table of contents:

1. **Mission, Goals, and Values**
2. **Climate and Energy**
3. **Governance and Access**
4. **Markets and Enterprise**
5. **People and Ecosystems**

Once the WRI becomes driven by a process that fits their mission, their annual reports may begin to resemble this much more productive format:

1. **Process** – Process status and improvements
2. **Diagnosis** – Our diagnostic model of why the human system is locked into unsustainability
3. **Solution Element Hypotheses** – Changes to our collection of modular hypotheses on how the human system can be changed to a sustainable mode
4. **Change Resistance Experimentation** – Experimental results for the last year in overcoming change resistance:
   a. Efforts to push on the high leverage point of general ability to detect political deception: We had some notable success here in voter education using the Truth Test, so that voters are not so easily deceived by corrupt politicians. Experiments in Corruption Ratings are also looking promising.
   b. Efforts to push on the high leverage point of repulsion to political corruption: This has proven to be a tough nut to crack. We made some slight experimental progress with our Zero Tolerance to Corruption and Proof You Can Make a Difference solution elements.
   c. Efforts to push on the high leverage point of quality of group decision making at the government level: Carefully monitored experimental pilot programs are beginning to show that Decision Ratings are effective here.
5. **Proper Coupling Experimentation** – Experimental results for the last year in proper coupling of the human system to the environment, by pushing on the high leverage points of consumption efficiency and consumption cost efficiency:
   a. Promising headway was made with 16 experiments in different ways to introduce the concept of Common Property Rights. The best results were obtained with the Environmental Property Rights solution element, due to its simplicity and understandability.
   b. Progress was made in the actual coupling mechanism with a long series of artificial and real world experiments centered on variations of the Reflective Pricing solution element.
   c. We are still stumped on what appears to be the toughest part of global proper coupling: how to get complete global cooperation at a very aggressive, top priority level. Experimentation in this area has not gone well, so we have iteratively returned to our diagnostic model to see why this is so hard to solve. *We suspect we have made a false diagnosis.*

The World Resources Institute is so close to scoring well on the process KPE that I’m tempted to give them a “moving score,” one that is moving from low to high. But until that actually starts to occur, it would be best to tell it like it is. WRI scores a 2 for only slightly productive.

Due to lack of a process that fits the problem, WRI scores a zero in KPEs 6 and 7, a true analysis of the problem is performed and the Scientific Method is used to prove all key assumptions.

But WRI does much better in key process element 8, learning from experience. There is substantial evidence they are rapidly improving, as shown by our examination of their 2002 to 2005 annual reports. They receive a 3 here for moderately productive.

On the final section of the key process elements, the problem domain key best practices, WRI falls down. Because they lack a process that fits the problem domain, it is impossible for them to see the critical importance of a social system structural analysis, the identification of low and high leverage points, or finding out why change resistance has been so successful. They thus receive zeros on KPEs 9, 10, and 11.

This gives the World Resources Institute a process maturity rating of 424 on a scale of zero to 10,000. This is low, and explains why they have achieved only low mission success to date.

But hidden in this assessment is a trend so beautiful it makes my eyes mist right over. *The World Resources Institute is about to discover the concept of a formal problem solving process that fits the problem. After reason itself, this is the most powerful tool in the world.* Once an intelligent agent puts it into their toolbox, they join the ranks of the most powerful agents in the human system. Already in this exclusive club are the fields of science, medicine, business management, project management, software engineering, quality improvement, and many more.

Welcome to the club.
Solution Factories

If the above environmental organizations someday decide to join the club and score high on process maturity, they will be doing the equivalent of becoming solution factories. This concept is so important it is covered in a chapter of its own on page 331. The chapter opens with these words:

“Tomorrow’s leading activist organizations will no longer be activist organizations. They will be solution factories.

“An ordinary factory produces physical products. A solution factory produces mental products. The output of a solution factory is the memes and meme carriers needed to solve a social problem and keep it solved indefinitely. These are created by using a formal process that works so well it’s almost like using an assembly line. But, unlike an assembly line, solution factories do not produce physical products. They produce mental products which in turn cause new emergent properties to appear in the social system with the problem. It is these emergent properties that solve the problem.”

This is a totally new paradigm. But once you see how memes lie at the heart of the sustainability problem, as well as all activist problems, you will see that solution factories are where all activist organizations are evolving to anyway. This includes think tanks, which are currently the most influential of all types of activist organizations. A solution factory is a hyper efficient think tank on steroids.

Please take the time to study the workflow diagram below, from page 336. This workflow maximizes process efficiency for solving complex social system problems, which is what all activist organizations are trying to do. Interestingly, the solution factories chapter was written long before the process assessment chapter was even conceived.

The first step of the workflow is problem identification. This is done in such a well defined, repeatable manner that solution factories score a perfect 5 on KPE 1, identify the problem.

KPE 2, find the proper practices, doesn’t really matter that much because overcoming change resistance and solving the model drift problems are much more important. A solution factory deliberately gives finding proper practices only a modest amount of effort, so they score only a 3 on this key process element.

The same applies to KPE 3, tell people the truth about the problem and the proper practices. Once change resistance is overcome, this will be easy. Solution factories score another 3 here.

There is no place in the workflow for KPE 4, exhort and inspire people to support the proper practices, because that is not needed once change resistance is overcome. Solution factories score a zero here.

Up to this point solution factories have scored about the same as the environmental organizations. Solution factories recognize that the first three steps of Classic Activism must be done adequately, with extra attention on the first step. The fourth step has such low leverage it receives no investment at all.

But after this point solution factories run away from...
the pack. Perhaps surprisingly, they score only a 4 in KPE 5, the formal definition, management, and continuous improvement of a process that fits the problem. This is because once you have the right process, it only has to be run reasonably well to achieve extraordinary results. Instead of over polishing the process apple, solution factories know it is better to put their limited resources into process execution, which is what the remaining steps do.

Thus it comes as no surprise that solution factories score a 5 in KPE 6, a true analysis of the problem is performed. Structural analysis is the second step in the workflow, so it must be done extremely well. Otherwise the workflow suffers grievously, because structural analysis is far and away the most important workflow area. This is because it builds the main mental and physical models that everything else depends on.

It is also no surprise that solution factories score a 5 on KPE 7, the Scientific Method is used to prove all key assumptions. This is so critical the workflow has a complete subsystem just for it, driven by the Hypothetical Evolution of High Fitness Solution Components loop. This subsystem is the second most important workflow area.

In the next KPE, learning from experience, solution factories don’t have to invest a lot of effort. This is because learning from experience is built into the workflow. Step 5, measurement of results, handles this automatically with the Evolution of the Actual Solution loop. Thus solution factories score only a 4 here.

Only two environmental organizations scored well in the key best practices of Analytical Activism. The European Union Environmental DG did well because it did not have to overcome change resistance, which is still rare. The Nature Conservancy did even better, due to the power of its Conservation by Design process. But The Nature Conservancy’s process did not extend to the remaining KPEs, causing it to score only a 4,489 in process maturity. The EU Environmental DG did a little better, with a score of 5,184, because the change resistance part of the problem was not in its problem domain. Solution factories do a lot better, because their process fits the problem domain perfectly. It should, because it was designed for it. Solution factories score a perfect 5 in all of the problem domain KPEs.

This gives solution factories a process maturity rating of 8,100 on a scale of zero to 10,000. Compared to where environmental organizations are today, this should be sufficient to solve the sustainability problem quickly and reliably, though a little better is probably needed to solve all the pesky little subproblems. Over time process maturity will undoubtedly approach as high as it needs to go, because the process is self-improving.

**Doctor! We’ve Made a False Diagnosis!**

We hope that by now you have come to the same conclusion we have: The environmental movement is not on track to solving the sustainability problem because the process does not fit the problem. There is no other reason. It is not that it is a hard problem. Science and business have solved problems just as hard. Nor is it because environmental sentiment is in the minority. Polls consistently show it is not. The real reason is the same seven little words we have intoned over and over: the process does not fit the problem.

Another way to say the same thing is the environmental movement has made a false diagnosis. This grave blunder has led to the wrong treatment, which has caused the patient to grow sicker and sicker, until now she is almost terminally ill.

The false diagnosis sprung into general acceptance decades ago, when it was universally assumed that environmental unsustainability was caused by the proper practices not being followed. This was such apparently sound reasoning that the wrong treatment has been applied for just as long. The treatment is simple. You first find the proper practices. Then you tell the people, especially politicians, the truth about the problem and all about the proper practices they must follow to solve the problem. Then you patiently wait awhile. If that doesn’t work, then you tell them again, and exhort and inspire them to adopt those proper practices, or else we’re all doomed. If the treatment doesn’t work then you obviously must be performing the process steps wrong, so do them again. But this time do them better. If the treatment still fails, then try it again, but this time…. And so forth, right on up to today, where the treatment still fails.

If a treatment fails repeatedly, then reason suggests that either the treatment or the diagnosis must be wrong. If there is no other treatment, then the diagnosis must be wrong.

In this case, because so many variations of the treatment have been tried, it must be a false diagnosis.

But how could it possibly be a false diagnosis? The proper practices not being followed is the cause!

Yes it is. But it is not the root cause.
The Basic Process of Classic Activism

This brings us all the way back to the point we made in chapter two, starting on page 34. The false diagnosis is the erroneous conclusion that there are only three possible root causes of the proper practices not being followed. They are causes A, B, and C as shown above. If these are the correct root causes, then solutions 2, 3, and 4 would solve the problem.

But they have not. And they will not, because these are not the real root causes. Instead, they are coincident occurrences (see page 104) due to deeper underlying fundamental causes. All classic activists have been doing for the last thirty years is treating coincident symptoms.

If classic activists switched to a process that fit the problem, it might be something like the System Improvement Process. This process decomposes all complex social system problems into three subproblems:

1. **Change resistance** – This is resistance to adopting proposed solutions.
2. **Proper coupling** – This is moving from the present state to the goal state.
3. **Model drift** – The solution model must keep the system in the goal state. If it drifts too far the problem will occur again.

Each of these subproblems has its own root cause. Until these are found the main problem remains undiagnosed, and a rational treatment plan that is highly likely to work cannot be developed.

On easy problems change resistance is low. In such cases Classic Activism will work. But the solution will only work for awhile or will require large amounts of continual effort if model drift is present.

On the global environmental sustainability problem change resistance is very high. Thus finding the root cause of change resistance and developing a solution to treat that should be environmentalism’s first priority.

But it is not, because the process does not fit the problem.

Then after the change resistance problem is solved the root cause of poor proper coupling must be found. The low leverage points to stop pushing on must be identified, along with the high leverage points to start pushing on. Otherwise the proper coupling solution will continue to converge toward the equivalent of command and control, as explained in the Goodbye to Command and Control chapter on page 321. Command and control will work at first, but it will later fail, just as it did for the former Soviet Union. Thus finding the root cause of poor proper coupling and developing a solution to treat that should be environmentalism’s second priority.

But it is not, because the process does not fit the problem.

Finally, after the proper coupling problem is solved the root cause of model drift must be found. Why is the model civilization uses to run itself unable to self-correct fast enough to avoid the problem in the first place? Until we solve that problem, keeping the sustainability problem solved will require such high amounts of effort and vigilance that the solution will be unsustainable. Thus finding the root cause of model drift and developing a solution to treat that should be environmentalism’s third priority.

But it is not, because the process does not fit the problem.
Once you are convinced the process must fit the problem, two questions arise: What is the right process? How can I apply it?

There is no one perfect process, because the process must not only fit the problem. It must also fit whoever is using it. Therefore this book uses a very high level generic process which is easily customized. This is the System Improvement Process.

How this process works is what parts two and three of this book are all about. Part two applies the process to the transformation problem. Part three applies it to the sustainability problem. By the time you have finished the book you will know how to begin applying the process to the problems you and your organization are working on.

As you do that, you will discover that the key to it all is finding the right leverage points to direct your solution efforts to. This chapter shows how you can find those points, with a surprisingly small amount of effort.

The Central Strategy of the System Understanding step

Successful scientists have one overriding trait in common: the persistent employment of a central strategy that leads to discoveries that others, looking at the same world and the same data, have missed. In writing his Principia Mathematica, Sir Isaac Newton’s core strategy was to combine the insights of those who came before him with a handful of the right new laws that would explain one single thing: why all objects moved the way they did. Einstein’s strategy was to use thought experiments (Gedanken) to look at the world in an entirely new manner, so that he could find entirely new perspectives that would lead to entirely new fundamental laws of behavior. Even Alexander Fleming, who by chance discovered penicillin when he correctly deduced that something was inhibiting bacteria growth in a Petri dish, had a central strategy that made the difference. It was to say to himself “What is causing this?” when he accidentally encountered a new phenomenon, instead of brushing it aside as a curiosity.

Our central strategy is to find the right high leverage points that, when pushed on with the limited amount of force that problem solvers have, will tip the system into a new mode whose natural behavior is solve the problem.

There appear to be only two ways to find the right high leverage points in a complex social system: trial and error, and construction of a model that explains why the system behaves the way it does and hence where its leverage points are. The first method, trial and error, is too slow and unreliable. This leaves the second method, modeling, as the only way to find the right high leverage points.

There is a particular type of high leverage point we are looking for: those that require only a small amount of force to solve the problem. If this amount is small enough, then those already committed to solving the problem will have enough collective force to solve it.

Because our strategy is so leverage point centric, let’s examine:

What Leverage Points Really Are

How good our analysis is depends on two main factors: how correctly we have captured the fundamental structure explaining why the problem is occurring, and how correctly we have identified the high leverage points in that structure.

To avoid falling into a groupthink trap, we must distinguish between the popular definition of leverage points and the one we will be using. The popular definition of a leverage point is a place in a system where a small change leads to a large change elsewhere in the system. A typical example may be found in Leverage Points: Places to Intervene in a System, an article written by Donella Meadows in 1997. She defined leverage points as “places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything.”

However, this definition is fraught with seductive illusion. While it looks wonderfully helpful at first glance, in practice it tends to lead analysts astray. For example, using the popular definition of leverage point, global population growth is a high leverage point, because lowering it by just 1% a year would have a large effect on the world’s population 50 years from now. But how much effort is it going to take to lower population growth by 1%? A huge amount, because the behavior of...
every reproductive couple in the world is involved, as are the cultural norms behind their behavior and recent advances in medicine and agricultural productivity that have caused a population explosion in most parts of the world.

**Leverage** is the ratio of change in output to change in input. If it takes a large amount of effort to cause a small amount of change, which causes a large amount of change elsewhere, that is a low leverage point, not a high one. Thus the population growth rate is actually not a high leverage point at all—it is a low leverage point. So are the other factors in the IPAT equation. (Environmental Impact = Population x Affluence x Technology) A little change in affluence (consumption per person) would cause a big change in impact. A little change in technology (impact per unit of consumption) would also cause a big change in impact. But the effort to cause those changes to happen is so large that environmentalists have been unable to exploit these three points (PAT) for over 30 years. Therefore the entire right hand side of the IPAT equation consists of low leverage points.

Fortunately there is a better way. All it requires is the proper perspective.

Our definition of a **high leverage point** is a place in a system where the small amount of force required to prepare and make a change causes a large predictable response. An example of a high leverage point is a ship’s rudder. A small force on the rudder causes a large change in the ship’s course, especially if that small force (such as one hand on a ship’s tiller) is maintained over a long period of time.

Our definition distinguishes between what can be called low and high change force leverage points. A **low change force** leverage point requires only a low amount of change force to cause a large change in system behavior. Because the ratio of output to input is high, this is a high leverage point.

By contrast, a **high change force** leverage point requires a high amount of change force to cause a large change in system behavior. The output and input are both high. Thus this is a low leverage point.

Using the popular definition of leverage point, there are many high leverage points in a system. For example, Donella Meadows lists nine types in the first version of her paper, and twelve in the second version. Thus any given complex system has hundreds of high leverage points at a minimum. But if our definition of high leverage point is used, there are only a handful of high leverage points. It is these very few “right” high leverage points that problem solvers must find and focus on if they are to solve the problem, which explains why we have taken such pains to define what high leverage points really are.

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**Capturing Fundamental Structure**

The purpose of the System Understanding step is to understand why the system works the way it does so well that the next step of Solution Convergence is relatively easy. As we have explained, the strategy we will use to accomplish this is to identify and deeply understand those high leverage points that, when pushed on with the limited amount of force problem solvers have, cause the problem to be solved.

The first step in finding these points is to capture the system’s fundamental structure. By **fundamental structure** we mean the foundational essence of what is ultimately causing the problem symptoms. We must get to the root of why the problem is occurring, or, like the doctor who is unable to make a diagnosis, we will be unable to intelligently solve the problem.

If a model can clearly show why a problem’s symptoms are occurring, at a level of insight deep enough to easily lead to solution, then the model has captured the system’s fundamental structure. This chapter will do this using causal flow diagrams and simulation models. In both cases we will attempt to capture only what makes the critical difference and will ignore everything else.

The purpose of these models is to lay the groundwork for the next step in the System Improvement Process, which is Solution Convergence. In that step solution elements are developed to “push” on the high leverage points identified in the System Understanding step. If the models provide a clear view of where to push and what happens when these points are pushed, then the models have done their job.

Now for a few more terms: The purpose of pushing on high leverage points is to introduce predictable, lasting structural change to a system. **Structural change** is a change to a system’s structure. This is done by the addition, removal, or modification of nodes and relationships. Doing this predictably and efficiently requires knowing the system’s structure, which is why this book spends so much time in analysis of system structure.

**Deep structural change** is structural change that causes loop dominance to change significantly and indefinitely. The result is the system now behaves so differently it seems to have “flipped” into a new mode, such as from sustainable to unsustainable. Deep structural change is what is required to solve any difficult complex social system problem, because the solution requires the system to behave fundamentally differently indefinitely.

Using this definition, let’s improve our definition of a high leverage point. A **high leverage point** is a place in a system’s structure where deep structural change can be made, with relatively little effort, to solve a problem.
The Powell Memo

Many system conditions and historical events contributed to the sudden rise to power of the Corporate Proxy Movement in the late 20th century. But the one that appears to have played the crucial role of the “precipitating event” was the now infamous Powell Memo of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed

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This completes the review of the key terms and strategies used to perform the System Understanding step. The final models in this chapter will serve as elaborate, easily communicated, testable arguments that certain points within them are high leverage points. If the models are sound then two things follow logically: they contain the correct high leverage points to push on to solve the problem, and because of our definition of high leverage points, pushing on them will be relatively easy.

What more could a problem solver ask for?

The Corporate Proxy Movement Transformation

The purpose of the second step of the System Improvement Process is to understand why the system works the way it does. In the transformation problem the system is the environmental movement. This is the social group doing the startup phase of solving the global environmental sustainability problem. We have already analyzed why this movement has failed to solve the problem. But that is not enough to understand how the movement can succeed, by transforming itself into a more mature movement that has the capability to achieve its objectives. To do that, we need to “study the masters” who have succeeded in similar transformations.

The first master we shall examine is the one who is leading the opposition to sustainability. This is the New Dominant Life Form, which is the modern corporation and its allies. This life form achieved a stunning victory in the most powerful country in the world in the late 20th century when the Corporate Proxy Movement rose to political dominance in that country. Its victory was capped by the ascendancy of the George W. Bush administration in 2000. The Corporate Proxy Movement now so dominates the most powerful country in the world and is so against sustainability that the environmental movement is reeling from the onslaught. Worse yet, the environmental movement has no credible plan to counter the success of the Corporate Proxy Movement, which seems to be growing even stronger.

We will now perform an analysis of why this social transformation succeeded so spectacularly. Because we will be taking a process driven analytical approach, what we find will differ from most other analyses.

The Powell Memo

Many system conditions and historical events contributed to the sudden rise to power of the Corporate Proxy Movement in the late 20th century. But the one that appears to have played the crucial role of the “precipitating event” was the now infamous Powell Memo of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed of August 23, 1971. Here is the story of how the seed

“Consider that the conservative political movement, which now has a hammerlock on every aspect of federal government, has a media message machine fed by more than 80 large non-profit organizations – let’s call them the Big 80 – funded by a gaggle of right-wing family foundations and wealthy individuals to the tune of $400 million a year.

“The story of the conservative rise that Stein [Author of a PowerPoint presentation called “The Conservative Message Money Matrix” and driver of the Democracy Alliance] portrays begins back in the early 1970s, when there was panic among conservatives, especially in corporate boardrooms, that capitalism was under serious attack, and something drastic had to be done about it.

“The National Chamber of Commerce asked Lewis Powell, a former head of the American Bar Association and member of 11 corporate boards, to write a blueprint of what had to be done. The result, says Stein, is one of the most prescient documents of our time. The memo lays out the framework, the goals and the ingredients for the conservative revolution that has gained momentum and power ever since. Two months after penning the memo, then President Richard M. Nixon appointed Powell, a Democrat, to the U.S. Supreme Court.

“Powell told the conservatives that they needed to confront liberalism everywhere and needed a ‘scale of financing only available through a joint effort’ focused on an array of principles including less government, lower taxes, deregulation and challenging the left agenda everywhere. The conservative right, starting with seed money from the Coors Brewing family and Richard Mellon Scaife’s publishing enterprise, moved forward to implement virtually every element of the Powell memo. It is a story of how the conservatives – in spite of political differences, ego, and competing priorities – were able to cooperate and develop a methodology that drives their issues and values relentlessly.

“Starting with just a handful of groups, including the Heritage Foundation, in the early ’70s, the conservatives built a new generation of organizations – think tanks, media monitors, legal groups, networking organizations, all driven by the same over-arching values of free enterprise, individual freedoms and limited government.

“Stein describes how the message machine works. If Rush Limbaugh wants something on vouchers – it’s immediately in his hands; if Fox News’ Bill O’Reilly needs a guest to talk about the ‘death tax,’ he’s got him...
from one of the think tanks. Stein estimates that 36,000 conservatives have been trained on values, issues, leadership, use of media and agenda development. These are not the elected officials, but rather the cadre of the conservative network. Stein figures that the core leaders of the Big 80 groups he studied are about 2,000 people who make between $75,000 and $200,000 and have all been trained in the Leadership Institute.

“The wealthy conservative families that have been the early bread and butter of the movement and continue their support are relatively well known at this point, including Scaife from Pittsburgh, Lynde and Harry Bradley from Milwaukee, Joseph Coors from Colorado; and Smith Richardson from North Carolina. Important networking goes on at the Philanthropy Roundtable, where groups are showcased.

“But the key today to keeping the message machine fed is what Stein calls the ‘investment banking matrix,’ which includes key conservatives like Grover Norquist, Paul Weyerich, and Irving Kristol, who raise, direct, and motivate. Stein estimates there are about 200 key people who invest an average of $250,000 a year and about 135 of them also serve on the boards of the Big 80 groups

“Each of these groups are ‘mission critical,’ and they are strategic, coordinated, motivated and disciplined,” says Stein, adding that the investment bankers monitor them closely.

“And contrary to popular belief among progressives, the conservatives who are part of that machine are of various stripes – far right, neo-conservative, libertarian, evangelical, etc. – but what makes them so successful is they form strategic alliances around common issues they support.

“Then there is the conservative media machine, which operated at full power to get George W. Bush re-elected in 2004. Conservatives and their allies were able to magnify their message through a network of right-leaning TV and radio channels, including Rupert Murdoch’s Fox News Channel, which provided Bush and Co. with a 24/7 campaign infomercial - for free. Here was a news network with more viewers than CNN and MSNBC combined, constantly repeating, often verbatim, the messages out of the White house and the Bush campaign.

“More help for Bush came from the far-less known religious broadcasters. ‘Under the radar screen, the Christian Church community has created a formidable electronic media infrastructure and now plays a major role influencing public opinion,’ says Jeffrey Chester, executive director of the Center for Digital Democracy. The religious media are producing and distributing ‘news,’ commentary and cultural guides, and their reach and influence are undeniable.

“As veteran investigative reporter Robert Parry argues, Bush’s electoral victory proved that the conservatives have achieved dominance over the flow of information to the American people - so much so that even a well-run Democratic campaign stands virtually no chance for national success without major changes in the media system. ‘The outcome of Election 2004 highlights perhaps the greatest failure of the Democratic/liberal side in American politics: a refusal to invest in the development of a comparable system for distributing information that can counter the Right’s potent media infrastructure,’ according to Parry. ‘Democrats and liberals have refused to learn from the lessons of the Republican/conservative success.’ ”

Next, so that you may see for yourself what the 14 page Powell Memo itself contained, here are a few key extracts: (Comments and italics are added. All bolding is in the original.)

“Confidential Memorandum: Attack of American Free Enterprise System

DATE: August 23, 1971
TO: Mr. Eugene B. Sydnor, Jr., Chairman, Education Committee, U. S. Chamber of Commerce
FROM: Lewis F. Powell, Jr.

“The purpose [of this memorandum] is to identify the problem, and suggest possible avenues of action for further consideration. [Powell is a natural analytical thinker. The first step of the System Improvement Process (SIP) is the same as his approach: identify the problem. SIP calls this Problem Definition.]

“Dimensions of the Attack – No thoughtful person can question that the American economic system is under broad attack. This varies in scope, intensity, in the techniques employed, and in the level of visibility. [Note the way Powell shrewdly frames his argument: business is under “attack.” Actually corporations are non-physical entities created by people to serve their needs. Corporations are thus servants of the people, who are not “attacking” them. Instead, they are attempting to get corporations to behave responsibly, as good servants should.]

“Sources of the Attack – The sources are varied and diffused. They include, not unexpectedly, the Communists, New Leftists and other revolutionaries who would destroy the entire system, both political and economic. These extremists of the left are far more numerous, better financed, and increasingly more welcomed and encouraged by other elements of society, than ever before in our history. [Powell builds his fallacious “we are under attack” argument, brick by clever
brick. Here he uses the fallacy of guilt by association. The average American liberal/progressive is not a communist or a revolutionary. Nor are they extremists. What Powell is doing is painting a false enemy, which makes is easier to rally your own supporters."

"The most disquieting voices joining the chorus of criticism come from perfectly respectable elements of society: from the college campus, the pulpit, the media, the intellectual and literary journals, the arts and sciences, and from politicians. [By implication it is now okay to go after all of these groups, because they are attacking business. Note how this is the same thing that happened in China’s Cultural Revolution, where all of these groups, except party politicians, were attacked (humiliated, imprisoned, resettled, or even killed) by representatives of the people’s army."

"Perhaps the single most effective antagonist of American business is Ralph Nader, who – thanks largely to the media – has become a legend in his own time and an idol of millions of Americans. The passion that rules in him – and he is a passionate man – is aimed at smashing utterly the target of his hatred, which is corporate power. [Powell employs the tried and true technique of painting a hated common enemy and associating a group with that enemy. This is one of the many forms of the false enemy strategy."

"The Apathy and Default of Business – What has been the response of business to this massive assault upon its fundamental economics, upon its philosophy, upon its right to continue to manage its own affairs, and indeed upon its integrity?"

"The painfully sad truth is that business, including the boards of directors’ and the top executives of corporations great and small and business organizations at all levels, often have responded – if at all – by appeasement, ineptitude and ignoring the problem."

"In all fairness, it must be recognized that businessmen have not been trained or equipped to conduct guerrilla warfare with those who propagandize against the system, seeking insidiously and constantly to sabotage it. [Powell argues that business must replace its ideology with something more effective, and creates his own ideology."

"Responsibility of Business Executives – The overriding first need is for businessmen to recognize that the ultimate issue may be survival – survival of what we call the free enterprise system, and all that this means for the strength and prosperity of America and the freedom of our people. [Notice how the New Dominant Life Form has done extraordinarily well here. It has gotten a corporate proxy, Powell, to fend for it and argue that “the ultimate issue may be survival” of the New Dominant Life Form. By equating that life form with “the free enterprise system,” which people feel is essential to their way of life, Powell has cleverly persuaded his audience to defend what is in actuality their own tyrannical master. There are very few people who would knowingly do that. Because they did end up doing that, it is apparent that most corporate proxies are totally incognizant of the undeniable fact that they are now ideoserfs, intellectually and economically bound to a new master: the New Dominant Life Form."

This is a key point. Recall that an ideoserf is “someone who is bound to an ideology, as serfs were bound to the land.” It is a more accurate and less incendiary term than “slave,” but is about the same. Here the ideology stems from the fundamental tenant of corporatism: that corporatization and economic growth are essential to modern civilization and the more of each the better, because they bring such bountiful benefits to people."

According to David Korten, author of When Corporations Rule the World, “an ideology is a belief system—a set of theories, beliefs, and myths with some internal coherence—that seeks to universalize the interests of one social sector to the whole community. In market ideology, for instance, freeing market forces from state constraints is said to work for the good not only of business, but also to that of the whole community. Transmitted through social institutions such as universities, corporations, churches, or parties, an ideology is internalized by large numbers of people, but especially by members of the social groups whose interests it principally expresses.”

The Powell Memo strengthened an existing ideology so that it was even more irresistible, and created a method of promoting it that was much more effective than any before. The result was that soon most of the powerbrokers in the one country that mattered the most, the United States, were rabid New Dominant Life Form ideoserfs."

"The day is long past when the chief executive officer of a major corporation discharges his responsibility by maintaining a satisfactory growth of profits, with due regard to the corporation’s public and social responsibilities. If our system is to survive, top management must be equally concerned with protecting and preserving the system itself. [Powell builds on his argument, and now implores top corporate proxies to protect and preserve their master, by “protecting and preserving the system.”
Since this refers to “the free enterprise system,” the system is the same as the New Dominant Life Form and the ever expanding niche it has created for itself.

“...A significant first step by individual corporations could well be the designation of an executive vice president (ranking with other executive VP’s) whose responsibility is to counter—on the broadest front—the attack on the enterprise system. [Progressive organizations will need to do the equivalent: an executive in charge of that organization’s analytical effort to counter the attack of the New Dominant Life Form on Homo sapiens. Environmental organizations will need an executive in charge of their problem solving process.]

“But independent and uncoordinated activity by individual corporations, as important as this is, will not be sufficient. Strength lies in organization, in careful long-range planning and implementation, in consistency of action over an indefinite period of years, in the scale of financing available only through joint effort, and in the system. It should include several of national repute qualified scholars in the social sciences who do believe in the campus is the single most dynamic source. [This is explicit identification of a high leverage point.]

“...The Campus—Although [the] origins, sources and causes [of “the assault on the enterprise system”] are complex and interrelated, and obviously difficult to identify without careful qualification, there is reason to believe that the campus is the single most dynamic source. [This is the closest the memo comes to a summary of its package of strategies. This summary makes it clear that the present environmental movement has absolutely nothing like this.]

“The Chamber should consider establishing a staff of highly qualified scholars in the social sciences who do believe in the system. It should include several of national reputation whose authorship would be widely respected—even when disagreed with. [While some of these scholars are located on campus, most are in “think tanks,” probably the Corporate Proxy Movement’s single most effective mechanism. Earlier Ron Hazen called think tanks “the Big 80.”]

“There also should be a staff of speakers of the highest competency. [These became speakers for the think tanks.]

“The staff of scholars (or preferably a panel of independent scholars) should evaluate social science textbooks, especially in economics, political science and sociology. The objective of such evaluation should be oriented toward restoring the balance essential to genuine academic freedom. [This is the equivalent of hidden but effective censorship. The use of the word “balance” is fallacious. It really means balance it more towards business.]

There is simply no such thing as a “balance” between truth and falsehood. There is only the truth. Most of the time when conservatives press for “balance,” they are really pressing for society’s tacit support of a clever and fallacious rationale to see things their way. But because the public and the media have such a low general ability to detect deception, the “balance” ploy works, and the public is showered with a mixture of the truth and falsehood, all peddled as a “balanced” sampling of the truth.

“The Chamber should insist upon equal time on the college speaking circuit. [This is another form of the “balance” fallacy.]

“Perhaps the most fundamental problem is the imbalance of many faculties. [The “balance” fallacy continues.]

“The methods to be employed require careful thought, and the obvious pitfalls must be avoided. Improper pressure would be counterproductive. But the basic concepts of balance, fairness and truth are difficult to resist…. [Note the fallacious but effective appeal to businesspeople for “balance” by mixing it with fairness and truth. Also note that the “balance” fallacy has become a widespread and effective conservative tactic. A prime example is the “Fair and Balanced News” slogan used by Fox News in the United States.]

“What Can Be Done About the Public?—Reaching the campus and the secondary schools is vital for the long-term. Reaching the public generally may be more important for the shorter term. The first essential is to establish the staffs of eminent scholars, writers and speakers, who will do the thinking, the analysis, the writing and the speaking. It will also be essential to have staff personnel who are thoroughly familiar with the media, and know how to most effectively communicate with the public. [This describes how massive amounts of propaganda will be created and delivered, without ever calling it that.]

“The national television networks should be monitored in the same way that textbooks should be kept under constant surveillance. This applies not merely to so-called educational programs (such as ‘Selling of the Pentagon’), but to the daily ‘news analysis’ which so often includes the most insidious type of criticism of the enterprise system. Whether this criticism results from hostility or economic ignorance, the result is the gradual erosion of confidence in ‘business’ and free enterprise. [There you have it: “surveillance” of television and textbooks, the same method that totalitarian regimes use to control what information the public has access to, as well as what the public can say in the media.]

“It is especially important for the Chamber’s ‘faculty of scholars’ to publish. One of the keys to the suc-
cess of the liberal and leftist faculty members has been their passion for ‘publication’ and ‘lecturing.’ A similar passion must exist among the Chamber’s scholars. [This is the Meme Channel Strangulation loop, which can be seen in the full diagram of The Dueling Loops of the Political Powerplace model on page 38. In this loop degenerates control such a high percent of meme transmission channels (the media), and create so much of what is in them, that what rationalists transmit is overwhelmed. Examples of this strategy in the US are the purchase by conservatives of TV stations, newspapers, and magazines, plus a torrent of publishing and speaking by writers and speakers from think tanks.]

“Incentives might be devised to induce more ‘publishing’ by independent scholars who do believe in the system. [Note that “incentives,” more accurately called bribes, have been heavily used by the Bush administration to get supposedly neutral authors to support the administration’s viewpoints, even though this is illegal.]”

“The Neglected Political Arena – But one should not postpone more direct political action, while awaiting the gradual change in public opinion to be effected through education and information. Business must learn the lesson, long ago learned by labor and other self-interest groups. This is the lesson that political power is necessary; that such power must be assiduously (sic) cultivated; and that when necessary, it must be used aggressively and with determination – without embarrassment and without the reluctance which has been so characteristic of American business. [Because the end justifies the means and business is under “attack,” aggression, and lots of it, is okay. The end justifies the means is a core strategy associated with winning the race to the bottom of the Dueling Loops of the Political Powerplace.]”

“Neglected Opportunity in the Courts – American business and the enterprise system have been affected as much by the courts as by the executive and legislative branches of government. Under our constitutional system, especially with an activist-minded Supreme Court, the judiciary may be the most important instrument for social, economic and political change. [Another high leverage point is identified. Note how Powell is a natural systems thinker. He is able to find a sufficiently complete set of correct high leverage points intuitively, without a long formal analysis. This is a rare skill.]”

“A More Aggressive Attitude – … it is essential that spokesmen for the enterprise system – at all levels and at every opportunity – be far more aggressive than in the past. “There should be no hesitation to attack the Naders, the Marcuses and others who openly seek destruction of the system. There should not be the slightest hesitation to press vigorously in all political arenas for support of the enterprise system. Nor should there be reluctance to penalize politically those who oppose it. [Again the memo presses the need to attack vigorously. This is just what they later did.]”

“The Cost – The type of program described above (which includes a broadly based combination of educational and political action), if undertaken long term and adequately staffed, would require far more generous financial support from American corporations than the Chamber has ever received in the past. High level management participation in Chamber affairs also would be required. [First what to do and why has been persuasively presented. Now Powell appeals for the money to do it. This appeal worked.]”

“The staff of the Chamber would have to be significantly increased, with the highest quality established and maintained. Salaries would have to be at levels fully comparable to those paid key business executives and the most prestigious faculty members. Professionals of the greatest skill in advertising and in working with the media, speakers, lawyers and other specialists would have to be recruited. [Powell has got it right here. If you want top notch results, you need top notch talent. And if you want lots of it, the only way to get it is to pay top dollar.]”

“Quality Control is Essential – Essential ingredients of the entire program must be responsibility and ‘quality control.’ The publications, the articles, the speeches, the media programs, the advertising, the briefs filed in courts, and the appearances before legislative committees – all must meet the most exacting standards of accuracy and professional excellence. [Powell gets it right again. Quality must be closely monitored, because in most cases, quality of effort is what makes the difference, not quantity of effort.]”

“Conclusion – It hardly need be said that the views expressed above are tentative and suggestive. The first step should be a thorough study. But this would be an exercise in futility unless the Board of Directors of the Chamber accepts the fundamental premise of this paper, namely, that business and the enterprise system are in deep trouble, and the hour is late.” [Powell finishes with a strong closing, making a single appeal based on a single premise. That “business and the enterprise system” were actually not “in deep trouble” is irrelevant. Powell’s argument has been so persuasive that a false premise has been made to appear very true, so true it can serve as the very foundation of his argument. Such is the power of deception in the hands of a master.]”
Some Examples of the Success of the Powell Memo

The Powell Memo led to a number of immediate moves by business to thwart the “attack.” David Korten, in the second edition of When Corporations Rule the World, 2001, page 144, describes some of these efforts: (Italics added)

“[The Powell Memo] set the stage for an organized effort by a powerful coalition for business groups and ideologically compatible foundations to align the U. S. political and legal system with their ideological vision.

“Among Powell’s recommendations was a proposal that the business community create a business organized and funded legal center to promote the general interests of business in the nation’s courts. This led to the formation of the Pacific Legal Foundation (PLF) in 1973. Housed in the Sacramento Chamber of Commerce building, it was the first of a number of corporate sponsored ‘public-interest’ law firms dedicated to promoting the interests of their sponsoring corporations. The PLF specialized in defending business interests against ‘clean air and water legislation, the closing of federal wilderness areas to oil and gas exploration, workers’ rights, and corporate taxation.’ Some 80% of its income was from corporations or corporate foundations.

“In a 1980 speech, PLF’s managing attorney Raymond Momboisse turned reality on its head by attacking environmentalists for their ‘selfish, self-centered motivation…; their ability to conceal their true aims in lofty sounding motives of public interest; their indifference to the injury they inflict on the masses of mankind; their ability to manipulate the law and the media; and most of all, their power to inflict monumental harm on society.’

“Business interests funded the establishment of law and economics programs in leading law schools to support scholarly research advancing the premise that the unregulated marketplace produces the most efficient—and thereby the most just—society. Business funded all-expense-paid seminars at prestigious universities such as George Mason and Yale to introduce sitting judges to these economic principles and their application to jurisprudence.

“Corporations began to create their own ‘citizen’ organizations with names and images that were carefully constructed to mask their corporate sponsorship and their true purpose. The National Wetlands Coalition, which features a logo of a duck flying blissfully over a swamp, was sponsored by oil and gas companies and real estate developers to fight for the easing of restrictions on the conversion of wetlands into drilling sites and shopping malls. Consumer Alert fights government regulations of product safety. Keep America Beautiful attempts to give its sponsors, the bottling industry, a green image by funding anti-litter campaigns, while those same sponsors fight mandatory recycling legislation. The strategy is to convince the public that litter is the responsibility of consumers—not the packaging industry.

“The views of these and similar industry sponsored groups—thirty-six of them are documented in Masks of Deception: Corporate Front Groups in America—are regularly reported in the press as the views of citizen advocates. The sole reason for their existence is to convince the public that the corporate interest is the public interest and that labor, health, and the environment are ‘special’ interests. The top funders of such groups include Dow Chemical, Exxon, Chevron USA, Mobil, DuPont, Ford, Phillip Morris, Pfizer, AnheuserBusch, Monsanto, Proctor & Gamble, Phillips Petroleum, AT&T, and Arco.

“Business interests funded the formation of new conservative policy think tanks such as The Heritage Foundation and revived lethargic pro-establishment think tanks such as the American Enterprise Institute, which experienced a tenfold increase in its budget. In 1978, the Institute for Educational Affairs was formed to match corporate funders with sympathetic scholars producing research studies supporting corporate views on economic freedom. [See the graph on the next page for the effect the memo had on the growth of think tanks. 79]

“In 1970, only a handful of the Fortune 500 companies had public affairs offices in Washington. By 1980, more than 80 percent did. In 1974, labor unions accounted for half of all political action committee (PAC) money. By 1980, the unions accounted for less than a fourth of this funding. With the inauguration of the U. S. President Ronald Reagan in 1981, the ideological alliance of corporate libertarians consolidated its control over the instruments of power.

“Business roundtables are national associations of the chief executive officers (CEOs) of the largest transnational corporations.

“The first Business Roundtable was formed in the United States in 1972 [the year after the Powell Memo]. Its 200 members include the heads of 42 of the 50 largest Fortune 500 U. S. industrial corporations. The head of General Motors sits with the head of Ford and Chrysler—and so on with each major industry. In this forum, the heads of the world’s largest U. S. based corporations put aside their competitive differences to reach a consensus on issues of social and economic policy in America.

“Once positions are defined, the Roundtable organizes aggressive campaigns to gain their political accep-
tance, including personal visits by its member CEOs to individual Senators and representatives.

“The Roundtable took an especially active role in campaigning for the North American Free Trade Agreement (NAFTA). Recognizing that the public might see free trade as a special interest issue if touted by an exclusive club of the country’s 200 largest transnationals, the Roundtable created a front organization, USA*NAFTA, that enrolled some 2,300 U.S. corporations and associations as members. Roundtable members bombarded Americans with assurances through editorials, op-ed pieces, news releases, and radio and television commentaries that NAFTA would provide them with high paying jobs, stop immigration from Mexico, and raise environmental standards.” [All of which turned out to be grossly untrue. In fact, just the opposite happened.]

Two months after writing the memo, Powell was appointed to the US Supreme Court, where he served for 15 years until just before his 80th birthday. One might expect that he would have been strongly conservative. But according to Wikipedia, “He developed a reputation as a judicial moderate, and was known as a master of compromise and consensus-building.” Powell apparently had no idea at the time that his 14 page memo would so thoroughly change the course of American history.

Finding the Right High Leverage Points

Why did the strategy in the Powell Memo work so well? Because it pushed correctly on the right high leverage points.

How did Powell find those points? Not by modeling the system, as we are about to do, but by pure intuition. As proven by the effectiveness of the strategy he laid down in the memo, Powell was one of those rare people who could analyze a complex social system problem properly without use of a formal model. Because such people are so rare, the environmental movement cannot count on finding one. Even if they were available, there remains the question, how can we prove which person is capable of duplicating this feat and who is not? The only way to determine that would be to examine their past record. However, there is no one alive who has pulled off a feat similar to the one Powell did, it is that rare. This leaves the environmental movement with the only other way to do the same thing—with a formal analysis of where the high leverage points are.

But there is a second reason a formal analysis must be done: The problem has become much more difficult to solve. In my opinion, if Lewis Franklin Powell, Jr. (1907 to 1998) was alive today and was a progressive trying to solve the transformation problem, he would find himself unable to do it again. This is because the problem has grown far too complex to yield to an intuitive analysis, due to the cleverest, most formidable opponent that Homo sapiens has ever known. This opponent has countered all the easy solutions available to environmentalists, has changed the rules of the game to be even more in its favor, and most important of all, has a huge learning curve lead on environmentalists, who may never be able to catch up.

Why can’t environmentalists beat corporate proxies at their own game by simply pushing on the same high leverage points as corporate proxies? Why can’t they fight fire with fire? Because environmentalists cannot push as hard. They have much less money, numbers, and influence than corporate proxies. In addition, environmentalists prefer to tell the truth and not resort to falsehood. This is because at heart they are rationalists and humanists seeking the high road of the race to the top, not degenerates and corporate proxies who are all too eagerly exploiting the race to the bottom, where anything goes because the end justifies the means.

In order to succeed the environmental movement needs an entirely new way of thinking. They must find totally different high leverage points from those the opposition is using and push there. The top one was
identified in the second chapter. It is the general ability to detect political deception. There is no known way to easily counter pushing there, because if the dueling loops model is correct, then there is no other reinforcing loop that can give a politician more supporters than the race to the top. This is because the truth has no higher master. Remember these words, because they may become the intellectual battle cry of the next incarnation of the environmental movement, the one that is based at last on science and experimental proof, and logical inspiration, rather than on intuition and emotional inspiration.

It is important to understand that the truth has no higher master is logical inspiration, not emotional inspiration. This is required, because a race to the top must be based on logical appeal. Dependence on emotional appeal has a shaky foundation, and is too easily a long slippery slope that leads to engaging in the race to the bottom, usually without even knowing it.

Let’s return to our discussion of leverage points. However important it may be, ability to detect deception is not the type of leverage point this analysis is concerned with. We are instead trying to find the optimum leverage points for the environmental movement to use to transform itself from pushing on low leverage points to pushing on high leverage ones. After it does that, then it can begin to push on the general ability to detect political deception high leverage point and others.

For example, one transformational high leverage point is rather obvious. It is the same one Powell identified for corporate proxies to use. It is united action.

We now proceed to find those transformational high leverage points by modeling the transformation that the Powell Memo so successfully initiated.

The Dynamic Structure of the Corporate Proxy Movement Transformation

The underlying reason the Corporate Proxy Movement worked is it focused effort on a single very high leverage point: the use of falsehood to make The Race to the Bottom among Politicians go dominant. This loop is easily exploited. In this case the exploiter was the New Dominant Life Form, working through its proxies.

Examination of the Powell Memo easily proves that the Corporate Proxy Movement employs lots of falsehood. The memo has numerous running fallacies. One is the “balanced” fallacy, which has already been discussed in the memo comments. Another is that business is under “attack.” It is not, as discussed.

Yet another fallacy is that corporate freedom and independence must be preserved and strengthened, if we are to maintain the “free enterprise system.” But this is also unsound. The economic system need not be preserved in its present form to promote the general welfare of the people. There is absolutely no way that system is already optimized, as history has shown. Therefore corporate freedom and independence is not a mandatory requirement.
There are more fallacies, but the above are enough to show that the Powell Memo is basically two things: a collection of bold, gigantic, foundational falsehoods and a plan to create even more and deliver them to the people, and thereby win the race to the bottom. But at the bottom of the entire argument lies the greatest fallacy of them all. It is total, unquestioned allegiance to the New Dominant Life Form, rather than to Homo sapiens. This allegiance is so strong that it leads to behavior that is grossly detrimental to Homo sapiens, such as copious amounts of environmental unsustainability, poverty, and conflict.

Let’s examine the dynamic structure which corporate proxies so successfully exploited. In the second chapter we presented The Race to the Bottom among Politicians, as shown.

Briefly, the loop works like this: Starting at the bottom, corrupt politician influence is used to create and transmit large amounts of falsehood and favoritism. If this is done well, it increases decisions to support corrupt politicians among citizens. This causes commitment to support those corrupt politicians, which moves people from the stock of Uncommitted Supporters to the stock of Degenerate Supporters. Because the corrupt politicians now have more supporters, this increases corrupt politician influence even more, and the loop starts all over again. It grows until the stock of Uncommitted Supporters is nearly empty, at which point diminishing returns set in and it is not worth trying to convert the rest of the Uncommitted Supporters.

The loop works because the race to the top has no equivalent of size of falsehood and favoritism. This is used to inflate the appeal of falsehood and favoritism by the size of the lie and the amount of favoritism, up to the point where it would cause a backlash. Since the race to the top depends on the truth, and that cannot be inflated, the race to the bottom has an inherent structural advantage over the race to the top.

Let’s take this loop and expand it, to see in detail how the Corporate Proxy Movement exploited the loop so well. This requires only two changes. One is to remove size of falsehood and favoritism. For simplicity it is no longer needed. The other is to replace falsehood and favoritism with the details of how the Corporate Proxy Movement creates and transmits falsehood, and how it uses favoritism. The modified diagram is shown on the next page.

This is the supremely efficient and effective political machine that corporate proxies built for their master, the New Dominant Life Form, in only about one generation. It has an amazingly simple structure, which is part of its power. The machine is designed to do one thing and do it well: focus on getting a huge number of high quality false memes transmitted to the right people.

It does this by employing at least seven types of top talent specialists, as shown. The key source for these specialists is the campus indoctrination and recruitment machine. Only the very best are selected, because as the Powell Memo stressed, “Quality control is essential.” To attract the top talent that high quality requires, “Salaries [are] fully comparable to those paid key business executives and the most prestigious faculty members.”

Top talent researchers play a special role. They create the high quality basic false memes that other specialists use in their work, such as writers and speakers. Basic false meme creation is much like basic research. It involves hypothesizing about what false memes would work best in what areas, and then proving, through experimental application on focus groups, test projects, and so on, which is the best choice for the type of deceptive persuasion required.

Let’s follow the loop around. It started with seed money from what is now the conservative message machine investment banking matrix. This is a huge subsystem in itself. Its first donors caused the amount of funding available to be enough to establish the first of the big 80 think tanks, which are where the key people in the gray oval work. This “generous financial support from American corporations” allows hiring the many types of specialists required.

The top talent researchers were the first scholars hired, because no one else could do anything until they crafted the basic set of messages to transmit. These are the high quality basic false memes. While most of these researchers did publish and talk about their work, the real effect was to provide the other specialists with the basic cannon fodder they needed to blow away the puny arguments the opposition (liberals) were shooting into the meme stream. In other words, the top talent researchers preached to the choir, and then the choir sang to the world.
The Corporate Proxy Movement Machine

The goal of this machine is to create and transmit a huge number of high quality false memes, so as to achieve a dominant Race to the Bottom Among Politicians. The ultimate goal, which corporate proxies are unaware of, is to achieve a permanent competitive advantage for their master, which is the New Dominant Life Form. “Top talent” means the best money can buy.

A *meme* is a mental belief learned from someone else. Most of our important values, facts, and rules are memes, because we learned them from others via watching or listening to our parents, peers, friends, teachers, business acquaintances, etc, or by reading, listening, and watching the many forms of media available. Almost none of the socially important values, facts, and rules we use are genetic. Seeing the world from a memetic perspective allows us to see the importance of who controls the public meme stream, as well as the importance of what is in it. Whoever controls the meme stream controls the world.

By hiring so many specialists and transmitting such a high number of high quality false memes, the machine controls enough minds to control the political system. It is that simple.

But then again, it was not altogether that simple. No one figured out how to build the machine until the Powell Memo came along. Such is the power of what science calls a precipitating event.

If the current conditions of a system are close to a certain threshold, a *precipitating event* will suddenly trigger large amounts of change such that a new mode results. For example, when a cloud system is supersaturated with water, the precipitating event of a slight temperature drop can cause an enormous amount of immediate rain. Or when a corrupt politician has been getting lots of bad press, but is still in power and fairly popular, a new “smoking gun” scandal can cause the press and the public to suddenly turn defiantly against him. This can lead to swift resignation or impeachment.

If the Powell Memo had never been written, sooner or later a similar machine would have been built. It would have been different. It probably would have been later, maybe even much later. But the Powell Memo accelerated the evolution of the system in the desired direction, because conditions were ripe for the right
precipitating event. One way to view social system engineering is to define it as accelerating the mемetic evolution of a system in a preferred direction.

Let’s return to our walk around the loop. A high number of high quality false memes transmitted increases decisions to support corrupt politicians. This increases commitment, which moves more people from the stock of Uncommitted Supporters to the stock of Degenerate Supporters. Because they now have more supporters, this increases corrupt politician influence, which in turn increases political results favoring the modern corporation and its allies. Its chief allies are the rich, the military, and in the United States the religious right and the Republican Party. It is members of those groups, plus corporations, who receive all sorts of breaks, such as lower taxes, preferential legislation, patronage appointments, and so on. As favoritism to these groups increases, so does the amount of funding available, and the loop starts all over again.

To summarize the loop, the more and better the deception promoting a system favorable to the New Dominant Life Form, the more favoritism the modern corporation and its allies receive. In short, deception allows favoritism, and more favoritism causes more deception, which causes even more favoritism, and so on.

Now let’s consider another aspect of this formidable structure. The Corporate Proxy Movement Machine has found a way to leverage the way the number of high quality false memes transmitted increases the decisions to support corrupt politicians. This starts at the upper left of the diagram. As Ron Hazen wrote in his article, The Right-Wing Express:

“Stein estimates that 36,000 conservatives have been trained on values, issues, leadership, use of media and agenda development. These are not the elected officials, but rather the cadre of the conservative network. Stein figures that the core leaders of the Big 80 groups he studied are about 2,000 people who make between $75,000 and $200,000 and have all been trained in the Leadership Institute.”

Training your top leadership to think alike and to think well is a very high leverage point. It is represented on the diagram by the way all 2,000 top leaders are trained at the Leadership Institute. This causes united high quality action. One result of this is the way everyone is “on message” all the time. They also speak the message they have been given, via what they normally read that the machine churns out. When an event occurs that needs extra spin, or extra force to make it go the right way, “talking points” papers and special meetings may be used to enhance the pinpoint accuracy and power of the message. The result is the optimum unified message is delivered to the right people, which is what leverages the number of high quality false memes transmitted into a much higher rate of decisions to support corrupt politicians than normal.

The Leverage Points of the Corporate Proxy Movement Transformation

Looking at this structure and the Powell Memo, we see these leverage points:

1. United, well coordinated action.
2. A sufficiently large and steady source of funds.
3. Appeal to a strong primal urge. This was fear of successful attack.
4. The use of top talent to achieve high quality work.
5. The use of top pay to attract top talent.
6. Learn from experience, which is a reinforcing loop.
7. Think tanks. There are places for like minded specialists to feed on one another and develop new, cutting edge ideas that are of great value to the machine.
8. A carefully designed set of different roles to play, in order to create and transmit a high number of high quality false memes.
9. Unified high quality training, which occurred at the Leadership Institute.

Which of these are high leverage points? The question is not quite proper. They are all necessary, because the effectiveness of the machine is an emergent property of the machine’s structure. This structure requires all the leverage points listed above. Take any one away, and the effectiveness of the Corporate Proxy Movement would quickly vanish.

Thus the highest leverage point of them all is the one not listed above. It is the emergent property of the structure to exploit the race to the bottom so well.

Note how almost all the leverage points listed can be used by environmentalists, because they use no falsehood or favoritism. The exceptions, 3 and 8, are easily modified to be usable. Simply change them to “3. Appeal to the strongest calling the intellect has: the search for the truth.” and in 8 substitute the word “true” for “false.”

The most important thing we have learned from this analysis is what basic structure a successful social transformation machine needs to have.
Next we look at another even more relevant transformation. It fits the one the environmental movement needs to go through to a T, because it was an identical transformation in two ways: (1) The adoption of an entirely new problem solving process, and (2) The use of the race to the top.

The Second Age of Reason

Transformation

The Corporate Proxy Movement Machine has a key feature limiting what the Analytical Environmental Movement can learn from it. That machine exploited a race to the bottom. But this is not what the environmental movement can or should do. Instead, it must take the high road, by employing a race to the top. Let’s examine this difference.

The Race to the Top among Politicians is completely different in a fundamental way from the race to the bottom. It cannot be exploited. That is, no one person or group can use the race to the top to gain more from the system than their fair share. Nor can they manipulate it to spread anything but the truth. This is because the race to the top is built on the cathedral of truth, and truth has no higher master.

The long pages of history can offer no larger or better example of the race to the top than the Second Age of Reason. This is because the Second Age of Reason defined truth itself in a new way, and made the race to the top go higher than it had ever gone before. The result was a historical period so intellectually intoxicating that it named itself—the only period of history to ever do so. What name did it choose? The word that means the greatest possible leap to the greatest possible new truth: enlightenment.

What made the Enlightenment such a great leap to such a great new truth? That itself was part of the dazzling beauty of the leap, because the new mechanism was so simple you could hold it in your head in a few simple sentences. It was the Scientific Method, humanity’s greatest invention since agriculture.

The Scientific Method is a five step process that, when performed properly, guarantees the production of new truth. There are two main types of new truths: hypotheses that have been proven false, and those that have been proven true. (We really mean probably false or probably true. “True” really means failure to prove a hypothesis false.) Both types of new truths are valuable forms of new knowledge, because they have passed the acid test of the Scientific Method and so are reliable. This gave Homo sapiens an entirely new kind of knowledge: one that was reliable. This rock solid reliability allows one set of hypotheses to serve as the foundation for a new set, and so on, allowing an entire new field of science to be built in the twinkling of a cosmic eye, as indeed happened to physics, chemistry, biology, astronomy, and many more.

As the Scientific Method spread to each new field where progress had been painfully slow or non-existent before, the same thing always happened: the field exploded into a frenzy of excitement and discovery, as the new built quickly upon the old. The Second Age of Reason employed an entirely new form of reason, and therefore was able to rapidly build entirely new large, useful bodies of knowledge, using an entirely new kind of building brick: reliable knowledge. The result was an intellectual landscape with edifices as towering as any of the physical structures that the hands of men and women had raised.

What was the core dynamic structure that caused this transformation to come about? What were the high leverage points? The answers to these questions, combined with what we have learned from analysis of the success of the Corporate Proxy Movement, should allow us to build the structure the Analytical Environmental Movement needs.

The Dynamic Structure of the Second Age of Reason

The First Dark Age ended when the First Age of Reason began, long ago in ancient Greece when Aristotle (582 to 496BC) invented formal logic. Eager minds could now reason correctly for the first time, because the basic rules for correct reasoning were now known and could be taught. But that beacon of light was snuffed out when the Second Dark Age began around the time of the fall of the Roman Empire. It lasted a thousand years, and ended when the Second Age of Reason began in the early 17th century, due to discovery of the Scientific Method. That event precipitated the greatest transformation civilization has seen since the invention of agriculture, because conditions in the human system were ripe for an equally large transformation.

Those conditions were so simple they can be described in two sentences: Logic had improved so much that it was now hitting the limits of what it could do, as defined by Aristotle and those who came after him. The
key limit it had reached was that it could not translate how the real world behaved into reliable knowledge.

This caused the greatest minds of Europe, as well as elsewhere, to be hungry for a better way. They were desperate for a new way of thinking that would allow them to reach down and pick up the jewels of knowledge they knew were lying all around. All they lacked was the right tool.

These were the conditions necessary for the right precipitating event to cause the Second Age of Reason to begin. The dynamic structure that spontaneously emerged when that precipitating event occurred is shown above.

We need to explain several aspects of this model. One is how it works. The second is how it went through the well known phases of the Technology Adoption Life Cycle (explained below). The third is where the high leverage points are and why they are so powerful. Let’s start with how it works. For brevity the Scientific Method is frequently abbreviated as SM.

Starting at the upper right, the structure began to appear when the precipitating event of the invention of SM occurred. This caused the first rough but useful version of the power of the Scientific Method to appear.

The innovators of the method explained it in person and in writing to their fellow scientists, which increased the amount of logical proof SM is useful. This was possible because 1. Innovators are open to any new technology that can show it offers a better way through logic alone. Some of these innovators (particularly Sir Isaac Newton) were so capable that improvement of SM occurred because they saw the SM as so useful it was worthy of their improvement efforts. This increased the power of the Scientific Method. In the first phase of the Second Age of Reason, this loop is almost all there was. This is because the Scientific Method was so new it had not been applied much at all. Thus at first it depended mostly on logical proof for its appeal.

Logical proof SM is useful is all it took for innovators to go through conversion to a whole new way of thinking and become Committed to the Scientific Method. When they did so they left their old method behind, and were no longer Committed to No Process, because there was none before. Before the Scientific Method all scientists had was the same ad hoc, common sense, event oriented mindset and techniques that most environmentalists are using today. But afterwards they
had a new, ten times as powerful version of the most powerful tool in the world: reason.

The more innovators who Committed to the Scientific Method, the more use of SM occurred. This led to discovery of more reliable knowledge. This in turn increased scientific proof SM is useful. (Here scientific proof means experimental proof that is useful to science, but not that practical and useful in the real world. It is also called basic research.) As more and more scientific proof SM is useful occurred, it was not long before the second phase of the transformation began.

2. Early Adopters are those who find it easy to understand a new technology, once they have seen it used. They do not hesitate to start using it, even if hardly anyone else is.

The second phase of the transformation began when so much scientific proof SM is useful appeared that the early adopters started to outnumber the innovators. The transformation now took on a new flavor, because while the innovators focused on improvement of SM, the early adopters, due to seeing a body of new scientific knowledge grow so fast, and thus the potential benefits of more use of the method, began promotion and defense of SM via writing, speaking, and teaching. This had the effect of increasing SM training and learning, which caused SM users to get even more out of using the SM, which had the effect of increasing the amount of reliable knowledge still more.

An outstanding example of an early adopter who promoted and defended a new paradigm was Thomas Huxley (1825 to 1895). He so passionately, logically, and effectively supported the new theory of evolution that he became known in his own time as “Darwin’s bulldog.” This made all the difference, because Darwin was so shy and ill at ease in public that he could not play that role.

Darwin’s Origin of Species was first published in 1859. Its central hypothesis was that species appeared as the result of the natural process of evolution.

The new theory so threatened the dominant omni

xp (a pervasive memetic life form) of the time (the church), as well as many established scientists who supported the theory of divine creation, that they mounted a ferocious attack. This threatened to carry the day. It was into this breach that Darwin’s bulldog stepped to defend the theory of evolution against its attackers.

Robert Downs, in Books that Changed the World, 1983, page 284, describes Darwin’s supporters in this passage:

“But Darwin was not lacking in stalwart champions. Foremost among these were Charles Lyell, the geologist, Thomas Huxley, biologist, Joseph Hooker, botanist, and Asa Gray, the famous American botanist. Of them all, Darwin leaned most heavily on Huxley, whom he called his ‘agent general’ and who referred to himself as ‘Darwin’s bulldog.’ Darwin was not a controversialist, and never appeared in public to defend his theories. The brunt of the defense was carried out by the able and aggressive Huxley.”

The turning point in the battle between science and religion was the famous attack from Bishop Samuel Wilberforce at the annual meeting of the British Association for the Advancement of Science in June of 1860, which Darwin could not attend due to illness, and would not have attended anyhow because he was uncomfortable defending his theories in public. Robert Downs went on to recap the epic event this way:

“Darwinism was the conference theme. The big gun on the opposition side was Bishop Wilberforce of Oxford. At the conclusion of a forceful address which he believed had smashed Darwin’s theory, the Bishop turned to Huxley, sitting on the platform. ‘I should like to ask Professor Huxley,’ he demanded sarcastically, ‘is it on his grandfather’s or his grandmother’s side that the ape ancestry comes in?’

Carl Zimmer, in Evolution: The Triumph of Man, 2001, page 53, continues the story from there:

“Later Huxley would tell Darwin and others that at that moment he turned to a friend seated next to him, struck his hand to his knee, and said, ‘The Lord hath delivered him into mine hands.’ He stood up and lashed back at Wilberforce. He declared that nothing that the bishop had said was at all new, except his question about Huxley’s ancestry. ‘If then, said I, the question is put to me would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessed of great means and influence, and yet employs these faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion, then I unhesitatingly affirm my preference for the ape.’

“Finally it was John Hooker’s turn. He climbed to the podium to attack Wilberforce. Later he wrote to Darwin about his speech. ‘I proceeded to demonstrate that (1) he could never have read your book, and (2) he was absolutely ignorant of the rudiments of Botanical Science. The meeting was dissolved forthwith, leaving you master of the field.”
[Darwin wrote afterward to Hooker that] “I would have soon have died as tried to answer the Bishop in such an assembly.”

The point is the bigger the new paradigm, the more likely it is to be resisted by those supporting the old paradigm, and hence the critical importance of its promotion and defense by early adopters.

Continuing with the Early Adopters loop, as reliable knowledge grew to a substantial amount, a new phenomenon appeared. That knowledge began to be applied outside the halls of science and basic research laboratories. Large amounts of application of reliable knowledge in the real world began. This led to tangible and often dramatic increases in quality of life benefits, such as a longer lifespan, less hunger, and more creature comforts. This provided a greater and greater amount of quality of life proof SM is useful. This cast such a spell over a large percentage of the population that the third phase of the Second Age of Reason began, as large numbers went through conversion to a whole new way of thinking.

The third phase of the transformation was the most dramatic, because now a majority of the population was beginning to adopt the new technology en masse. The curve of adoption became exponential at this point and shot dramatically upward.

The majority adopted the new technology of the Scientific Method in stages. The first was the Early Majority. They were driven by a strong sense of practicality, and so had to see a large amount of success of the new technology before making their move. For them this was lots of quality of life proof SM is useful. Once this reached a certain threshold, the early majority phase of the transformation began.

The other half of the majority was more hesitant. The Late Majority waited until they could see many peers who are using SM. We are a very social species, so this caused peer pressure to use SM, which as it went high became irresistible. This caused the late majority to also go though conversion to a whole new way of thinking and become Committed to the Scientific Method.

The last phase of the transformation occurred after all of the late majority has adopted the SM, and all that was left was the Laggards. (For simplicity and because it doesn’t matter much the laggards loop is not shown.) These were people who were allergic to new ways of thinking and felt more comfortable with the way they’d always done it—even though there was a string of proof the new way was better. It can take a very long time for laggards to convert. Some never did.

Conversion to a whole new way of thinking is the same as conversion to the use of a new technology, because that’s all the Scientific Method is: a new technology. As the Second Age of Reason progressed, a different loop became dominant as a particular type of technology user went through the conversion experience. Let’s take a closer look at how this happened, from the perspective of:

Evolution is the process of continuous improvement of the fitness of a replicator. Fitness is how well a replicator has adapted to an ecological niche. The higher the fitness, the more the replicator can dominate its niche, up to the point of diminishing returns.

The process cycle has three steps. Replication causes the essence of one generation to be copied into the next generation. During this event random variation occurs. This causes different organisms to have different levels of inherited fitness. Selection causes only those organisms winning the battle of survival of the fittest to reproduce into the next generation, and the cycle starts all over again.

The process of evolution applies to evolutionary replicators of any kind, that is, anything that can undergo these three steps successively. Thus it applies to memetic ideas and not just genetic species. This includes the ideas in this book, which will either survive and evolve to a fitness beyond anyone’s imagination, or they will not. If not, then these ideas, and the species they were intended to save from self-destruction, will perish relatively soon, as all replicators eventually must.
The Technology Adoption Life Cycle

The five phases used in the Second Age of Reason model make up what Geoffrey Moore calls the Technology Adoption Life Cycle, as shown above. This predictable cycle was introduced to the corporate world in 1991 when he published what has become a business classic: Crossing the Chasm. 80

Crossing the Chasm became an instant sensation in high tech industries. From there its message spread to anyone interested in how to better understand new technologies so different that they responded poorly to standard marketing practices.

I believe the central challenge with the ideas presented in part one is not applying them, but getting them accepted by existing environmental organizations. Ideas like process driven, the seven steps of the Analytical Method, the need to model, feedback loops, the race to the bottom, Corruption Ratings, the folly of Classic Activism, and so on are so totally different from conventional wisdom that an allergic reaction (or worse yet, no reaction) will occur unless those promoting and managing these new ideas have a model of why different types of people react the way they do. This model is the Technology Adoption Life Cycle and its five types of technology adopters.

Think of the product of this book as an entirely new problem solving approach, and environmental organizations as customers who need to be sold on the benefits of changing to that approach, or they will continue to fail to achieve their objectives. Keep that perspective in mind as Geoffrey Moore now tells the story of the Technology Adoption Life Cycle in his own words: 81 (Bolding and italics added)

“Whereas other industries introduce discontinuous [radically new] innovations only occasionally and with much trepidation, high-tech enterprises do so routinely and as confidently as born-again Christians holding four aces. From their inception, therefore, high-tech industries needed a marketing model that coped effectively with this type of product introduction. Thus the Technology Adoption Life Cycle became central to the entire sector’s approach to marketing.

“The model describes the market penetration of any new technology product in terms of a progression in the types of consumers it attracts throughout its useful life.

“As you can see, we have a bell curve. … The [customer] groups are distinguished by their characteristic response to a discontinuous innovation based on a new technology.

“Innovators pursue new technology products aggressively. They sometimes seek them out before a formal marketing program has been launched. This is because technology [such as advanced problem solving tools to achieve the goals of environmentalism] is a central interest in their life. At root they are intrigued with any fundamental advance and often make a technology purchase simply for the pleasure of exploring the new device’s properties. There are not very many innovators in any given market segment [such as environmentalists], but winning them over at the outset of a marketing campaign is key nonetheless, because their endorsement reassures the other players in the marketplace that the product does in fact work.”

“Early adopters, like innovators, buy into new product concepts very early in their life cycle, but unlike innovators, they are not technologists [those whose skills allow them to understand the new technology and why it should logically work, which is reason enough to buy it]. Rather they are people who find it easy to imagine, understand, and appreciate the benefits of a new
technology, and to relate these potential benefits to their other concerns. Whenever they find a strong match, early adopters are willing to base their buying decisions upon it. Because early adopters do not rely on well-established references in making these buying decisions, preferring instead to rely on their own intuition and vision, they are key to opening up any high tech market segment.”

Who will be the innovators and early adopters among the millions of environmentalists and thousands of environmental NGOs spread around the world? I would hope that you and your organization will become one of them, because unless there is a critical mass of innovators and early adopters, the rest of the Technology Adoption Life Cycle will never come to pass.

Moore continues with:

“The early majority share some of the early adopter’s ability to relate to technology, but ultimately they are driven by a strong sense of practicality. They know that many of these new fangled inventions end up as passing fads, so they are content to wait and see how other people are making out before they buy in themselves. They want to see well-established references before investing substantially. Because there are so many people in this segment—roughly one-third of the whole adoption life cycle—winning their business is key to any substantial profits and growth.”

Now you can see why a critical mass of innovators and early adopters is so crucial. It’s because without them, the early majority has no “well-established references” on which to base a decision. Thus the fate of humanity hangs on how many environmentalists and environmental organizations become innovators and early adopters.

Moore describes the rest of the Technology Adoption Life Cycle this way:

“The late majority shares all the concerns of the early majority, plus one additional one: Whereas people in the early majority are comfortable with their ability to handle a technology product, members of the late majority are not. As a result, they wait until something has lots of support and tend to buy from large well-established companies.

“Finally there are the laggards. These people simply don’t want anything to do with new technology, for a variety of reasons, some personal and some economic. The only time they ever buy a technological product is when it is buried so deep inside another product—the way, say, a microprocessor is designed into the braking system of a car—that they don’t even know it is there. Laggards are generally regarded as not worth pursuing.”

However there is a hidden trap in the cycle, one that has ensnared countless high tech companies because they had no idea it was there. The same thing will happen to the environmental movement unless it can see the trap and avoid it.

The trap occurs because of:

The Difficulty of Crossing the Chasm

The title of Geoffrey Moore’s book, Crossing the Chasm, comes from the difficulty of going from the early adopter stage to the early majority stage. He uses the diagram on the next page to show the chasm.

Progressing smoothly from one stage to another looks easy, because each customer type can serve as a reference to the next type. While that works fine in normal new technologies, it fails in “discontinuous” ones, because they are so radical that there is a serious, potentially unbridgeable gap between where an organization is now and where it needs to be to adopt the radically new technology.

There are a number of reasons a new technology may be discontinuous. In a marketing effort, which is the area Crossing the Chasm emphasizes, the chasm occurs because the types of people or organizations on each side of the chasm are so different that early adopters do not make good references for early majority buyers. In a new tool adoption effort, which is what applies to this chapter, the discontinuity occurs because the new technology (a formal process, structural thinking, and modeling) is so radically different that organizations adopting it have nothing old to scale up to create the new. Instead, they must learn or create something large and new from scratch. This is usually not easy, due to the all too common presence of change resistance.

For example, to be formal process driven, an organization with only an informal process has to “jump” across the chasm by a large internal reengineering effort. It cannot smoothly scale anything up, but must instead retrain most of its staff, hire perhaps 10% or more new people to get the critical skills it doesn’t have, and completely change the mindset of almost everyone in the organization. In a case like this, crossing the chasm will be difficult because people usually do not handle large changes of this type easily or quickly.
Now let’s return to the marketing viewpoint. This is also important, because to get individuals or organizations to accept change, you have to market the new ideas to them. A large marketing chasm exists between early adopters and the early majority, because the two customer groups are so different.

The main difference is early adopters buy into new technology because it is a change agent. It requires much learning because it is so different. It may even require reengineering an entire organization, or starting a new one. But that is worth it because the potential gains are so high.

By contrast, the early majority is generally much more conservative. They don’t want to turn anything upside down. All they want is incremental improvement over the way they are currently doing things. Moore describes them this way: “They want evolution, not revolution. They want [new] technology to enhance, not overthrow, the established way of doing things. And above all, they do not want to debug somebody else’s product. By the time they adopt it, they want it to work properly and to integrate appropriately with their existing technology base.”

For example, here is what the CEO of one large environmental organization wrote, in response to reading the first three chapters: (Italics added)

“…an organization like the [name of organization] is unlikely to embrace an entire new approach at once, however valid. I think you and your colleagues will feel less frustrated, and will make more rapid progress, if you seek to influence the ongoing dialogues on various issues within the [name of organization] as well as offering your own entirely new approach. …this is an organization that often responds better to a series of coordinated, incremental nudges than to a big, bold, new idea.”

Note the plea for “a series of coordinated, incremental nudges” rather than “to embrace an entire new approach at once.” This is a perfect example of how the early majority responds to discontinuous change. They know it is probably good for them, (as the phrase “however valid” shows here) but they just don’t want to do it, because it is too much change too fast. Avoidance of discontinuous change even when obviously needed is one of the many forms of change resistance.

Given this model of behavior, it’s easy to predict what might happen when this book is published. There could be a lot of interest, and quite a few innovators and early adopters. But that might be followed by a lull in any further adoption, and the “fad” of these innovative ideas would come to a quiet end. It would have failed to cross the chasm.

How can that be avoided? And how can we get enough of the right innovators and early adopters to help us find a way to cross the chasm?

We will take up these questions shortly in the chapter on Solution Convergence. But first we must complete our analysis of why the Second Age of Reason worked the way it did. That analysis remains incomplete until the high leverage points have been identified and explained.

The Three High Leverage Points of the Second Age of Reason

There are two main steps to using high leverage points successfully: identifying where they are and figuring out how to push on them correctly. The System Understanding step of the System Improvement Process identifies them. The next step, Solution Convergence,
uses the results of the System Understanding step to quickly converge on the solution elements that will push on the high leverage points well enough to solve the problem.

Once the precipitating event of the invention of SM occurred, the dynamic structure of the Second Age of Reason spontaneously appeared. The reason it did so is that the Scientific Method contained the ability to create its own high leverage points.

Unlike a marketing, military, or political campaign, there was no one managing the Second Age of Reason. It happened without a central manager of any kind. Instead, it was a powerful idea that self-managed its own rapid acceptance, through the use of three kinds of proof it was useful. These three kinds of proof are the three high leverage points.

**High leverage point 1** - The first high leverage point to appear was logical proof SM is useful. All it took for this to happen was logical inspection of the method. For the first few people who adopted it, the innovators, this was enough to cause their conversion. It also caused them to want to improve the method, so that it would be even more useful, which caused improvement of SM, which allowed the 1. Innovators reinforcing loop to appear.

A high leverage point is a place in a system’s structure where deep structural change can be made with little effort. The exact point used here is the strength of the logical proof something is true, combined with the size of the potential benefits if it is true. Here the potential benefits were as big as science could imagine: the opening of the doors to a new universe, one filled with reliable knowledge.

Without the built-in ease of logical proof that it was useful, the Scientific Method would have never caught on. It would have been unable to establish the first loop necessary for getting started.

The lesson here is that for any new tool to manage its own acceptance, it must have a very strong, built-in, logical proof that it is extremely useful. That proof must be clear, irrefutable, and have a certain elegant simplicity that appeals to the deeper valleys of the intellect.

**High leverage point 2** - The second high leverage point to appear was scientific proof SM is useful. This too was built into the tool, because the tool was so powerful that it caused a surprisingly quick accumulation of new reliable theories to appear. These theories, such as the ones expressed in Newton’s *Principia Mathematica* in 1687, so excited the scientific community that a large number of early adopters appeared almost overnight. Like Newton, they began writing, speaking, and teaching about the benefits of the new tool. This caused more scientists to learn how to use the tool or how to use it better, which caused even more reliable knowledge to appear. This established the 2. Early Adopters loop.

These were definitely early adopters, because so far there was only mostly scientific proof the SM was useful. There was not yet much application of reliable knowledge, and so there was very little quality of life benefits yet, such as better machines and better medicines. There was just not much practical proof the new tool was useful, and so the early majority held back.

But in the case of the Scientific Method, the tool was such a quantum leap over anything that had come before that it took only a few successful applications by early adopters to cause a near stampede by the usually more hesitant early majority, who began to adopt this phenomenal new device as fast as they could. Here is one example so influential that it set a new course for biology, medicine, and all of science: (Italics added) 82

“By 1600, the Renaissance in Europe had brought about an intellectual awakening immediately affecting the natural sciences. In Italy, fifty years earlier, the founder of modern anatomy, Andreas Vesalius, disproved Galen’s theory that there were pores in the septum of the heart which directly transmitted blood from the right to the left chamber. About the same time, Servetus, who was later burned at the stake for holding views considered heretical by the Calvinists, stated his belief that blood circulates through the lungs; he did not, however, recognize the heart as the pumping organ.

“To the brilliant and incisive mind of the English physician William Harvey fell the task of discovering and formulating an orderly, systematic and scientific set of principles which would finally unveil the mystery of blood circulation and of the various functions of the heart.
Throughout his life, Harvey had a predilection for medical research and experimentation, rather than for the practice of medicine. In 1616 he began lecturing before the Royal College of Physicians on the circulation of the blood. Though by this date Harvey had become convinced of the validity of his theories on blood circulation, another twelve years of experimentation and observation passed before he was ready to publish his conclusions. Finally, in 1628, his small seventy-two page volume, considered by many authorities to be the most important medical book ever written, was published in Frankfort, Germany.

"In an introduction and seventeen concise chapters, Harvey gives a clear and cohesive account of the action of the heart and of the circular movement of the blood around the body.

"On the basis of his experiments Harvey noted that the heart’s contraction forces the blood out; further, that as the heart contracts, the arteries receive the blood and so dilate. The heart, actually a muscle serving as a kind of pump, forces continuous circulation of the blood.

"The momentous discovery, in short, was that the same blood is carried out by arteries and returned by veins, performing a complete circulation. The single missing link, the capillaries, minute vessels through which the blood cells pass from the arteries to the veins, was discovered only a few years after Harvey’s death by an anatomy professor at Bologna, Marcello Malpighi.

"To convince the skeptics, Harvey used the quantitative method. If the blood sent out by the heart in a single day is measured, he reasoned, the quantity is much in excess of all the food taken in and digested. Harvey thus concluded that ‘the blood could be furnished in no other way than by making a circuit and returning.’

"Harvey’s use of animals for experimental purposes was an innovation in scientific research. He may be rightly regarded as one of the founders of the science of comparative anatomy.

Aside from these remarkable discoveries, Harvey’s greatest contribution to science and medical research was his introduction of experimental or laboratory methods. The essence of Harvey’s method was, as he states, 'to search and study out the secrets of Nature by way of experiment.'

"The history of medicine goes back several thousand years before the birth of Harvey. Physicians had already learned to recognize and to describe with a fair amount of accuracy the principle diseases afflicting mankind. Observation, however, while important, is not in itself enough and frequently leads to erroneous conclusions. Herein lies the major difference which distinguishes Harvey from his predecessors. Little handicapped by superstition or by reverence for antiquated theories, Harvey went beyond superficial observation: he drew up hypotheses and tested them by experimentation. He was the first scientist to adopt the scientific method of experiment for the solution of a biological problem, a method which all his successors of significance have since followed."

High leverage point 3 - As more early adopters like Harvey and Newton caused a large body of reliable knowledge to appear, the inevitable happened. That knowledge was applied, quality of life radically improved, and proof of the power of the Scientific Method began to spread over Europe and later the globe. This caused the 3. Early Majority loop to activate and the transformation became unstoppable. But this could only occur once quality of life proof SM is useful rose to a high enough level to start converting the early majority by the thousands, and later by the millions. Seen from this viewpoint, it’s as if all the two previous high leverage points did was create the conditions and forces necessary for the third and final high leverage point to activate.

This is because these three high leverage points form an auto-activation chain. Once the first high leverage point in it is activated, the rest are automatically
activated, one at a time, as the threshold conditions necessary for their activation are reached.

This is not the only auto-activation chain in our work. Another is present in the Dueling Loops of the Political Powerplace model, presented in the second chapter. The full model behind that one is covered in detail in the manuscript to *A Model in Crisis*. It has a three link auto-activation chain. Each link is a high leverage point. The first link is the general ability to detect political deception, which we have already discussed. The second and third links are discussed in *A Model in Crisis*. They are repulsion to corruption and quality of group decision making. The precipitating event is the solution elements it will take to activate the first link in the chain. These elements were presented in chapter three.

An auto-activation chain consists of the preconditions required, the precipitating event that activates the first high leverage point, and the rest of the high leverage points that are successively activated. Auto-activation chains can not only be spotted in analyses of the past—they can be designed into new, future structures. This makes the auto-activation chain itself a meta-high leverage point. It is one of the most potent tools of all in the complex system problem solver’s toolbox.

Let’s return to the model we’ve been discussing. Once the **3. Early Majority** loop was activated, it was only a matter of time until so many people were Committed to the Scientific Method and use of SM was so high that the **4. Late Majority** loop was activated. This required no particular high leverage point of its own, because activation of this loop is an emergent property of the structure as a whole.

Next let’s express what we have learned in the System Understanding step with:

**The Transformation Strategy Map**

Adding the defects and flaws found in our analysis gives us the revised strategy map shown on the next page. It doesn’t contain everything we learned—only the most important aspects that will serve as our strategy to first understand the key causes of the problem.

The symptom of **not pushing on high leverage points** has three causes. **Pushing on low leverage points** was found in chapter two in the Dueling Loops of the Political Powerplace model. **Pushing on high leverage points poorly** is one we have implied but not discussed. Some high leverage points are being pushed on, but so poorly they are ineffective. For example, efforts like factcheck.org, vote-smart.org, and various “let’s find the truth” projects and articles attempt to increase the general ability to detect deception. They do this by providing facto, detecting deception, and letting the public see the real truth. But because the managers of these well intentioned efforts remain unaware of the existence of the high leverage point of general ability to detect deception, as well as the structure of the problem, their efforts cannot be focused correctly enough to make enough of a difference.

The third cause of the lower symptom is **insufficient amount of force on high leverage points**. This is because the amount of force applied times where it is applied equals the effect on a system.

The most important defect is the one in bold: **faulty analysis of difficult problems**. Its critical role is shown by the large number of arrows going in (five) and out (two) of it. Notice how the five inputs cause a faulty analysis, which in turns causes pushing on the wrong leverage points or pushing poorly.

But much more important than this defect is the Illusion of the Right Process reinforcing loop. As discussed in chapter two, the environmental movement is now heavily committed to **dependence on Classic Activism**, which is the key defect. The more it uses that process, the more the movement is using a problem solving process that works on easy problems, but fails on more difficult ones. As the analysis in chapter two showed, the more difficult problems are those exhibiting strong resistance to adopting the solution.

Because the process works on easy problems and not difficult ones, it causes success on easy problems. This creates the Illusion of the Right Process, because the process appears to be working. After all, it solved most of the problems the environmental movement encountered at first. But as we have seen, the process then became less and less effective, until by the beginning of the 21st century it has become mostly ineffective.

Nevertheless the illusion is so strong that the environmental movement clings to the belief that they are still on the right path, as the following common reaction to the ideas in part one illustrates. This was from a mid-level environmental organization manager who has an MBA, and thus should perhaps not be so easily led astray:

“I realize from your perspective that the environmental movement might look like a failure and our approaches irrational; however from my perspective it does not. It is a work in progress that I am delighted to participate in. There have been and continue to be many successes, some small and some major. Because you are working outside of the movement and are at home, you
Do not see the progress. You see the failures because they are more widely reported.”

As a result of the present strength of the Illusion of the Right Process loop, the easy problems continue to be solved, but the difficult ones are not, because of **faulty analysis of difficult problems**.

An important defect causing the illusion is low ability to tell good from bad practices. If you cannot tell the difference, then success on easy problems makes it look as if the process should work on all problems, because whether they are simple or difficult doesn’t matter. These two defects combine to increase **dependence on Classic Activism**.

Low ability to tell good from bad practices is caused by the low amount of correct analysis components that have accumulated over the lifespan of the environmental movement. This is identical to the low amount of correct ideas (and high amount of false assumptions) that had accumulated in science until the Scientific Method was invented. The lower the number of correct analysis components, the worse the **faulty analysis of difficult problems**.

The low amount of correct analysis components is due to a body of knowledge not derived by experimentation, which in turn is caused by low process efficiency. This is because the present process, Classic Activism, is grossly inefficient. It is about where science was before the invention of the Scientific Method. Because Classic Activism is so inefficient, even if 100% of environmentalists worked 24 hours a day for 100 years, they would still be unable to solve the global environmental sustainability problem. The same thing happened in the days of pre-science, when scientists struggled for centuries, and in some cases millennia, to make historic advances such as solving the problem of what causes infections and why do the planets behave the way they do? Thus the poor ability of Classic Activism and pre-science to solve difficult problems stems from the same fundamental flaw: low process efficiency.

Pre-science was unable to detect its fundamental flaw of a body of knowledge not derived by experimentation for thousands of years. That flaw lay hidden to every mind in the world until the invention of the Scientific Method, demonstrating how challenging flaws can be to see.

In transformations from old to new paradigms, those believing in the old paradigm have blind spots that make it impossible to see flaws like this one. This is what is occurring here. The present process paradigm of the environmental movement is Classic Activism. This
process excludes the use of the Scientific Method to test the hypothesis that a solution is correct, because it blindly assumes that at least one of the three standard solutions of Classic Activism must be correct. This creates a blind spot that makes it impossible for classic activists to see that the flaw of a \textit{body of knowledge not derived by experimental proof} exists, and that it is the flaw leading to why the modern environmental movement is consistently failing to solve the difficult problems it now faces.

\textbf{Groupthink}

This blind spot is one reason for the large amount of change resistance to the ideas in this book. However, it is not the main reason. That appears to be the generations of dependence on Classic Activism that has led to a case of groupthink the model calls the Illusion of the Right Process. Like all peer supported illusions, this one will not be easy to break. Behavior like this is normal for large paradigm changes, and is part of the problem to solve.

Psychologist Irving Janis invented the term groupthink in 1972. His original definition was “a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members’ strivings for unanimity override their motivation to realistically appraise alternative courses of action.” Janis intended the word to be chillingly reminiscent of the terms doublethink, duckspeak, and newspeak, as coined and used by George Orwell in his dystopian novel \textit{Nineteen Eighty-Four}.

The entry at en.wikipedia.org/wiki/groupthink describes groupthink as “a process by which a group can make bad or irrational decisions. In a groupthink situation, each member of the group attempts to conform his or her opinions to what they believe to be the consensus of the group. ...this results in a situation in which the group ultimately agrees upon an action which each member might individually consider to be unwise.” (Italics added)

Groupthink can affect anywhere from a small group up to an entire population. In this case the group is all environmentalists who share the consensus that Classic Activism is The Way.

\textit{When reality differs from the consensus a group holds, groupthink causes bad decisions.} Wikipedia lists the seven symptoms this is happening as:

1. Incomplete survey of alternatives.
2. Incomplete survey of objectives.
3. Failure to examine risks of preferred choice.
4. Failure to re-appraise initially rejected alternatives.
5. Poor information search.
6. Selective bias in processing information.
7. Failure to work out contingency plans.

All of these are present here. Let’s examine a few:

“Incomplete survey of alternatives” leads to limiting solution alternatives to the only ones that Classic Activism knows: 2, 3, and 4, as introduced on page 34.

“Incomplete survey of objectives” means not considering all components of an objective. For example, environmentalism has never formally defined all the components of the sustainability problem definition. It has only defined the goal state, and even that only vaguely. Left out are the system, constraints, the deadline, and the level of confidence. This causes such an incomplete top objective that there is no correct way to measure problem solving success or evaluate competing solution alternatives.

The rest of the seven symptoms are more self-explanatory. The reason for all of them is the strong group assumption that “We know what we’re doing. Classic Activism will work. It always has and it always will.” If a group is certain something will work, then there is no need to survey other alternatives, be clear about the top objective, examine the risks of the chosen solution, and so on.

\textbf{The Rest of the Map}

As we enter the flaws section of the strategy map, notice how our conclusions become more subtle and deeper. This is because we are drilling down from symptoms, to defect, to flaws. \textit{The deeper we go, the less obvious the cause and effect relationship is.} Proof of this is how long it took science to discover its central flaw was a \textit{body of knowledge not derived by experimental proof}.

Another flaw is the \textit{environmental movement is fragmented}. This is a lot more obvious than most of the other flaws, but it is a deep underlying cause nevertheless. It causes \textit{dissipation of problem solving effort}, which in turn increases \textbf{faulty analysis of difficult problems}, because of lack of focus and low coordination of effort.

\textbf{Dissipation of problem solving effort} also causes an insufficient amount of force on high leverage points, because effort is so unorganized no one can focus it on the high leverage points that have been correctly identified.

Moving over to the left side of the map, \textit{not enough top talent} is a direct contributor to \textbf{faulty analysis of difficult problems}. This is because the more capable the problem solvers are, the better their analysis is going to be, up to the point of diminishing returns.
But what is the cause of not enough top talent? There are many. I believe the two top contributors are lack of top pay and lack of sufficient inner fulfillment. This follows from the competitive marketplace that exists for top talent and an application of Maslow’s Hierarchy of Needs. (See page 200 for the hierarchy.)

In the business world, there is little doubt that the top attractor for top talent is top pay. This is because the top reward for top performance is top pay. This relationship is built into innumerable job contracts, stock bonuses, human resource department strategies, and the entire workforce culture.

But pay alone is not enough, as Maslow showed and most behaviorists have come to agree. Peer esteem, self esteem, and self fulfillment are also needed, because pay alone physically does not provide any of those. It does provide peer esteem and self esteem indirectly, through your peer’s admiration of your pay, and your own satisfaction of goal accomplishment.

But pay does not seem to contribute at all to the highest need of them all, self fulfillment. This is what is most needed to attract, retain, and sustain the very highest talent. This is because outside of the for-profit business world, the very best seem to be motivated mostly by self fulfillment. This can be seen in this representative quote:

“Science knows only one commandment: contribute to science.”

Next, what is the cause of lack of top pay? Again, there are many reasons. But the main one that has the potential to improve pay for environmentalists more than anything else is that funding is not sufficiently based on actual ability.

Environmental organizations work quite differently from for-profit corporations, because they are non-profit and have social goals, rather than financial ones. As a result, it is tougher to measure work contributions in the non-profit sector. Performance is thus usually measured by an odd, haphazard collection of ways, including ability to raise funds, to increase membership, to generate publicity, to lobby successfully, and so on. But these measures are so different they cannot be equated into one single reliable indicator, as can how much profit a for-profit corporation is making or how much an employee is contributing to profits. The result is there is no reliable standard measure of actual problem solving ability.

This flaw is the real reason for lack of top pay, because if funding sources cannot tell who to best donate their money to, then they must guess. That means that the real top talent individuals and organizations get about the same amount of funding as anyone else. But if donors knew who the real performers were, they would get the lion’s share of the money.

The third cause of not enough top talent is lack of training in appropriate analytical techniques. Conceptually, top talent productivity equals number of people times motivation time skills. If that third factor is low, the other two matter little.

There is an additional effect occurring due to funding is not sufficiently based on actual ability. This increases the problem of funding is not directed to best problem solving strategies. Strategies are independent of people and organizations. Ultimately they live and die on the basis of financial support. The Darwinian struggle that should be going, the one that would cause those strategies with the highest actual ability to solve the problem to thrive, is simply not present. As a result, high fitness problem solving strategies are not favored at the environmental movement level. Because of that, the lower fitness strategies dominate people’s thinking, resulting in faulty analysis of difficult problems.

The usefulness of the strategy map lies in the way we keep drilling down, from top to bottom. Starting with the symptoms, we ask what is their cause, and what is the cause of the cause, until we get to the bottom. Currently the bottom is the flaws shown on the map. If we can resolve these flaws then the problem is solved, because the flaws are the high leverage points. That is where we must focus the remainder of our work, rather than the map as a whole. This is much like the doctor who, after she has made a diagnosis, focuses all her efforts on a treatment plan based on that diagnosis, and little else.

This particular strategy map is more of a causal flow diagram than a bona fide strategy map designed to be quantified and serve as an actual performance management tool. An additional or better map that could do that would be part of a serious application of Analytical Activism.

Now let’s take what we’ve learned from the Powell Memo and the Second Age of Reason and distill it down into a model that gets as close as possible to the essence of large social transformations.
The Basic Structure of Process Revolutions

In *The Structure of Scientific Revolutions*, a short book published in 1962, Thomas Kuhn stunned the scientific community with the theory that the history of science is not a slow, progressive, evolutionary accumulation of knowledge. Instead, science is continually undergoing a predictable cycle that includes violent intellectual revolutions. This violence stems from the way old paradigms are shattered by new ones, and the way supporters of old and new paradigms battle it out until the new one wins. What changes during a Kuhn Cycle is the model of understanding a scientific field uses to explain a related set of phenomena, such as quantum physics or the theory of evolution. The five steps of the cycle are shown.

In Kuhn’s terminology, a **model** is the shared mental model (really a problem solving process plus facts) being used by a scientific field to solve problems in that field. At first, in the (1) **Normal Science** phase, the model/process works so well that it is supported by all. But then, as new problems arise that it cannot solve, the (2) **Model Drift** phase begins. As more and more problems remain unsolved, Model Drift increases. Eventually it gets so bad that the (3) **Model Crisis** phase starts. In this phase those using the model have fully awakened to the fact that their beloved model, the one that worked so well for so long, is now ready for the trash heap because it no longer works. But because they have nothing to replace it with, the model users are in crisis. They cannot make sound decisions anymore and they know it. About all they can do is try to patch and plug the old model, and use brute force to try to make it work better. While such heroic effort is commendable, it cannot be productive because the model is broken. It no longer works.

The Model Crisis phase continues until the first realistic candidate to become the new model/process appears. This initiates the (4) **Model Revolution** phase of the Kuhn cycle. In this phase the old paradigm and the candidates to become the new paradigm battle it out in a prolonged struggle for survival of the fittest. Eventually the competition evolves a single viable replacement for the old paradigm, and the jostling between those supporting the old and the new starts to quiet down. This signals the beginning of the (5) **Paradigm Change** phase, during which the new paradigm is taught to newcomers and those using the old paradigm. This may take a few years or decades, but it often takes generations, because there are usually so many people habituated to the old paradigm that despite all evidence the new way is ten times better, they refuse to give up the old way, and take it with them to the grave.

The Paradigm Change phase is where severe change resistance occurs. People find it hard to change core beliefs. As John Kenneth Galbraith explained, “Faced with the choice between changing one's mind and proving that there is no need to do so, almost everybody gets busy on the proof.”

But with the passing of enough time, the new paradigm gains the support of the majority and becomes the new (1) **Normal Science**. The cycle then starts all over again, because our knowledge about the world is never complete.

The Kuhn Cycle applies not only to scientific models but to any body of knowledge whose use is critical, whose construction is evolutionary, and whose progress is punctuated by revolutions from the old and new. Thus it applies to the social transformations this chapter has been studying.

This brings us to the following proposition:

All major social transformations occur due to invention of a radically better process. It follows that all large social transformations are process revolutions.

Let’s examine a few process revolutions. The greatest invention of mankind is widely considered to be agriculture. While this does have its technical side, its larger side is the epic social transformation it caused. People could now feed themselves so much more efficiently that permanent large cities, extreme social specialization, and population growth became possible. Without the discovery of the process of saving the best seeds, replanting them in the same fields, harvesting the crop, and storing it until needed, you and I, if we had existed, would still be hunter gatherers, with an average life expectancy of about 28 years.

Moving forward about 8,000 years, mankind’s second greatest invention was the first formal rules of logic, by Aristotle in 500 BC. People could now reason correctly for the first time. This led to the blooming of the Ancient Greece and the explosion of new knowledge, because now probing minds could reason forward correctly, using the process of logical reasoning.
Moving forward another 2,200 years, the third greatest invention was the Scientific Method in the 17th century. This is the grandfather of all modern processes, because it is the only known way to produce reliable knowledge. Since modern civilization cannot move forward, much less continue to run, on anything less than reliable knowledge, all of science and all of industry is built on the cornerstone of the Scientific Method.

What was the greatest change in methods of government in the last 200,000 years? Besides the invention of the very idea of government and the social contract, it was the invention of the democratic form of government in the 18th century, starting with France and the United States.

What about the Industrial Revolution? That became possible due to the radically better processes of interchangeable parts and manufacturing step job specialization, combined with universal power.

What all these social revolutions had in common was the invention of a radically more efficient process. Radically better doesn’t mean just a little better—it means several orders of magnitude better. It means a quantum leap in production efficiency so large that the unimaginable becomes commonplace, and the impossible becomes possible.

In 1971 the Powell Memo invented a new process for producing and delivering rationales for supporting preconceived ends. The process was so efficient that the American conservative movement was able to rise to unimagined power in a mere 30 years.

This raises an obvious question: Is it possible for environmentalists to invent a process that is even more efficient than the Corporate Proxy Movement Machine, and use it to usher in the Age of Transition to Sustainability and the Third Age of Reason?

I think it is, because this new process can be based on the race to the top, instead of the race to the bottom. While the race to the bottom has the structural advantage that falsehood and favoritism can be inflated and the truth cannot, the race to the top has an even bigger structural advantage: if the general ability to detect political deception can be increased to a high level permanently, the race to the bottom will collapse forever, because its advantage no longer works.

But that is not the question this chapter is asking. The question on the table is this: What is the radically more efficient process that needs to replace Classic Activism? The answer is what this book is all about: Analytical Activism.

This chapter will present two simulation models as part of its analysis of how the system works the way it does. The first is shown below.

**Overview of Model Structure**

The model is based on two key concepts: The first is that the old paradigm of the old process is battling for the same stock of Not Infected Neutralists that the new paradigm is. Thus the structure of the model is very
similar to the structure of The Dueling Loops of the Political Powerplace that was covered in chapter two.

The second concept is process efficiency, which is defined as the reduction in normal cost of producing a product. For example an 80% efficient process can reduce the normal cost of solving a problem from $100 to $20. A 100% efficient process is impossible due to diminishing returns.

The better a process can help its users to achieve their objectives, the higher the appeal that process has. This appeal is expressed on the model as old paradigm product appeal and new paradigm product appeal. The product is whatever the process produces, such as a mincemeat pie recipe allows its process user to produce a tasty pie every time, if they follow the recipe.

How process efficiency produces a product will be described in the next model in this chapter. In this model it is treated as a black box. Efficiency is defined as the reduction in normal cost of producing a problem from $100 to $20. A 100% efficient process is impossible due to diminishing returns.

Efficiency as falling from 60% to 20% over a model drift length of 20 years.

The model is generic. It could be used to model the way the new process of the Scientific Method replaced the old one of mere corporate lobbying and behind the scenes deal making. Or it could be used to model the way the new process of the Corporate Proxy Movement replaced the old, slow, terribly unproductive process of trial and error used by the alchemists. Or it could be used to show how the old paradigm of Classic Activism is about to give way to the new paradigm of Analytical Activism.

What we will do is use a series of simulation runs to show how any process revolution works. Except for the first three runs, all runs will follow the same pattern: First the old process attracts lots of Old Paradigm Supporters, which is the (1) Normal Science phase of the Kuhn Cycle. Then the old process starts to lose supporters as its efficiency and hence its appeal falls, as the Kuhn Cycle enters the (2) Model Drift phase. In the (3) Model Crisis phase, many or most supporters have fled the old paradigm but, because there is not yet a new one, they are forced to be neutralists and have no reliable process on which to base their work. But then the new paradigm (NP) comes to their rescue when the NP beginning year is reached, which begins the (4) Model Revolution phase. During this phase the appeal of the old paradigm product appeal and the Old Paradigm Supporters battle it out against the new paradigm product appeal and the growing number of New Paradigm Supporters. Once the percent new paradigm supporters exceeds 50%, the new paradigm has won the battle and the (5) Paradigm Change phase begins. Eventually the percent new paradigm supporters levels off to an equilibrium, which means the new paradigm is now the new (1) Normal Science. This sets the stage for the cycle to someday start all over again.

A major difference between this model and The Dueling Loops of the Political Powerplace model is there are now two factors of memetic infectivity. (A meme is a mental belief. Memes “infect” new minds when they are replicated from one mind to another.) One factor is the number of exposures to new memes. The other is the potency of these exposures, which on the model is called appeal. The number of exposures, appeal, memetic in-

<table>
<thead>
<tr>
<th>Process Revolution Model Variables</th>
<th>Simulation Runs</th>
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<tbody>
<tr>
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<td>200 year long runs</td>
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<tr>
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<td>200 200 200</td>
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<td>Old Paradigm Supporters</td>
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</tr>
<tr>
<td>Not Infected Neutralists</td>
<td>32% 71% 99%</td>
</tr>
<tr>
<td>New Paradigm Supporters</td>
<td>0% 0% 0%</td>
</tr>
</tbody>
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fectivity due to exposure frequency, memetic infectivity due to appeal, and incubation time are used to calculate the infectivity rates in a manner that approximates the way people become infected with new ideas in the real world.

Although the model periods are in years, they could just as well be months, weeks, or decades, depending on the type of process. Reasonable values have been used for all model variables. Changing them does not alter the fundamental behavior of the model, because that is determined by the structure of its three main feedback loops.

The Simulation Runs

The table on the previous page lists the simulation runs we will examine. The changeable variables are varied from run to run so the analyst can try different scenarios. Each scenario is a reproducible experiment. The lower three variables are the result variables. These are the outcome of a simulation run, after equilibrium is reached. A successful paradigm change has a very high (or very dominant) percentage of New Paradigm Supporters. The clearly dominant supporter cells are filled with dark gray. The arrows indicate values that have not yet reached equilibrium.

Now let’s run the model and use it to better understand how process revolutions behave. Our goal is to gain insights into how we can best design the structure it will take to transform the environmental movement from Classic to Analytical Activism.

Run 1 – We start with the most basic of all possible scenarios: The NP beginning year = 200, so the new paradigm never appears. OP beginning and ending process efficiency both equal 90%. Running the model with these values gives the graph show below.

This is very basic behavior. Old Paradigm Supporters starts out low, at 1%, as it does in all runs. Due to the appeal of 90% it starts growing. As it does, the reinforcing loop of Illusion of the Old Paradigm causes supporter growth to accelerate exponentially, because the more supporters there are, the more exposures. But as the stock of neutralists begins to be exhausted, growth slows down, and eventually reaches a steady state equilibrium of 68% Old Paradigm Supporters. This illustrates the classic “S curve” seen so often as growth starts out exponentially but later encounters its inevitable limits and does not overshoot.

Because the new paradigm never starts, the percent of New Paradigm Supporters stays at 0%. In this and all runs the initial number of New Paradigm Supporters is zero.

Why is the upper loop called the Illusion of the Old Paradigm? Because the Old Paradigm Supporters are under the illusion they are using the best process available. In the first three scenarios this is true, because there is no better alternative. But in latter scenarios where there is also a new and better paradigm it is not true.

Next let’s see what happens when process efficiency changes during simulation runs.

Run 2 – Process revolutions occur because the old process has dropped considerably in efficiency. It is that low efficiency that causes the search for a new and better process to begin. To explore this behavior, let’s set OP ending process efficiency low, at 30%. The result is shown below.

This is dramatically different. The Old Paradigm Supporters rise to a high level as they did before. But this time they soon start to fall, due to falling process efficiency. Because even a low efficiency of 30% has considerable appeal, all supporters do not abandon the process. Some remain, causing the Old Paradigm Supporters to level off at 29%. This shows how, under the right conditions, a discredited paradigm can still have a significant minority of supporters generations later—if there is no better alternative.

Run 3 – Now let’s lower ending efficiency a little more, to 20%. How much will this lower old paradigm support at the end of the run? Probably only a little bit more.

But that’s not what happened. Instead, Old Paradigm Supporters falls to zero. This shows that it is possible for a “threshold of minimum efficiency” to exist. Above that threshold, which appears to be about 25% in this case, a significant minority of supporters will be attracted. But below the threshold they all abandon the process.
Why does such a threshold exist? Looking at the structure of the model, it’s because the Illusion of the Old Paradigm loop requires a certain minimum rate of infection to keep enough supporters to produce what it takes to infect the next generation of supporters. Below the threshold the loop collapses. Above the threshold it grows. Finding or creating thresholds and exploiting them is a key strategy in social system engineering.

This run has enough behavior to represent the first three phases of the Kuhn Cycle. First we see how, during a process revolution, initial high appeal leads to lots of supporters at first. This is the (1) Normal Science phase. But as process efficiency and appeal drops, the (2) Model Drift phase begins, as it does here in years 25 to 80. After that, so many supporters have lost confidence in the process that they have abandoned it and have become neutralists again. The process now has little support, which is the (3) Model Crisis phase. If there was a better process the crisis could end, but in this scenario it cannot, because no alternative appears.

What are all those neutralists (and some supporters) doing after a paradigm fails? Why looking for a better way, of course. And because there are lots of them, and they are no longer devoted to the old paradigm as their raison d’être, they just may find it.

Run 4 – In this run they do find a better way. The NP beginning year is changed to 80, causing the new paradigm to begin its appeal then. Now we have a very exciting educational graph that tells quite a story.

The biggest story is that because of the appearance of the new paradigm, all those neutralists that abandoned the old paradigm now have a new paradigm to support. But because efficiency falls off in the new paradigm as well, it goes through the same rise and fall pattern as the old paradigm. If a third paradigm appeared another rise and fall could occur. A large number of paradigm cycles can occur, as indeed they have in areas such as types of government and scientific fields.

To more deeply understand what’s happening, below the supporters graph is a graph of the appeal variables. These are the behind the scene forces that are driving what is much easier to see: who supports what. Complex social system problem solvers need to cultivate the unconscious habit of thinking in structural terms of what is causing superficial behavior, such as what is causing the symptoms of unsustainability, and thinking one level deeper for what is causing that, and so on, until they arrive at a model of understanding complete enough to design a solution without guessing.

Let’s walk though the behavior of this scenario, using it to understand the environmental movement.

As before, initial high old paradigm product appeal causes lots of neutralists to become infected with the old paradigm and move to the stock of Old Paradigm Supporters. Once this reaches a maximum, the (1) Normal Science phase of the Kuhn Cycle begins. This corresponds with the success that environmental Classic Activism achieved in its golden years: the 1960s and 70s.

But the process of Classic Activism had an Achilles heel: it only worked on a small subset of problems, which were the easy problems the environmental movement tackled first. But as time rolled by, the movement ran out of low hanging fruit to pick, and was forced to move on to the more difficult problems. Because the old paradigm of Classic Activism could only handle easy problems, its efficiency began to fall. This caused the (2) Model Drift phase to begin, which on the appeal graph is the years 0 to 60. Due to delay this fall is the years 30 to 70 on the supporters graph. In the real world the fall was the late 1980s to 2001.

It was in 2001 that the George W. Bush administration rose to power in the United States. This event threw the environmental movement into the (3) Model Crisis phase, because the process the movement was using broke down completely. Classic Activism was totally unable to provide a solution and allow environmentalists to counter the anti-environmentalism of the most powerful country in the world.

But some clouds have a silver lining. A Model Crisis forces at least a few process users to doubt the validity of the process and to urgently begin looking for a better one.

I was one of them. My search for a better process led to the book you are reading.
But I am not the only one who feels that the problem solving process the environmental movement is using is failing and that something radically better is needed. Many others feel the same way. For example, in September 2005 the delegates at the Sierra Club’s national convention voted on this question: “When it comes to change and the environment, the best approach is what?” The winner, with an astounding 60% of the vote, was “a new way of thinking.”

When people begin searching for “a new way of thinking” and the first few potential new paradigms begin to appear, the (4) Model Revolution phase of the Kuhn Cycle has begun. Analytical Activism and other candidates, such as the “third wave” of environmentalism, are competing to see which will become the new process. This will be a rocky, unpredictable period. On the graph this is the period from year 70 to 90. Notice how neutralists peak during this period, because they have abandoned the old paradigm, but a new one is not yet strong enough to attract many supporters.

This intense searching and competition will cause a new suitable process to appear. As it starts demonstrating its success it will gather more and more supporters. Eventually enough New Paradigm Supporters will get behind it to initiate the next phase, which is (5) Paradigm Change. This occurs in years 90 to 110, when the New Paradigm Supporters grow from low to high.

Finally, once the new paradigm becomes entrenched, it becomes the new (1) Normal Science, and the cycle starts all over again.

**Run 5** – In the real world, however, paradigms usually don’t fall in efficiency nearly as suddenly as in run 4. Let’s try a more realistic scenario by changing ending efficiency for both paradigms from 20% to 60%.

Now, instead of both paradigms rising and falling to zero, they converge on a steady state equilibrium of 35%. This is exactly what we would expect. If two paradigms have equal appeal, and all else is equal, then over a long period of time they should attract the same number of supporters. However all else is not always equal, as we will soon see.

**Run 6** – For a new paradigm to win supporters away from the old one, it must have greater appeal. Let’s see what happens if we raise the appeal of the new paradigm from to 90%, and leave the old paradigm at 60%. This is a large difference. This should cause more supporters to flock to the new paradigm. At the end of the run, the new paradigm should have trounced the old paradigm by a comfortable margin.

What happened? Support for the new paradigm only grew a little. This is not what we see in the real world. A 90% versus a 60% process efficiency translates into a fourfold cost advantage for the new paradigm, which should make the new paradigm unbelievably dominant. The old one should be wiped out. What is wrong here?

The answer is so far we have been running the model with an artificially low value for ability to see NP is better. This variable measures the ability of people to see that a more efficient new paradigm is better than a less efficient old paradigm. It is similar to the general ability to detect political deception.

Many modern processes, like how government branches run and chip fabrication methods, are anything but simple. They require quite a bit of expertise to compare against competing processes. So it is no stretch of the imagination to say that in any given population that is exposed to a new process, the ability to see that it is better than the old process is going to vary. To complicate matters, Old Paradigm Supporters have usually developed a strong fondness for their beloved paradigm, and see their world in terms of that paradigm. This makes evaluating a new paradigm accurately difficult and often impossible.
This point is central to Thomas Kuhn’s theory of scientific revolutions. He explains it this way: (Italics added)

“These examples point to the third and most fundamental aspect of the incommensurability of competing paradigms...the proponents of competing paradigms practice their trades in different worlds. One contains constrained bodies that fall slowly, the other pendulums that repeat their motions again and again. In one, solutions are compounds, in the other mixtures. One is embedded in a flat, the other in a curved, matrix of space. Practicing in different worlds, the two groups of scientists see different things when they look from the same point in the same direction. Again, that is not to say that they can see anything they please. Both are looking at the [same] world, and what they look at has not changed. But in some areas they see different things, and they see them in different relations one to the other. That is why a law that cannot even be demonstrated to one group of scientists may occasionally seem intuitively obvious to another.

“Equally, it is why, before they can hope to communicate fully, one group or the other must experience the conversion that we have been calling a paradigm shift. Just because it is a transition between incommensurables, the transition between competing paradigms cannot be made a step at a time, forced by logic and neutral experience. Like the gestalt switch, it must occur all at once (though not necessarily in an instant) or not at all.”

The last sentence above tends to support our strategy of the precipitating event, “which must occur all at once.” This really means in a short time, so as to exert a concentrated sudden force on the system.

The ability to see NP is better variable is a simplifying abstraction that measures a population’s average ability to see from their world into another. If that ability is high, then they can determine if what the other world offers is preferable.

Comparing Classic to Analytical Activism, we can see that each process is so vastly different, and depends on such different foundational assumptions, that they are two completely different worlds. A long term classic activist is, on the average, very non-analytical and event oriented compared to an analytical activist. These two types of activists will have very different skillsets—so different, that most classic activists will be totally unable to evaluate how effective an analytical approach could be. That is, until they make the paradigm shift that Kuhn mentions above, and step into the new world of Analytical Activism.

Runs 1 through 6 all used a value of 0% for ability to see NP is better. This is unrealistic. Let’s increase it gradually to understand how it affects the system’s behavior.

Run 7 – But first there is another variable to consider that has also been artificially low: influence per OP supporter. So far that and influence per NP supporter have been the same value of 5. But entrenched old paradigm supporters, such as tenured faculty, senior managers, and old timer activists, generally have much more clout than those rash and brash enough to support a new paradigm. So in run 7 let’s raise influence per OP supporter from 5 to 10. In runs 8 through 10 we will return to raising ability to see NP is better.

Amazing. The shoe is now on the other foot. Even though the new paradigm has a fourfold cost advantage over the old paradigm, the old paradigm is strongly dominant. This is because all that extra influence per OP supporter allows more OP exposures to be transmitted. This is much more advantageous than a better process. Thus even though the old paradigm is worse than the new one, it wins.

This illustrates what is called the Meme Channel Strangulation loop in the Niche Succession model in the manuscript to A Model in Crisis. As that book explains:

“The more a corrupt politician dominates the meme stream, the less their opposition can. Once they realize this, their best strategy is to flood all available meme channels with false memes. Examples of this are purchase and control of television, radio, and newspaper organizations, the creation of biased think tanks, the financial backing of prolific authors, the sponsorship of publicity events that lean your way, and the barrage of press releases that paint certain pictures. Once a politician is in power he or she can use the power of incumbency to do this all the more.”
Run 8 – All is not lost, however. As we explained earlier, ability to see NP is better is unrealistically low. Let’s raise it just a smidgeon, from 0% to 20%, and see if that gets the new paradigm out of the hot water it’s in.

Hmm, that’s not quite good enough. The two camps are so evenly divided there will be a perpetual donnybrook over what process is best, when actually the new one is much better. It appears that a value of 20% for ability to see NP is better is still lower than what it is in the real world.

Run 9 – So let’s double it to 40% and see how our carefully constructed dynamic abstraction of reality behaves:

Too bad. This is still not good enough. So let’s double it again, to 80%. Surely that will be good enough. Anything much higher is going to be difficult or impossible to achieve.

Run 10 – How sweet it is. The delightful results below show that now we’re there. A little experimentation and a thoughtfully constructed model has led us to logical proof that ability to see NP is better must be changed from its present low value to a high one, or a successful total transformation of the environmental movement from Classic to Analytical Activism will not happen.

I know for a fact it is now low in the environmental movement, because out of the hundreds of environmental activists and a few academics who have read part one of this book or academic style articles based on it (as of today, January 1, 2006), none of the academics and only about 1% of the activists have expressed support for the basic proposition that an analytical approach is a much better way. Even if you multiply that 1% by 10, it is still abysmally low. How can it be raised? That is a question we will take up in the chapter on Solution Convergence. Here’s a clue on what the answer might be: outside of the scientific community, most people need more than logical proof that a new paradigm is better than an old one.

Run 11 – Thanks for following me this far. The first ten runs may have been a little tedious. Now for a little fun.

Most complex models have at least one instance of what the British, in characteristic understatement, might call “interesting” behavior. This one is no exception. Let’s roll everything back to where it was in run 4 except for influence per OP supporter, which we will leave at 10. Because appeal is equal and the old paradigm has more influence, the Old Paradigm Supporters should end up higher.

As we can see below, the Old Paradigm Supporters do indeed do a lot better, at 9% versus 0% for the New Paradigm Supporters. But ability to see NP is better is 0% in this run, which is unrealistic. This brings us to the following conundrum: If both paradigms have the same appeal, what effect will ability to see one is better than the other have on system behavior?
Run 12 – One line of reasoning is that since both paradigms have equal appeal, the ability to distinguish which is better should not have any effect at all. But another line goes this way: If you look at the appeal graph, after the appeal of the old paradigm has fallen to 20%, the new paradigm makes its grand appearance, starting at 90% appeal and drifting down to 20%. Therefore after it starts and before it falls to 20%, the ability to see NP is better should make a big difference. There should be more New Paradigm Supporters than old ones until they both fall to a low level.

Okay, let’s start our engines and run the model one more time at full throttle, with ability to see NP is better pushed all the way up to 100%. Now that should show what effect that variable should have.

The second line of reasoning is just what the model did. As you can see by comparing the supporter graphs in runs 11 and 12, raising ability to see NP is better accelerated conversion from the old to the new paradigm. This caused all those Old Paradigm Supporters to make a faster mad dash for the better new paradigm. Then once it too lost its luster, they headed for the exits and back to neutralism.

Or did they? In fact, how could they, because even if ability to see NP is better is an impossibly high 100%, the old paradigm still has an inherent advantage: influence per OP supporter = 10, which is twice as much as the competition. Furthermore, throughout this book we have been attempting to drill home the message that whenever one loop has an inherent advantage over another, that advantage will show up in system behavior no matter what.

Therefore something must be wrong. Have we found a flaw in the model? Or maybe there’s a bug in the software that runs the model?

Actually there is no flaw. Nor is there a bug. Every well constructed model always speaks the truth, no matter how subtle the truth may be. Here the fact that complex social systems are stuffed full of counter intuitive behavior comes into play. Our intuition was that after 300 years, the model should have run to final equilibrium. After all, look at the run 12 graph. At the end of the run those supporter lines are dead flat.

But, with one finger we can nudge the slider on the final year variable from 300 to 500 years, and see what more the model has to say to us. Here is what it said to me:

The model says that problem solvers, myself included, should be wary of assuming that certain trends are what they seem. A dead flat line may not be dead flat, but growing imperceptibly slowly, as it was here, biding its time until it had enough supporters to make a comeback. It took them awhile, but after 200 years of hiding in a flat line (years 100 to 300), the Old Paradigm Supporters made it right back to where they were at the end of run 11. The lesson here is that sometimes you not only have to go deep—you also have to go long.

The model has even more to say. Another lesson is that if the percent of old or new paradigm supporters goes very low, in a small population they will die out. But in cases like this one and a large population they will not. This means that the behavior seen in this run only holds for large populations, such as the entire environmental movement. In a small population, such as a small or medium size organization as opposed to an entire industry or country, after somewhere around year 150 all Old Paradigm Supporters would have disappeared, and they could never recover as they do in run 12B.

This completes the review of the process revolution model’s dynamic behavior. Next, what have we learned from the model?

Model Insights

Our goal in modeling The Basic Structure of Process Revolutions was to gain insights into how we can best design the structure it will take to transform the environmental movement from Classic to Analytical Activism. The process revolution model offers the following key insights into how we can do that:

1. The transformation to Analytical Activism is just another case of a Kuhn Cycle. That cycle can be accelerated by maximizing perceived relative appeal and insuring a high ability to see the new process is better than the old one.
2. If influence per Classic Activism supporter is much greater than influence per Analytical Activism, as is likely due to entrenchment, then a high ability to see that the new process is better than the old one is required. Otherwise the transformation will be too slow or not occur at all.

3. To avoid losing supporters for Analytical Activism over time, it must avoid model drift. This will require built in self-improvement, because otherwise it will not adapt to changing circumstances.

4. It takes old paradigm supporters awhile to change paradigms. This delay must be taken into account. An initially slow transformation does not necessarily mean failure lies ahead—it may merely mean that change cannot be rushed.

5. It is possible to tailor a new process to fit a subclass of problems well, but not the entire set of problems. If the subclass of problems is solved first, this would cause the new process to have high beginning efficiency and low ending efficiency, which would cause early success and later failure. Avoid this trap. It has already occurred once.

6. The highest leverage point is process efficiency.

7. The second highest leverage point is perceived process appeal.

8. The third highest leverage point is ability to see that the new process is better than the old one.

The greatest insight is probably not where the high leverage points are. It is the fact that the transformation from Classic to Analytical Activism is just another case of the Kuhn Cycle. It therefore has all the characteristic behavior of that cycle. Only by deeply and correctly understanding the Kuhn Cycle will problems solvers be able to engineer the successful cycle that all of humanity is now dependent upon.

The Memetic Evolution of Solutions to Difficult Problems

The process revolution model treated process efficiency as a black box. Input equaled output, because process efficiency equaled process appeal. But if process itself is what we want to better manage, then we need to know how processes work.

The class of processes we are most interested in is those that produce solutions to difficult, complex problems that push the envelope of solvability. Solving such problems is not a neat and tidy matter, but is historically messy, unpredictable, and wasteful, since most solution candidates do not pan out.

The best abstraction I know for modeling such processes is memetic evolution, because that is exactly what is happening. Memes evolve just as genes do. A meme is a mental belief that was learned from someone else. They follow the same three steps of the evolutionary algorithm as genes do: mutation, selection, and replication. A memeplex is a complex of memes that work together to achieve more than its component memes could accomplish working alone. Most memes are actually memeplexes, but are called memes for short. From this viewpoint, a solution is a memeplex whose component memes work together to solve a problem. The main portion of a model of how memes evolve into solutions is shown on the next page.

The Solution Evolution Model

The backbone of the model is the seven stocks of solution component memes. As its life cycle progresses, a solution meme moves from the top of the model to the bottom, ending up as either sound or unsound. A sound meme is one that works. An unsound one doesn’t. Once enough solution components are accumulated a problem is considered solved, with a probability of solution that depends on problem difficulty and the soundness of the solution.

A solution consists of Sound Solution Components plus Unsound Solution Components. No one ever knows how many unsound memes are in a solution until a post mortem analysis, and even then it’s hard to tell. All we can be certain of is whether the solution works or not. A poor solution is one with too many unsound memes, not enough sound memes, or both. A solution to a difficult problem will have anywhere from hundreds to millions of memes, or in some cases, such as putting a man on the moon, billions. The more difficult the problem, the more solution memes required to solve it. Due to the challenge of understanding and managing solution meme relationships, the cost and difficulty of solving a problem varies exponentially with the number of memes required to solve it, because as the number of memes in a solution rises, the number of relationships among them rises exponentially.

The model has three sections: mutation, selection, and replication. These are the three steps of the cycle of evolution, which applies equally well to genes or memes.

A solution meme begins its long journey through life when it is born in hypotheses generation. The proper goal of a hypothesis is to create a new meme that has a high probability of becoming part of the solution, or contributing indirectly to the solution, such as basic research. A newly generated hypothesis is a mutation, because it differs from past hypotheses.
The new hypothesis enters the stock of Hypotheses to Test. If the stock grows too large, hypotheses may be abandoned due to size of backlog. But in a healthy process most hypotheses, after a delay of average experiment performance length, enter the stock of Experiments Completed.

Now our friendly little meme faces its greatest crossroad in life: selection, also known as survival of the fittest. It can now go in any of three directions. This brings us to the five steps of the Scientific Method, which are:

1. Observe a phenomenon that has no good explanation.
2. Formulate a hypothesis.
3. Design an experiment(s) to test the hypothesis.
4. Perform the experiment(s).
5. Accept, reject, or modify the hypothesis.

The meme just completed the fourth step. If the hypothesis was not accepted or rejected, but instead looks promising enough to rework and try further experimentation, it flows upward through the modification pipe and back to Hypotheses to Test. If acceptance occurred, it flows downward to Hypotheses Accepted. If rejection occurred, the meme dies.

Once a meme makes it to the stock of Hypotheses Accepted, the model takes into account that this is not a perfect world. People make mistakes. In fact, my motto is that if I’m not making at least ten mistakes a day, I’m working on something that’s too easy. So if an error occurred when reviewing the experimental results, the meme flows through the incorrect acceptances pipe to Unsound Selections. Or if the experimenters were highly trained, the meme probably flows through correct acceptances to Sound Selections.

Our plucky little meme has survived all the way to sound or unsound selections. It has one more step to go, however, because so far only those doing experimental review know about these memes. It is not until others know about them that they can become useful to all. Thus these memes need to be replicated by transmission to user minds. This can be done by conversation, books, articles, conferences, videos, television, and so on. But until it is done, the user community cannot use the selections.

Hence for Sound Selections, it takes transmission of truths to user community to move a meme down to Sound Solution Components. Here is where it spends most of its productive life, as it works closely with other memes as a complex solution to a difficult problem. The same thing occurs to the hopefully much smaller number of memes in Unsound Selections when transmission of fallacies to user community moves unsound memes to Unsound Solution Components.
That Unsound Solution Components happen is why solutions contain so many problems of their own. Because it is impossible tell which solution components are sound and unsound after they are selected, problem solvers need to proceed cautiously and think in terms of solution probabilities and potentially defective solution components.

Some transmissions will not be high enough quality to be understood, remembered, or easily looked up. The model considers these as never sufficiently transmitted. Thus some or even most selections will have failed to replicate, and so will die instead of being replicated.

But the rest make it to Sound Solution Components or Unsound Solution Components, where they work hard, often for a long time, to solve the problem. After a meme’s productive life is over it dies. This can happen when it becomes lost, forgotten, misunderstood, garbled, etc. But the biggest reason its life ends is it becomes obsolete as the problem it was solving changes over time. A solution meme sooner or later dies because it cannot change itself, and so fails to adapt to a changing environment. Thus Sound Solution Components is continually drained by sound knowledge obsolescence, and Unsound Solution Components is drained by unsound knowledge obsolescence. Because of this continual loss a problem solver’s work is never done.

There are two main reinforcing loops in the model. The Building the New from the Old loop takes the knowledge in the bottom two stocks, Sound Solution Components and Unsound Solution Components, and uses that to increase the creation rate of new hypotheses. It is only by building the new upon the old that knowledge is advanced significantly. In other words, the new must evolve from the old, instead of starting from scratch. Otherwise our knowledge would consist only of original, unimproved ideas. These would be so small in number and so simple that such a society could not possibly be anything more than primitive.

The loop produces a solution with higher and higher fitness as it takes proven, reliable new knowledge and uses it to generate the next round of hypotheses. Properly done, this can produce a very high fitness solution.

The other loop is Paradigm Soundness Emergence. It’s about three times as strong as the other loop, because in general, the process of solution evolution does not suffer nearly as much from a shortage of new ideas as it does from errors in accepting or rejecting those new ideas, which determines the quality of the final product.

Tunnel vision is the inability to see outside your own paradigm. Tunnel vision is rampant in large, challenging problem solving endeavors, because solving such problems requires a strong, driving body of knowledge to form and carry the project along to completion. But such a tidal force can also carry minds along the wrong currents, because if you believe in one thing strongly you tend to overlook, downplay, or deny alternative possibilities. Your own defects, in the form of Unsound Solution Components, are invisible. This causes more unsound components to be accepted, because a mixture of fallacious and true beliefs cannot be used to determine the truth reliably. All this occurs because the mind is attempting to maintain consistency and work efficiently, using the paradigm it has built from accepted hypotheses as its only frame of reference.

Paradigm tunnel vision is especially strong in groups. The larger a group is, the more pressure there is to follow the social norm. This is also known as peer pressure and following the herd. If you want to truly look at a tough problem objectively and be able to see what most others cannot, drop out of the herd for awhile.

Acting against the debilitating effect of tunnel vision is soundness emergence. As the soundness of a body of knowledge increases, its effect on reducing paradigm error increases faster than the rate of soundness increase. This causes a small amount of soundness to be amplified by the loop into even more soundness. This effect is due to the way components working together have emergent properties that are greater than the components working alone. Most fortunately, the effect of soundness emergence is stronger than the effect of tunnel vision. The result is the Paradigm Soundness Emergence loop causes solution evolution to produce a solution that is much more sound than without the loop. For example, if the effect of soundness of knowledge on decision making objectivity curve is changed to a straight line, which is a one to one relationship, run 11 tops out at 65% solution success instead of 99.9%, and no attempt to better optimize the investment policies will improve it.

This is the fundamental structure explaining how solutions to difficult problems evolve. It is the structure that invention of the Scientific Method “discovered.” But it was really there all along. All inventing the Scientific Method did was point out that the structure was there in a stable, replicatable manner. Thus the Scientific Method itself is a meta-solution meme. After the basic rules of logic that we learn in our youth, it is the largest and most important solution meme known.
Looking At the Model as a Process

So far we have looked at the model as if it was a natural evolutionary sequence, mixed with the Scientific Method. But the way it is normally looked at is far less abstract. Usually it is viewed as a process.

A process is a repeatable series of steps to achieve a goal. In the model the process consists of three main steps: hypotheses generation (mutation), experimentation (selection), and transmission (replication). How much is invested in each step determines how efficient and well managed the process will be.

In this model process efficiency is output divided by input. The output is the solution success, which is the probability the solution components will solve the problem. The input is total problem solving effort. Because problem solvers tend to have a fixed amount of resources, total problem solving effort is held constant in the simulation runs.

The appeal of the process is solution success, because that is the ultimate measure of how good it is. If two processes had the same success percentage, and one had a higher efficiency, and thus a lower cost to solve the problem, it would have more appeal. But we can ignore that because total effort is constant.

For simulation runs the model allows the process to be \textit{managed} by deciding how much to invest in the six areas of effort required to build the solution. These are:

- Percent Effort (these must add up to 100%)
  - Step 1. Hypotheses generation
  - Step 2. Experimentation
  - Step 3. Transmission to user community

- Percent Training (these vary from 0% to 100%)
  - Step 1. Hypotheses generation
  - Step 2. Experimentation
  - Step 3. Transmission to user community

Effort is actual work. Training is the quality of that effort. The effect of training on quality curve (not shown because it’s on a subsystem) is designed so that as training rises from 0% to 50%, quality rises from .5 (which is half of normal) to 10. The maximum of 10 is entirely realistic, when you consider how difficult the process steps are, and the difference between the person on the street and a PhD with nine years of full time training in school, and more on the job.

The output of each process step is a function of training and work effort, which is the same as quality of effort and quantity of effort. This approximates the real world, where the amount of skill a person has makes much more of a difference than the actual work hours they put in. Investment in training is also the same as paying much more for people who are already trained. All this is why the model assumes that creating solutions to difficult problems is such an arduous task that training can increase work output by up to a factor of as much as 10.

The Simulation Runs

By looking at The Memetic Evolution of Solutions to Difficult Problems as a manageable, improvable process whose success depends on investment decisions, we can approximate how the processes of Classic and Analytical Activism work. Let’s review a series of simulation runs to see how the model behaves. This will show us how the environmental sector of society behaves when it comes to solving difficult environmental problems. The purpose of the model and these runs is to help us to better design and manage the process aspects of the solution to the transformation of environmentalism to Analytical Activism problem.

On the next page is the table of the simulation runs. The first three represent where the environmental movement is today. Runs 4, 5, and 6 are where it will be while in transition from Classic to Analytical Activism. Runs 7, 8, 9, and 10 are where the movement will be when it is almost there. Finally, run 11 is full Analytical Activism, as you can see by its ability to reach the full problem difficulty goal of 1,000 with a solution success of 99.9%. Wouldn’t it be nice if we could do that?

The goal of 1,000 is an arbitrary number selected to represent any large, difficult problem. It was set by adjusting total problem solving effort (not shown) until the 1,000 could just barely be achieved with a 99.9% confidence.

Runs 1, 2, and 3 all use the same six investment policies to represent full Classic Activism. The percent effort investments use a very low budget of 3% for hypotheses generation, a modest 37% for experimentation, and a gargantuan 60% for transmission. If you compare these to run 11, which is full Analytical Activism, you will notice that Analytical Activism has double the hypotheses generation budget, over double the experimentation budget, and one sixth the transmission budget.

This illustrates the stark differences between Classic and Analytical Activism. In the process of Classic Activism, introduced on page 34, once a problem is identified there are only three main steps to solve it: find the proper practices, tell the world the truth about the problem and the proper practices, and if that fails, exhort and inspire people to support the proper practices. Thus Classic Activism has little use for the analytical work of formal hypotheses and experimentation, though some is done informally, or to be more precise, intuitively. Thus classic activists put the bulk of their work into transmission of what they “know” to be the solution: spreading the word about the proper practices all must follow for
Solution evolution

Model Variables

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<th>Percent Effort</th>
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<th>3</th>
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Percent Training

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Result Variables

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<td>Problem difficulty (process capacity)</td>
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<td>691</td>
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<td>942</td>
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<td>95%</td>
<td>95%</td>
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<td>95%</td>
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<tr>
<td>Knowledge soundness</td>
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<td>-2,184</td>
<td>188</td>
<td>188</td>
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<td>246</td>
<td>689</td>
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<td>937</td>
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Our world to be sustainable. This is also called “more of the truth.”

In glaring contrast, full analytical activists put 90% of their effort into analytical work, and only 10% into transmission. This is because they know that a correct analysis will find solution elements that do not need much effort at all to promote, because built into the solution elements are incentives for agents to adopt the new proper practices.

In general classic activists put little effort into training, especially in areas they shun, like experimentation. This explains the 10% training for experimentation. But classic activists do see a high return in training for what they do most, so transmission of the truth has a 30% training budget. Hypothesis generation clearly is a more specialized skill. These policy percentages are not accurate because they are estimated. What’s important is the relative differences between the policies that Classic and Analytical Activism use. Those differences will cause the model to behave differently in the simulation runs, which should explain how process management strategy affects results.

The result variables tell how well an investment policy worked. Problem difficulty is how difficult a problem a particular investment policy can solve. It is the number of solution components required to solve a problem. Given a particular set of investment policies and a solution success goal, problem difficulty is the capacity of that process.

Solution success is the percent probability that the solution will work. This is also known as a confidence level, such as “I’m 95% confident this solution will work, based on how its components have worked in the past, in pilot programs and other large scale experiments.”

During a run, except for runs 1 and 2, a desired solution success level is the goal, and the problem difficulty is adjusted to be the maximum that will support that goal. For example, in run 3 the success goal is 95%. The difficulty was adjusted until success was 95%, and then the difficulty it took to do that, 268, was recorded. 268 is thus the maximum problem difficulty the process can solve for the investment policies in run 3, if a 95% probability of solution success is required.

Knowledge soundness is Sound Solution Components divided by (Sound Solution Components plus Unsound Solution Components.) Notice how run 2, in which classic activists attempt to solve a medium size problem of 560, has a soundness of 21%. This means somewhere around 79% of the assumptions classic activists make when attempting to solve medium size problems are false. This of course is why run 2 has such a low solution success of 18%. But in the last five runs soundness is over 99%. High knowledge soundness is why those five runs can achieve what the environmental movement also needs to achieve: solving big, tough, hairy problems no one has ever solved before with a very high degree of confidence.

The payoff is a simple calculation of the net benefits of following a run’s investment strategy. The formula is payoff equals 1 utility unit for every percentage point of success times problem size, minus 5 utility units for every percentage point of failure times problem size. Failure equals 1 – success. The 5 represents a risk adverse policy, which is what applies to the sustainability problem. If Homo sapiens wins and is sustainable, that’s good news because we can continue doing about what
we’ve always done. But if *Homo sapiens* loses, that is
catastrophic news. Thus bad news is far worse than good
news, which explains the value of 5.

By the way, for the real problem this shouldn’t be 5.
It should be more like 5,000,000. Just ask anyone who
was on Easter Island after deforestation caused its popu-
lation to crash in the 15th century by 75% and, due to the
horrors of mass starvation, the island’s first warfare and
cannibalism begin.

Now let’s take a look at the individual simulation
runs. In all cases all the stocks start at zero.

**Run 1** – We start with a small problem difficulty
of 100. This corresponds to the easy problems the envi-
ronmental movement worked on at first, using full Clas-
sic Activism. If we have modeled how memetic
solutions evolve correctly, then a very low difficulty
should have a high success. The result is shown below:

As expected, solution success is very high, at
98.9%. And it doesn’t take it long to get there, just as it
didn’t take long for the movement to jump on easy prob-
lems like local pollution in the 1960s and 70s. All it took
to solve these easy problems was a very small number of
Sound Solution Components. And because they were
easy problems, Unsound Solution Components was low.
This is because even a poor process can solve easy prob-
lems, because the defect rate while working on them is
so low. In this run the defect rate was a mere 6%, which
is why soundness was so high, at 95%. But as we shall
see in run 2, a poor process has a high defect rate when
applied to difficult problems.

Because this is such an easy problem, the payoff is
very low, at 94.

**Run 2** – In this run we raise problem difficulty from
100 to 560, which is a medium size problem. Examples
of medium size problems are national pollution and
regional natural resource depletion. Historically, me-
dium size problems tend to be solved poorly or not at all
until after several tries. These problems are well past the
ability of Classic Activism to solve reliably, so the
model should reflect that.

Wow! The classic activists didn’t do just do a little
worse—they fell flat on their faces with a dismal solution success of only 18%. Why did this happen?
The reason is even a medium size problem of 560 is
well over the process capacity of Classic Activism, be-
cause as we will see in later runs, it is not investing
enough in experimentation effort and training. Only that
investment will produce the large number of tested solution components required to solve medium and large
problems. Without the needed investment in quantity
and quality of experimentation, solution components
and success levels off at levels to low to solve the prob-
lem.

Because of the low investment in experimentation
training the defect rate is high. People are making edu-
cated guesses at what will work, instead of the long hard
series of experiments it takes to produce sound knowl-
dge. The result is a high defect rate, which translates
into a low knowledge soundness of 21%. That means
that 79% of everything classic activists believe to be true
is actually false, when it comes to how to solve me dium
size problems. It’s not exactly 79%, because this is just a
rough, uncalibrated model. But it is probably safe to say
that it is high, too high to solve anything but easy prob-
lems like in run 1.

The medium problem difficulty of 560 and the low
solution success of 18% combine to give an astounding
low payoff of -2,180. That is a calamity! If you have any
doubt, just ask those Easter Islanders—it really is that
bad when it happens.

**Run 3** – Still using the full Classic Activism investment
policies, let’s set problem difficulty to the maximum it
can be to achieve a success of 95%. We have chosen
95% because it is a common scientific standard of ac-
ceptance that a hypothesis is probably true. 95% (or
sometimes the range of 90% to 99%) means “very
likely.” Whatever the resulting maximum problem diffi-
culty is will approximate the problem solving capacity
of Classic Activism as it is practiced today.

The maximum problem difficulty turns out to be
268. This is 27% of the 1,000 that is possible if the most
efficient process management decisions possible are
made, which is what run 11 does.
Note how about one fourth of the way through the run solution success reaches its peak of 95% and holds there for the rest of the run. This occurs because enough sound and unsound solution component have been accumulated to solve the problem. Even though the solution components curves keep growing, that makes no difference in the success rate.

If you compare runs 2 and 3, you will notice that the sound and unsound solution components curves have switched places. That’s what causes the dramatic outcome differences in the two runs. A relatively high unsound curve means terrible results, while a relatively high sound curve means great results.

But they are not great enough for the real problem, which has a difficulty of 1,000 and a required success of 99.9%. So we must do much better. We are now about to change the investment policies a little at a time, as we gradually change the model’s dynamic behavior from Classic Activism into the goal of this book: Analytical Activism.

Run 4 – What is the quickest, most efficient way for classic activist organizations to change to Analytical Activism? Because the model is based on the only known method for producing reliable knowledge and the only known algorithm for efficient evolution, the model will tell us what the best route is when it comes to general top level strategy. But for lower level tactics, each organization will need to solve its own transformation problems.

The purpose of modeling is to gain insights into how to solve a problem. This is a process model, so by pushing here and there on it, we can see where the high and low leverage points in the process are. Let’s push on a few of these points and find out where we can get the biggest amount of improvement for the least amount of input. Whatever the answers turn out to be, that is where the environmental movement needs to go first.

Nothing characterizes Classic Activism more than its emphasis on transmission of ideas to users, which in our analysis of Classic Activism is called “more of the truth.” So it would seem to make sense to start by reducing that. This is easily done by reducing transmission to user community effort. Since the three percent efforts must always add up to 100%, let’s offset this by raising experimentation effort. After all, nothing characterizes Analytical Activism (as well as science) more than lots of careful experimentation. So let’s drop transmission effort from 60% to 35% and raise experimentation effort from 37% to 62%. These are large changes. This should take us quite a ways down the road from Classic to Analytical Activism.

Wow! What happened? The sound and unsound solution components went up, but the success curve didn’t budge. Furthermore, all four result variables in the table of runs are also the same. So raising experimentation effort and lowering transmission effort had no effect whatsoever on what matters most: solution success and problem difficulty. What could possibly explain this?

In the real world it would be hard to tell. But in the model it’s easy to find out, because a model displays its assumptions clearly for all to inspect. Digging into the model, we see that work effort has no effect on work quality, which makes sense. Only training affects quality. Thus even though run 4 is getting more experiments done that run 3, since quality has not changed the defect rate is the same, which causes the ratio of sound to unsound components to remain the same as before. Since there are already enough total solution components, this causes solution success to remain the same. If it is the same, then problem difficulty cannot be increased without reducing success, which would ruin our goal of 95% success.

It would seem that more work with the same quality should increase capacity. It does increase production capacity of components. But it does not increase ability to solve more difficult problems at a specified level of reliability, which is the type of capacity we are concerned with in this model.

This run illustrates what happens when intuition is used to decide what to do. We intuitively decided to increase experimentation and reduce transmission, and expected that to improve success and/or problem difficulty capacity. But we were wrong. Now let’s use the power of the model to decide what to do. Since the model is the result of analysis of the system, this takes us into analytical decision making.
Run 5 – First let’s roll the model setting back to run 3. Then we consider this question: Where is the best place to start if we want to change to Analytical Activism? That is, what is the best way to start increasing problem difficulty and/or probable solution success?

Study of the model shows the highest leverage point is the amount of experimentation training. This is because as quality of experimentation effort increases, so does the normal correct percent, which has a larger effect in increasing capacity or success than any other point in the model. So let’s increase experimentation training just a tad, from 10% to 15%, and see if our understanding of the model is correct. Below are runs 3 and 5 so you can compare them.

The result is as expected. Holding our success goal at 95%, the slight increase in experimentation training causes the problem size capacity to rise from 268 to 350. This is a 31% increase in capacity, though to make it all the way to a capacity of 1,000 we need a 273% increase. That will be easy in the model, but not in the real world.

Notice how the sound and unsound solution components curves are nearly identical in runs 3 and 5. This is also to be expected, because increasing experimentation training does not increase production quantity—it only increases production quality. Thus the model tells us one thing loud and clear: Because quality of production is the main problem with the environmental movement’s current process, that is the place to start.

Thus the only difference in the graphs is that in run 5 it takes longer to reach the solution success goal of 95%. This makes plenty of sense, because it takes longer to do a good job. Quality takes time.

Run 6 – Next, let’s start reducing Classic Activism’s reliance on “more of the truth” by lowering transmission effort from 60% to 35% and raising experimentation effort from 37% to 62%. Because more effort increases production of solution components, this should raise the problem solving capacity.

Wrong. Although this change did increase solution components considerably, it did not raise capacity one iota. It is stuck once again. Why?

This time we have a very simple answer. We forgot what we learned from run 4. Process effort does not affect process quality. In addition, at any given level of quality, there is a tradeoff between problem difficulty and solution success. As difficulty goes up success goes down, and vice versa. Thus all more experimental effort will do is increase production. It will not increase quality, which is what’s needed. So in the next run let’s increase that.

Run 7 – In run 5 we increased experimentation training from 10% to 15% and got a 30% increase in problem difficulty capacity, at a 95% confidence level. Let’s get really serious with this factor and raise experimentation training all the way up to what we know to be its optimum level. Because this will raise quality of production to its optimum, the results should be dramatically better. Here they are:

Boom! What a difference! The graph is so completely different from any before that we must be in some sort of entirely new mode. Well, it turns out we are. The new mode is Analytical Activism.

For the first time Unsound Solution Components is dead flat at near zero. And solution success does not hit its usual plateau. Instead, it keeps right on growing up to a fantastically high level of 99.9%, which is what is needed to solve what is currently civilization’s most difficult problem by far: the global environmental sustainability problem. This allows a jump in problem difficulty capacity from 350 to 691, a stunning 97%
increase. And the beauty of it is we did not spend any more money on solving the problem—we only spent it more wisely—on quality instead of quantity.

The run 7 graph has several interesting aspects. One is the way Sound Solution Components is actually a little lower than the previous run, despite the fact this run had dramatically better results. This shows how solving difficult problems reliably is not a matter of quantity—it’s a matter of quality. If you grasp the importance of that statement, please do me a favor: Whisper it into the ear of every environmentalist you meet.

Another aspect of the graph is it takes a long time to reach super high levels of quality. Runs 3, 4, 5, and 6 took from 20% to 30% of run length to reach their quality goal of 95%. But runs 7, 8, 9, 10, and 11 all take 100% of the run to reach their goal of 99.9%.

Presently activists are accustomed to near instant growth of solution success when using Classic Activism on easy problems. What might happen when they switch to Analytical Activism and encounter its much slower initial growth in solution success? We would probably see impatience. We might even see the false assumption that Analytical Activism is not working, which could lead to abandonment of the new process and a hasty return to the old one. The way to avoid this trap is to thoroughly understand the dynamic behavior of the fundamental process involved.

In the first half of the run 7 graph, why is the growth of success so slow while the growth of sound components is so fast? And why does solution success follow the classic S curve shape of population growth?

The success curve depends on the solution components curves, so let’s discuss them first. Unsound Solution Components stays at near zero because defects are so low, since we now have optimum experimentation training. Sound Solution Components follows mostly a goal seeking curve shape, because of diminishing returns on labor and the limit that total problem solving effort imposes.

Solution success follows an S curve because there is a non linear relationship between knowledge soundness and success, which is defined in the effect of knowledge soundness on success curve, as shown in the first curve on the top right of this page.

There is an exponential relationship between total solution components and maximum possible success, which is defined in the effect of solution components on maximum success, as shown in the second curve. This exponential growth curve shape and the S shape of the upper curve combine to produce the solution success S curve.

These two relationship curves approximate the behavior found in solving real problems. The first reflects the fact that as knowledge soundness rises, at first it has little effect on success. But then, as it starts to be 20% sound and become useful, it starts to have a big effect. But eventually diminishing returns set in, causing the last 30% of the curve to bend over to meet the maximum effect of 100%. This gives the soundness multiplier an S shape.

In the second curve, it is the exponential growth in the number of relationships between total solution components that defines the curve, because as these relationships grow, so do the emergent properties that affect maximum possible solution success. This is similar to the way the number of lines of communication grows exponentially as an organization’s size grows, which is a well known factor in determining how hard it is to manage a growing organization.

Looking at the diagram of the model back on page 183, you can see that the soundness multiplier times maximum possible success equals solution success. While these calculations may seem arcane, by explicitly stating them in the model we are stating our assumptions about how real problem solving processes behave, on the average. If these arcane assumptions produce behavior that approximates the real world, and the structure of the model makes sense, then the model is approximately correct, and can be used to roughly predict how the real world will respond when certain changes are made.

There’s a reason we have labored so long to explain why the solution success curve behaves the way it does.
It’s because solution success is what has been so elusive for the past 30 years, when it comes to solving the complete global environmental sustainability problem.

**Run 8** – Raising experimentation training to its optimum in run 7 made a dramatic difference. Let’s raise the other half of experimentation, effort, to near its optimum and see if we get similar results. This can be done by dropping transmission effort to its optimum of 10%, which will raise experimentation effort to 88%.

We’re on a roll. Dropping transmission effort to its optimum has improved results once again. Problem difficulty capacity jumps from 691 to 941. Our solution success goal of 99.9% is holding steady. Things are looking very good—if we can do the same thing in the real world.

**Run 9** – In all previous runs hypotheses generation effort has been 3%. This was the optimum for Classic Activism. Now let’s change it to the optimum for Analytical Activism, which is 6%. The reason is about what you would expect: an analytical approach to problem solving requires more cogitation up front, in the new idea creation step.

New hypotheses are not the same as sitting around brainstorming, or waiting for lightening to strike in the shower. Most highly successful new hypotheses are the result of inordinate amounts of sifting through analyses, experiments, and hypotheses, as well as reams of related literature and talk with your peers. Thus doing a good job requires real work and lots of it. This is why Analytical Activism requires double the amount of hypotheses effort that Classic Activism uses.

Here are the results of changing hypotheses generation effort from 3% to 6%:

The behavior is about the same. The only significant difference is faster initial growth of Sound Solution Components, since now there is plenty of hypotheses generation work.

Problem difficulty capacity has increased only slightly, from 941 to 942. It seems something is constraining the process from its greater potential. Could it be that we not only need to increase hypotheses generation quantity, but quality as well?

Yes. The next run shows what happens when that is done.

**Run 10** – When it comes to applying a process to a difficult problem, quality of work is almost always more important than quantity of work. Run 9 changed quantity of hypotheses generation to its optimum. Now let’s do the same for the quality side of that process step.

In all previous runs hypotheses generation training has been 25%. This was the optimum for Classic Activism. But the optimum for Analytical Activism needs to be more, since it is so dependent on the quantity of input to the process. Let’s raise hypotheses generation training to its optimum for Analytical Activism, which is 40%, and see how much of a difference that makes. It should be very significant, judging by the way the model uses this variable to calculate the hypotheses acceptance. The higher the quality of hypotheses generation, the higher the acceptance percent, which increases overall process throughput. The results are below:

The curves look almost the same as before. We can see that Sound Solution Components finished slightly higher. This translates into a higher ability to solve difficult problems. Looking at the table of simulation runs, we see that improving quality had a much bigger effect than improving quantity of hypotheses generation. Problem difficulty capacity increased from 941 to only 942 in run 9, but in run 10 it increased from 942 to 976. This is an increase of 4%. It’s not much, but it helps.

However as problem solvers get close to reaching a difficult goal, how to best measure progress changes. It is no longer a question of how far you’ve come. It is now a question of how much of a gap is left to close. The gap after run 9 was 1,000 – 942 = 58. After run 10 the gap is 1,000 – 976 = 24. Looking at the results of
this run this way, increasing hypotheses generation training to its optimum made a large difference. It closed the problem difficulty capacity gap from 58 to 24, which is a 59% reduction. That is terrific in anyone’s book, because such gaps can be very hard to close.

**Run 11** – We’re almost there. Of the six process management variables, one was at its optimum in run 7. Run 8 had two at their optimum, run 9 had four, and run 10 had five. Now, in run 11 we change the last one, so that all six process policies are at their optimum for Analytical Activism.

The final policy to change is transmission to user community training. This was at 30% for all previous runs. You might think that 50% is necessary for Classic Activism, because that process places almost all its eggs in the basket of “more of the truth.” But every little bit of additional transmission training reduces transmission effort, causing the optimum for Classic Activism to be 30% instead.

Analytical Activism is experimentation centric. This could lead to suspicion that the optimum transmission training for Analytical Activism is less than for Classic Activism. But because Analytical Activism has such a low transmission effort budget, 10%, it has a definite need for quality of that transmission, so that transmission effort is not wasted. This leads to an optimum of 37% for transmission training for Analytical Activism.

Thus our final change to complete the transformation from one process to another is to increase transmission training from 30% to 37%. Here are the results:

![Run 11. Full Analytical Activism, all policies at optimum](Image)

We have reached our destination. **Problem difficulty capacity** is now 1,000, with a confidence level of 99.9%. This process, with these very approximate six investment decisions, is what it will take to solve the global environmental sustainability problem. While there may be another process just as capable, I and the scientific community are unaware of it, because the Scientific Method is the only known process for producing reliable new cause and effect knowledge, and the evolution algorithm is the only known way to produce the many new memes necessary to solve extremely difficult problems.

### Model Summary and Conclusions

The solution evolution model shows how difficult problems are solved by the memetic evolution of many coordinated solution components. Once there are enough total solution components and their soundness is high enough, the problem is solved. The more difficult the problem, the more solution components needed to solve it. A solution component is a simplifying abstraction representing an average small part of a solution.

All non-trivial solutions contain a mixture of sound and unsound components. The ratio of sound to total components determines the soundness of the solution. *If a process is incapable of producing a solution with high soundness, it will be unable to reliably solve difficult problems, even if a large number of solution components are produced.* This is because the problem difficulty capacity of a problem solving process is a function of total solution components and component soundness. Both must be high to solve highly difficult problems.

Solution evolution occurs in three distinct steps: mutation, selection, and replication. In the first step, memetic mutations appear as new hypotheses are generated. These pass to the second step, selection, where experiments are used to subject the hypotheses to a survival of the fittest test. A hypothesis may be accepted, rejected, or sent back for modification and further experimentation. Those that are rejected die. Those that are accepted are sound if no mistake has been made, and unsound if an error has occurred. Thus unsound solution components are the same as the popular concept of defects.

Once accepted, a hypothesis is no longer a hypothesis—it is now a solution component, and passes into the third and final step of solution evolution, replication. Here an attempt is made to transmit the sound and unsound solution components to the user community. If a transmission succeeds the component is considered to have been replicated, because it has been copied from the mind of the experimenter who accepted it to those who will use it to actually solve the problem. If a transmission fails the solution component meme dies.

Each of the three steps of memetic evolution maps to a step in the Scientific Method. Mutation is hypothesis generation. Selection is experimentation and peer review, though for simplicity the model treats peer review as the final step of experimentation, rather than a separate step. Replication is publishing and education.

Each of these three steps can be done poorly or well, depending on how much is invested in the quantity and quality of the step. This is called effort and training in the model.
By modeling the foundational process that all solutions to difficult problems use, we can more clearly see the fundamental differences between processes.

The process of Classic Activism is characterized by a very high commitment to the third step of replication, where transmission of the solution to the user community occurs. This is because Classic Activism has only three main steps: find the truth by finding the proper practices to follow, spread the truth by telling the world about the problem and the proper practices, and if that fails, exhort and inspire people to support the proper practices. This is essentially “more of the truth.” When even exhortation and inspiration fails, classic activists assume the problem is they have done a poor job of that, causing them to try to exhort and inspire even more, using an endless variety of new packaging of the same old content. All this leads to classic activists putting most of their effort into transmission, which shortchanges the rest of the process.

Analytical Activism, however, does not fall into that trap. It looks at the total process and tries to optimize the quantity and quality of each step. This results in a low emphasis on transmission, a high emphasis on experimentation, and interestingly, a low emphasis on hypotheses generation. It also results in more training for all three steps, due to recognition that quality of work, not quantity, is what makes the difference. As a result, Analytical Activism has a problem difficulty capacity that is an order of magnitude higher than the one for Classic Activism, at a solution success confidence level that is several orders of magnitude higher than Classic Activism.

This completes the presentation of the simulation runs. By now you may be very familiar with how evolution, process, the Scientific Method, and The Memetic Evolution of Solutions to Difficult Problems work. But what exactly lies inside the two key stocks of the model: Sound Solution Components and Unsound Solution Components?

The High Level Solution Components

This section goes beyond the scope of this chapter, but I feel it is important for readers to know what’s in these key stocks. Let’s look at what they contain when the process is classic and when it’s analytical, at the very high strategic level:

**The Classic Activism Paradigm:**

**Unsound Components**

1. All it takes to solve an activist problem is to find the proper practices to avoid the problem, tell the world the truth about the problem and the practices, and if that fails, exhort and inspire them to adopt the practices.
2. This is primarily a technical problem. Thus all we have to do is find the proper technical practices to live sustainably, and get people to adopt them. Therefore the process I have always used will work in this case.
3. The high leverage point is to tell the public more of the truth about the problem and the proper practices required to live sustainably.

**Sound Components**

1. Many proper practices, such as alternatives to fossil fuels, organic low tech agriculture, and endless variations of reduce, reuse, and recycle.
2. The public needs general education on the importance of solving the global environmental sustainability problem.

**The Analytical Activism Paradigm:**

**Unsound Components**

1. Due to tunnel vision I cannot see my own defects, but there must be some. For example, Dr. Maurie Cohen, editor of an environmental sustainability journal at http://ejournal.nbii.org, has read the Dueling Loops material. He argues that: “You offer, at least to my mind, an overly rationalistic interpretation of the ‘truth.’ The suggestion here is that political debate is largely over ‘facts’ (and the misuse of otherwise factual information). However, much of what takes place in the political arena is about values and ideology that, as such, are not readily reducible to the kinds of objectivistic measures that I understand you to be proposing.”

**Sound Components**

1. This is a very difficult complex social system problem. Therefore a custom process tailored to this type of problem is required to reliably solve it in time.
2. This is primarily a social problem, not a technical problem. Thus the crux of the problem is change resistance to adopting the proper practices needed to live sustainably.
3. The fundamental cause for solution adoption resistance is The Dueling Loops of the Political Powerplace structure, the presence of the New Dominant Life Form, and its successful exploitation of the race to the bottom.
4. Given this structure, the reason Classic Activism fails is it is pushing on the low leverage point of “more of the truth.”

5. There is a high leverage point in this structure that has never been seriously and comprehensively tried. It is general ability to detect political deception.

6. Currently general ability to detect deception is low. If problem solvers could unite and raise it to a high level the race to the bottom will collapse, leaving the race to the top dominant. Politicians will then respond correctly to the truth about the global environmental sustainability problem because it will now be in their best interests.

These are only rough lists, but they should show the two very different paradigms classic and analytical activists live in. They are two completely different worlds.

A paradigm is a collection of facts and rules, one so integrated and inclusive that it creates the complete worldview a person uses to grapple with a particular world. Examples of paradigms are a code of morality, a political ideology, a field of science, or what’s needed to solve a specific problem. A paradigm defines the mental world its users inhabit while using it.

I invite you to consider which of these two worlds you would prefer to live in.

It is possible to perform an analytical comparison of these two processes. A simple process comparison model using the effect curves in the solution evolution model was built, as shown above.

Counting each of the preceding components as a hundred, we get 300 unsound and 200 sound Classic Activism solution components, and 100 unsound and 600 sound Analytical Activism solution components. Running the process comparison model with these values and a problem difficulty of 1,000 gives a Classic Activism solution success of 6% and an Analytical Activism success of 26%. A problem difficulty of 800 gives 10% and 53%. A problem difficulty of 700 gives 14% and 97%. Using a range of low problem difficulties shows the maximum possible solution success for Classic Activism is 51%, while for Analytical Activism it is 97%.

That tells the story.

There is a further story, however. The two sound solution components of Classic Activism can be reused in Analytical Activism. Thus Analytical Activism actually has 800 sound components, not 600. This makes a big difference, because it changes its solution success for a problem difficulty of 1000 from 26% to 60%, for 800 from 53% to 98%, and for 700 from 97% to 98%. The maximum possible solution success for Analytical Activism rises from 97.2% to 97.8%. It can’t rise much more, because of the defect of one unsound solution component: paradigm tunnel vision.

We must eliminate that defect….
Chapter 9. Finding the System’s Low and High Leverage Points

Process Step Output Summary

Key System Events – The environmental movement is currently being thwarted by a far more successful one: the Corporate Proxy Movement. As a result of the precipitating event of the Powell Memo of 1971, the Corporate Proxy Movement quickly ascended to dominance in the United States, where it shows no signs of losing that position. While this is yet another manifestation of the New Dominant Life Form, it is a unique and influential strategy that worked. Understanding how it worked will allow the environmental movement to counter it by creating an even more powerful movement, because it can be based on the race to the top instead of the race to the bottom.

Another key system event was the Second Age of Reason, in which invention of the Scientific Method transformed science from alchemy to true science. Study of how this occurred will allow environmentalism to do the same. The transformation worked because the precipitating event of invention of the Scientific Method activated the auto-activation chain of logical proof SM is useful, then quality of life SM is useful, and finally scientific proof SM is useful. Environmentalists can transform themselves to their own better problem solving process by a similar chain.

System Structure – The Corporate Proxy Movement Machine exploits a single main loop: The Race to the Bottom among Politicians. This is done by pushing on the high leverage point of falsehood and favoritism.

Meanwhile the environmental movement is attempting to exploit the opposing loop: The Race to the Top among Politicians. However they don’t know this, and thus have no idea they are pushing on the low leverage point of “more of the truth.” This cannot succeed, due to inherent structural factors. Environmentalists must therefore find the well hidden high leverage points in the system that will work, and push there instead.

Once they do find them, a deliberate process revolution can occur. How this could happen due to the higher appeal of the new paradigm of Analytical Activism is explained in The Basic Structure of Process Revolutions model. Here the Illusion of the Right Process is replaced by The New Normal Science of Analytical Activism, simply by pushing on the high leverage point of process efficiency.

Defects and Flaws – See the Transformation Strategy Map. The key defect is faulty analysis of difficult problems. The key flaw is dependence on Classic Activism. Both are due to the reinforcing loop of Illusion of the Right Process. Almost no environmentalists are aware of any of this, due to paradigm tunnel vision.

High Leverage Points – For the transformation of the Second Age of Reason these were:

1. The concept of process efficiency itself, which is necessary to accept that a new process can be better than an old one.
2. Logical proof the new process of the Scientific Method was better.
3. Quality of life proof the Scientific Method was better.
4. Scientific proof the Scientific Method was better.

For The Basic Structure of Process Revolutions model the high leverage point is process efficiency.

For The Memetic Evolution of Solutions to Difficult Problems the high leverage points are experimentation quality first and quantity second. This is because only high quality experimentation can provide the high soundness of knowledge needed to achieve a solution confidence level of 99.9% or more. The emergent super high leverage point for the entire model is the concept of process optimization, which is the real insight of the model.

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This completes the System Understanding step. We now have enough of an analysis of why the system works the way it does to make the next step, Solution Convergence, straightforward. This is because all the next step needs to do is take the models we have built, and the high leverage points we have found, and determine how to best combine this knowledge into a new model of how the environmental movement can successfully transform itself. The central strategy of this next step will be resolving the flaws in the strategy map, and focusing on the super high leverage point of process optimization.
Chapter 10

Process Step 3. Solution Convergence

The System Understanding Step Identified Where the high leverage points are and what flaws need resolution. The Solution Convergence step figures out how to best push on the high leverage points to resolve those flaws. Basically what this step does is take the output from the System Understanding step and use it to quickly converge upon the solution.

As we do this we must resolve these top risks:

**Risk 1. Failure to learn from the past** – We must learn so much from the success of the Corporate Proxy Movement and the Second Age of Reason that the transformation of the environmental movement to Analytical Activism is every bit as successful. If we do not learn deeply and correctly from the past, we will repeat the same mistakes.

**Risk 2. Up against a supremely capable foe** - This is an even greater risk. We are up against the most formidable opponent *Homo sapiens* has ever encountered: the New Dominant Life Form. Furthermore, the strength of this life form continues to grow, as it sweeps across the planet and makes humanity even more dependent upon it, in a seemingly unstoppable process popularly called globalization, but more accurately called global corporatization. Its cleverness is also growing, as seen in the continued growth of the mindset that civilization is commerce and that health and happiness is consumption.

Thus the solution we are about to converge upon must be fully capable of beating this opponent, so that we can restore the proper relationship: that of humanity as master over a trusted and productive servant, instead of the present one of the modern corporation as a global tyrant over 6.5 billion corporate serfs.

**Risk 3. Failure to cross the chasm** – As challenging as the second risk may be, an even greater one lurks dead ahead. It is so challenging it has ensnared many of the very foe we are battling against. It is the trap of failing to cross the chasm between early adopters and the early majority.

Countless corporations have fallen into this trap and died. *Homo sapiens* must not become the next.

**Risk 4. Failure to preserve conceptual integrity** – The other three risks are big, but this one surpasses them all. If the conceptual integrity of the product is not preserved, then all is lost, because the other three risks and many more will fail to be resolved.

**Conceptual integrity** is the key subconcepts that must be maintained for an overall concept to achieve its mission. As you read this chapter, try to discern what those key subconcepts are, and why they are so crucial to the success of the transformation of the modern environmental movement to Analytical Activism.

The Transformation Causal Flow Model

We are about to present the first model of the solution we have converged upon. It is a causal flow model, which allows a more informal and much less complex presentation of the solution. In the next chapter the transformation simulation model will be presented.

Both models are engineered to do one main thing: push correctly and indefinitely on the right high leverage points. So let’s begin by:

Finding the Right High Leverage Points to Build a Solution On

We will be using truth rather than falsehood to achieve our goal. Thus the three high leverage points (HLPs) the environmental movement needs to use to transform itself to Analytical Activism are similar to the ones that science used to transform itself to the Scientific Method. As The Second Age of Reason model showed, these were:

The Scientific Method transformation HLPs

1. Logical proof SM is useful
2. Scientific proof SM is useful
3. Quality of life proof SM is useful
The goal state is reached at least 50% of environmental organizations are using the Analytical Method as their central problem solving tool. The chief component of this tool experimentation. Why not use experimental proof as the main reason to convert? This insight leads to three high leverage points that can be used by the environmental movement to convert itself to Analytical Activism. These are:

The Analytical Activism transformation HLPs
1. Logical proof AA is better
2. Artificial world proof AA is better
3. Real world proof AA is better

An artificial world experiment is one performed in the artificial world of a contrived, carefully controlled setting, such as a laboratory or a roomful of test subjects. A real world experiment is one performed in the real world, such as government elections. Experiments consist of varying an independent variable(s) to see what effect it has on the dependent variable(s).

For example, an artificial world experiment to test Truth Ratings might involve getting 50 college students to go through a simulated election cycle. The real world version of that experiment would use real voters and politicians. In both cases, the independent variable would be whether the students or the real voters were exposed to Truth Ratings before voting. The dependent variable would be the election outcome. The hypothesis would be that Truth Ratings cause more voters to vote for those politicians with a higher Truth Rating. If that did indeed occur in an experiment, the hypothesis would be proven to be probably true. Otherwise it would be proven false.

This experiment would do more than just test the hypothesis. It would begin to calibrate the effect of Truth Ratings. Calibration is measuring the strength of a cause and effect relationship or the value of a node.

Until we have run many Truth Rating experiments, no one has any real idea how much politician ratings would affect voter behavior. If it turns out they affect it some, but not enough to help solve the problem, then we have an ineffective solution element. Or we may have some good news here. It may turn out Truth Ratings affects voters enough to make the race to the top go dominant, especially when combined with other solution elements.

Compare the two sets of high leverage points. Both are auto-activation chains. The first point in both chains is identical. In the second point, the basic research of scientific proof is almost the same as artificial world experimentation. In the third point, quality of life proof is the same as real world proof. Thus the chains are not just similar. They are nearly identical.

Therefore, if the precipitating event of the second chain is as strong and correct as that of the first, how can we fail?

In addition, Analytical Activism is as strong and correct as the Scientific Method, because it is the Scientific Method, applied to achieving an objective instead of testing a hypothesis. Testing a hypothesis to see whether or not it will achieve an objective is the same as testing a hypothesis to see whether it explains a phenomenon. If a valid hypothesis is at all difficult to find, then a process must be used to find it. There is no other way, unless you wish to do what the alchemists did, and grope around in the dark with guess after guess. Therefore Analytical Activism and the Scientific Method are precisely the same, down to the last nuance, because we have learned from the past.

Once again, if that is true, then how can we fail?

Well, one way we could fail is to underestimate our opponent (risk 2). Another is to not cross the chasm (risk 3). Another is we may fail to not get enough united action from the environmental movement. Yet another is we may move so slowly that the opposition has time to understand what we are doing and successfully counter it. How many more ways there are to fail I don’t know. But if a critical mass of supporters rises up and stands behind the concept of Analytical Activism, then it will have become the one thing stronger than all the armies in the world, and that is an idea whose time has come.

Furthermore, if the Enlightenment could name itself, and the Corporate Proxy Movement could design itself with the Powell Memo, why can’t Analytical Activism do both?

Notice how all three points on the Analytical Activism auto-activation chain are forms of the truth. Thus this transformation could be considered a race to the top, not among politicians, but among environmentalists.

With these thoughts in mind, on the next page is the structure that could work for the environmental movement.
Solution Overview

This is a causal flow model of the solution, rather than a simulation model. It is an amalgam of the best of two worlds: the extraordinary success of The Corporate Proxy Movement Machine and the even more extraordinary paradigm change of The Second Age of Reason. This resolves risk one, which was failure to learn from the past success of these two transformations. Notice how the model is so generic that it applies to any social movement, as does the concept of Analytical Activism.

The model’s chief characteristics are three main reinforcing loops, an auto-activation chain, and many top talent specialists. The specialists are represented by the gray oval and work for environmental organizations that are committed to Analytical Activism. Top talent specialists are the equivalent of the “scholars” of the Corporate Proxy Movement. The behavior of the model is dominated by the three loops, which are driven by the three high leverage points of the auto-activation chain.

Let’s walk through the model and see how it causes environmentalists to not only become analytical activists, but well trained, well paid, high quality ones with a high degree of inner fulfillment.

The Conversion Loop

The model starts with all environmentalists committed to Classic Activism. After the precipitating event of publication of the concept of Analytical Activism, a tiny handful convert to Analytical Activism. Only then does the Conversion to Analytical Activism loop start to grow. As it does, more and more classic activists convert. The goal of the model is to cause over 50% of all serious environmental organizations to become committed to Analytical Activism. Once that happens, the environmental movement has successfully transformed itself into one capable of solving the global environmental sustainability problem in time.
Conversion is caused by exposure to three kinds of proof that Analytical Activism is much better than present practices. Each proof is successively more convincing. These three kinds of proof make up the auto-activation chain.

The precipitating event activates the first link in the chain, which is \textbf{1. Logical proof AA is better}. Logical proof is conveyed mostly through reading and discussion. This includes exposure to how AA works, which is required to use it and to show it is better than the ad hoc, common sense, event oriented problem solving process presently used. Building a process that works, in the form of a large collection of proven hypotheses, is the goal of the three types of proof.

Once enough logical proof occurs, enough theory becomes available to begin a serious series of experiments to test the theory, which activates the second link, which is \textbf{2. Artificial world proof AA is better}. The first experiments will probably be artificial world experiments, because they are cheaper, simpler, and quicker than real world experiments.

Once enough artificial world experiments have been done and the body of theory matures enough, the third link in the auto-activation chain is activated. This is \textbf{3. Real world proof AA is better}. Real world experiments require considerably more time and expense, but the results are usually much more reliable. If designed properly, real world experiments can be easily scaled up into actual implementation of the solution elements that are being tested. This makes the transformation to Analytical Activism as painless and efficient as possible. \textit{Thus as the environmental movement makes the gradual conversion from Classic to Analytical Activism, they are also making a seamless conversion from theory to reality.}

Later we will discuss how \textit{early majority incremental change projects} are necessary to “cross the chasm” and cause enough of those \textit{Committed to Analytical Activism} to convert.

The solution may sound overly complex. But it is no more so than a similar one that has already worked: the Corporate Proxy Movement Machine, on page 158.

\textbf{The Investment Loop}

Let’s take a look at another loop. As the three auto-activation high leverage points are activated, the \textit{Redirection of Investment to Analytical Activism} loop also grows. Each kind of proof not only causes personal decisions to convert to Analytical Activism. It also causes decisions to increase funding to Analytical Activism, because it has proved it is worth that investment. This addresses what has long been a showstopper for the environmental movement: a large and reliable source of funding. This goes only to those environmental NGOs who are capable of doing a good job of Analytical Activism, as shown by their certification and track record of success. Certification is part of the high quality training program that is available for those who seek to become top talent specialists. Individuals are certified in particular skills, just as doctors, lawyers, engineers, accountants, and many professionals already are. Organizations are certified for their ability to manage particular sets of skills in order to consistently achieve objectives.

Notice how actual ability to solve the problem is rewarded with more funding, which attracts more top talent, which increases an organization’s ability to solve the problem, which causes it to be rewarded with even more funding, and so on. This has a powerful effect, because it is a race to the top.

\textit{Techie Alert}

The rest of this chapter gradually begins to get complex. Unless you want to master the tools of social system engineering, you probably don’t need to read it. The key ideas worth skimming are:

\begin{enumerate}
\item \textbf{1. The Transformation to Analytical Activism model} (page 198) – The publication of the concept of Analytical Activism is designed to be the precipitating event that will cause those committed to Classic Activism to convert to Analytical Activism. This works due to exposure to a steadily growing mountain of irrefutable proof that Analytical Activism is better.
\item \textbf{2. Maslow’s Hierarchy of Needs} (page 200) – By meeting these needs, especially self-fulfillment, the environmental movement can attract and retain the top talent needed to solve the sustainability problem.
\item \textbf{3. The Five Motivations to Adopt the New Technology of Analytical Activism} (page 205) – This diagram of Geoffrey Moore’s famous “crossing the chasm” curve shows how the solution is engineered to accommodate all five types of new technology users, starting with the logical proof necessary to convert innovators, and crossing the chasm with incremental change projects.
\item \textbf{4. The complete Transformation Strategy Map} (page 209) – On a single page we have captured the entire high level analysis and solution. The map is quite readable and illustrates how powerful such a simple tool can be.
\end{enumerate}
Redirection of Investment to Analytical Activism and Inner Fulfillment are the most important loops because they remain in place after the conversion loop has served its purpose and is no longer important. In fact, once conversion reaches 100%, the conversion loop disappears because there is no longer anyone to convert. Similar loops have vanished throughout the many twists and turns of history, as new loops rose to dominance.

Next let’s look at the Inner Fulfillment loop and the theory behind inner fulfillment.

The Inner Fulfillment Loop and Maslow’s Hierarchy of Needs

The most important loop of all in the long run is the Inner Fulfillment loop. This is because for people to reach maximum quality and quantity of work, and sustain that peak level of performance for a long time, they must achieve their fullest potential and be satisfied in the deepest and most complete way possible. This requires inner fulfillment of deep psychological needs. Money does not do this, once one’s survival and security needs are met. It takes something more.

That something more is well described by Maslow’s Hierarchy of Needs, as shown above. This theory of human behavior has five levels. As the needs on each level are met, they no longer serve as motivators. Instead, the person is now motivated by the next level up in the hierarchy.

Self actualization is the highest level. This is Maslow’s preferred term. It is more commonly called self fulfillment, which is the term we use. We will also use the term inner fulfillment to the top three levels. Outer fulfillment refers to the lower two levels. The higher the level, the higher the fulfillment.

Andrew Herrington of Pateo Consulting describes Maslow’s work this way: (Italics are in the original) 87

“Central is the simple argument that to do what you do well you must be enjoying what you do. Competitive businesses need their employees to be doing what they are doing well in order to prosper in the competitive marketplace.

“One of the best known theories explaining the actions of people is that of Dr. Abraham Maslow ("Motivation and Personality", New York, Harper and Row, 1954). Dr. Maslow hypothesized that people are motivated by a hierarchy of needs. The hierarchy he described may be drawn as follows: [See the diagram, which has been slightly improved.]

“Maslow’s theory requires that:

- Each individual’s needs must be satisfied at the lower levels before they progress to the higher, more complex levels.
- When low-level needs are satisfied, individuals are no longer motivated by them.
- As each level of needs is met, individual's progress to higher level motivators.
- All the needs are always present.

“It can be reasonably hypothesized that Knowledge Workers must be looking for motivation from the highest level of the triangle: Self-Actualization.

“Most Knowledge Workers have no need to worry about their physiological, security, and safety needs, so these basic, low-level needs no longer motivate their actions, although the needs are always present. Many people are today motivated primarily by social, esteem, and self-actualizing needs.
“Everyone needs to be loved, to be accepted, and to belong. Individuals join social, religious, fraternal, and educational organizations to fulfill this psychological need.

“Esteem needs are a step higher in Maslow’s hierarchy. In addition to being merely accepted and belonging, people want to be heard, to be appreciated, and to be wanted. People want to feel important and need status.

“At the highest level are self-actualizing needs. People seek to achieve their highest potential through professional, philanthropic, political, educational, and artistic channels. These needs, according to Maslow’s concept, become important only when all social and ego needs have been satisfied.”

Andrew Herrington and others reason that in a modern industrialized society, knowledge workers are motivated primarily by self fulfillment. Thus for the model to do a good job of maximizing the problem solving ability of the Analytical Activism Movement, it must motivate the top talent specialists mostly with self fulfillment, along with a sufficient amount of peer esteem, self esteem, and the money it takes to buy security and survival. The top three needs are achieved by the Inner Fulfillment loop. Let’s take a leisurely stroll through this loop.

Engaging in producing the three types of proof AA is better results in an increase in acts of social recognition and personal achievement. For example, publishing and speaking does wonders for one’s peer esteem and self esteem. So do awards, recognition in articles by others, and serving on peer review panels for journals. All this has long been the norm for business, academia, and some of the non-profit world. But much of this has not reached environmental organizations, because there is no accurate measure of the value of a person’s work, except for very broad measures like number of books sold, articles published, or successful projects.

The independent certification program fixes that defect by an institutionalized, accurate measure of the value of the contribution of an individual or organization to the practice of Analytical Activism, and later to the solution of the sustainability problem. This would be done in a similar way to Truth and Corruption Ratings. It would measure how well an entity was achieving its objectives, and how challenging those objectives were to achieve.

High certification ratings would bring prestige and fulfillment to those individuals who received them, as well as those individuals who worked for organizations that consistently achieved high ratings. Certification ratings would also give funding sources a very useful measure of who deserved their largess and who did not. For these reasons individuals and organizations would strive for high ratings, which is another reinforcing feedback loop. For simplicity it is not shown.

Let’s continue going around the Inner Fulfillment loop. Eventually, especially among those organizations providing the right climate to their specialists and receiving high certification ratings, peer and self esteem gives way to the higher level of self fulfillment. This is the highest goal of Knowledge Workers, which is what an analytical activist is.

The combination of high levels of peer and self esteem and self fulfillment increases the attraction, retention, and productivity of top talent. This increases the quantity and quality of specialist output all the more, and the loop starts all over again.

That’s how the three loops work. Next, let’s see how the three high leverage points work.

The 1st Link in the Chain: Logical Proof AA Is Better

The solution is built around an auto-activation chain. Each link in the chain is a high leverage point.

The first link is activated by the precipitating event of publication of the concept of Analytical Activism. This provides logical proof AA is better to those who can be convinced by logic alone that AA is a better way. These are the innovators of The Technology Adoption Life Cycle.

Activation of the first link started to occur in mid 2005, even though the concept of Analytical Activism has not been officially published in book or article form. As early drafts of the first three chapters began circulating, the first innovators took up the cause. While their number and influence is still far from sufficient to tip the system into the goal state, it has been more than enough to help improve the concepts and the form in which they are being presented.

The reason the first few innovators converted so quickly, in many cases after a single reading, is the first three chapters offered at least four logical proofs these concepts could work. Here is a summary of those proofs:

Logical Proof 1. There is a clear parallel between the urban decay problem in the US in the 1960s and the global environmental sustainability problem. In both cases initial solutions failed, because complex social systems are so counterintuitive they attract attention to wrong solutions. Jay Forrester proved that a correct system dynamics analysis of why conventional urban decay solutions were failing could lead to a correct solution. The same can probably be done with the global environmental sustainability problem, because it too is a complex social system problem.
Logical Proof 2. The modern environmental movement has no formal process that guarantees results if properly applied. Neither did science before invention of the Scientific Method. Once the Scientific Method was invented and adopted, scientists were able to achieve the goals that had long eluded them. The same thing can happen to any group of problem solvers, including environmentalists.

Logical Proof 3. It appears that the modern environmental movement is mostly following the process of Classic Activism. This offers only three main solutions. These worked on the easier problems encountered at first, which explains Classic Activism’s perennial appeal. But this standard set of solutions has proven inadequate on the more difficult problems (those with high levels of solution adoption resistance) for over 30 years now. Therefore the movement must change to something better that will allow solving the difficult problems. Analytical Activism and its chief tool, the System Improvement Process, can do exactly that.

Logical Proof 4. It also appears that the modern environmental movement is pushing on the low leverage point of “more of the truth.” This is logically demonstrated by the Dueling Loops of the Political Powerplace Model. Because the movement clearly lacks the ability to push with enough force to make this solution work, it is doomed to failure. If the movement is to succeed, it must instead push on high leverage points. And to do that, it must adopt an analytical process and become process driven, from head to toe. (For me this is the most powerful proof of all.)

The chapters written after the first three offer one additional proof:

Logical Proof 5. The Powell Memo worked for the Corporate Proxy Movement. Thus a similar plan could work for the environmental movement. That plan centers around adoption of Analytical Activism.

These proofs were all it took for innovative environmentalists to adopt these concepts.

As more innovators are attracted by logical proof AA is better, they will each make personal decisions to convert to AA. This results in a behavioral leap of conversion to a whole new way of thinking. As each innovator goes through this epiphany, they move from the stock of those Committed to Classic Activism to those Committed to Analytical Activism.

Now that they are committed, they begin use of AA. Because AA is such a powerful and complex approach to solving problems, they must sooner or later specialize to do their best work. This leads to a choice of specialty, from the roles shown in the gray oval. There are so many crucial roles to play that only the more common ones are shown. One that is not shown is spreading these ideas to others, and helping others to make the sometimes traumatic conversion step, because to some this means repudiating all they have believed in for so long. This role is sometimes called the evangelizer. This is the role being played by most of the first few innovators so far. Others are helping to improve the forms they are being presented in, as well as the ideas themselves. The last is the most important.

Back to the model. Once activists have chosen the roles they would like to play in helping to solve the problem through choice of specialty, the next step is to receive high quality training and certification in use of AA. This would eventually be at a university, combined with on the job experience working alongside those already proficient. The training would be every bit as demanding as that at the top colleges in the world, because that’s what is necessary to solve the top problem in the world: the global environmental sustainability problem. Most of the courses required are already widely taught, so this requires little change, other than to set up the programs necessary for the various specialties of Analytical Activism.

It will probably be best if a very small number of existing colleges are chosen, so that the environmental movement is as united in thought and deed as possible, and is not distracted by the task of setting up its own equally good institutions, which is probably not possible. Two that can serve this role in the English speaking world are the Massachusetts Institute of Technology (MIT) and the London Business School. Both have strong curriculums in business management and systems dynamics, and therefore can cover the requirements for training in the big three of Analytical Activism: the problem solving process that drives everything, structural thinking/modeling, and experimentation. These are the only two English speaking colleges in the world with MBA and systems dynamics programs, because the latter is so rare. Fortunately, both are widely acknowledged as among the best in the world.

Until formal programs at colleges are established, less formal training programs can be used. However the quality must be just as high.

All this is similar, and just as critical, as the Leadership Institute the Corporate Proxy Movement set up. Remember that according to Ron Hazen’s article on The Right Wing-Express:

“...the core leaders of the Big 80 groups he studied are about 2,000 people who make between $75,000 and $200,000 and have all been trained in the Leadership Institute.”
Once their training is complete, the innovators will begin working for environmental organizations practicing AA. Some of these may be government agencies or universities, but during the transformation to the Analytical Activism stage of solving the problem, we expect them to be mostly NGOs.

The first few innovators will work mostly on innovative synthesis. This is to improve the power of the many solution components of Analytical Activism. As their work progresses, they will speak and write about it.

The result is more and better logical proof AA is better. There is not much of that now. But as more accumulates something new will happen. Not only will more innovators be attracted and converted, but more and bigger decisions to fund AA will occur. Once enough of that begins to happen, the large and reliable source of funding node will begin to grow to sufficient strength.

This can make a radical difference, as proven by the conservative message machine investment banking matrix in The Corporate Proxy Movement Machine. Sufficient amounts of money spent the right way on top talent, combined with the natural desire of that top talent to serve humanity and pursue one’s full intellectual potential, are what drive the model.

Notice what we are doing here. Environmentalism can now be an attractive, well paid, high status, high fulfillment career. There is no reason top analytical activists cannot stand beside professors, scientists, virtuous politicians, and others in their contribution to knowledge and to society. There is also no reason they will not receive the same high social status that professors, doctors, and entrepreneurs receive, especially as close to seven billion people watch breathlessly as they proceed to solve the most daunting problem in the world. Top pay, top status, top fulfillment, and top contribution to the greatest problem facing humanity will attract the top talent needed to solve that problem. These glowing words may sound preposterous, but remember that an identical strategy worked for the Corporate Proxy Movement. Therefore it can work just as well for the environmental movement. But only if environmentalists can prove they are worth the investment.

The 2nd Link in the Chain: Artificial World Proof AA Is Better

It will not be long before the second link in the auto-activation chain is activated. This occurs when the logical proof AA is better has attracted enough top talent to begin running high quality experiments. At first these will be artificial world experiments, because they are cheaper, simpler, and much faster to perform.

An artificial world experiment occurs in a controlled, contrived environment where the experimenter has full control over all important variables. Essentially the experimenter creates an artificial world that approximates the real world closely enough for the experiment to be valid. The artificial world may be in a laboratory, an office, or anywhere. The distinction is that an artificial world experiment is so different from a real world experiment that one cannot be certain that the difference between the two has been accounted for in experiment design.

Otherwise this link works the same as the first, with the substitution of artificial world proof for logical proof.

There is no firm line between the first and second links, because part of logical education that Analytical Activism is a better way involves The First Experiment and many more.

Artificial world proof causes the second group of new technology adopters, the early adopters, to convert to Analytical Activism.

The 3rd Link in the Chain: Real World Proof AA Is Better

As overwhelming amounts of artificial world proof begin to accumulate, this link spontaneously activates when it becomes obvious there is enough proof to try these concepts in the real world. This is where tangible progress starts to be made on the actual problem, because each successful real world experiment is also part of the solution.

This link works about the same as the second link. The only difference is experimentation is now on the real world of people, plants, and animals, and all that the thin, fragile layer around the earth we call the biosphere contains.

Real world proof is so persuasive that once it begins to appear, droves of the early majority will begin converting from Classic to Analytical Activism. When that welcome trend arrives, we will know that Analytical Activism has become the top tool in the environmental movement’s toolbox, and that we can now begin to address the global environmental sustainability problem correctly.
The Three Subproblems of SIP

You may have noticed that the three subproblems of the System Improvement Process were not dealt with on the transformation model. Nor have they been mentioned yet. Why not?

Let’s review what the three subproblems of the System Improvement Process are. The guiding question of the Solution Convergence step is: How can the three subproblems be solved? This leads to the following questions about the three subproblems:

1. How can adoption resistance to the solution be overcome?
2. How can we move the system to the goal state?
3. How can we keep the system in the goal state?

The reason these questions are not as major as they normally are, such as in part one, is that this is a solution adoption problem. Thus it would appear that the three subproblems of SIP do not apply, and that we are only solving subproblem one.

However they do apply, once you analyze the problem in depth and design an appropriate solution. Subproblem 1, adoption resistance, occurs in the crossing the chasm risk. Subproblem 2, how to move to the goal state, is handled by the auto-activation chain. Subproblem 3, how to stay in the goal state, is accomplished by the Inner Fulfillment loop. That loop is designed to be self-maintaining once firmly established, just as a similar loop in modern science has been self-maintaining for over three hundred years now. If it can work for modern science, it can work for the modern environmental movement.

* * *

This completes the presentation of the transformation causal flow model. Next we address one of our top risks, which can now be properly understood in the context of the model just presented.
The Five Motivations to Adopt the New Technology of Analytical Activism

Artificial world proof
- See big change as worth it to reap big benefits, since not risk adverse

Logical Proof
- Find new technology easy to understand and justify

Real world proof
- Prefer practical and incremental change, since more risk adverse

Peer pressure
- Uncomfortable with new technology

Survival and security pressure
- Avoid new technology

Innovators Early Adopters

Early Majority Late Majority Laggards

Resolving the Crossing the Chasm Risk

Next we take a look at the transformation model from another angle: how it works with Geoffrey Moore’s five types of new technology adopters. Analytical Activism is a new type of technology, so we must understand it from that dimension as well. The purpose of this is to resolve risk three, which was failure to cross the chasm.

How the Transformation Model Handles the Five Types of New Technology Users

Above are the five main types of technology adopters and their motivations. The motivations in blue above the dotted lines are those causing adoption of Analytical Activism. The motivations below the dotted lines, in black, are the standard ones from Moore’s work.

What we’ve done is extend Moore’s theory to more closely suit the “market” we are dealing with. This market is environmentalists and environmental organizations. Like all markets, it is segmented into different groups. Each behaves very differently and thus requires a different reason to mentally “buy” into the product of Analytical Activism.

Here’s how The Transformation to Analytical Activism model is designed to work for each type of adopter:

Innovators – The first group to adopt Analytical Activism is the innovators, on the basis of logical proof alone. They do this because they are technologists (scientists, engineers, academics, already trained in a related technology, or technology enthusiasts) and hence accustomed to making decisions based on logic alone. This is why they find new technology easy to understand and justify. The logical proof innovators need is provided by the first link in the auto-activation chain.

For example, one of the first few people to read an early draft of part one had an MBA from the London Business School, which has a system dynamics school. She had taken a few simulation modeling courses, and said “When I was reading it I felt like I was taking the courses all over again. It touched on all the big reasons systems thinking and modeling work so well on problems like this.” She had no trouble at all buying into the idea these concepts could work. After a one-on-one meeting in which she peppered me with a written list of questions challenging various assumptions, she became an innovator.

Of the first four innovators taking an active role in creating or promoting these concepts, one is a software engineer, one is a retired hydrologist, another is a chemical engineer and entrepreneur, and one is a retired social worker, who through long exposure to me has become a systems thinker. This fits the pattern Moore predicted, because everyone in this group finds new technology relatively easy to understand and justify.

Early adopters – The second group, early adopters, is persuaded by artificial world proof. Because they see big change as worth it to reap big benefits and because they are not that risk averse, they only require reasonable proof the new technology works, rather than the irrefutable proof that real world proof would provide.
Early majority – The third group, the early majority, converts because of undeniable real world proof, such as seeing the beneficial results of Corruption Ratings in several actual elections somewhere in their own country. Since members of the early majority are more risk averse, they require very strong proof the new technology works. They are conservative, practical, low risk types. Thus they prefer the safety of incremental change. This is the third link in the chain.

Late majority – Once the third and final link is activated, the momentum of the solution structure as a whole takes over. Soon there are so many adopters that peer pressure causes the late majority to convert. This overcomes their discomfort with new technology.

Laggards – Finally, survival and security pressure causes even the laggards to convert, because if they don’t they won’t have a job or a company. This pressure overcomes their strong avoidance of new technology.

This model of behavior, or one like it, should be used by problem solvers to more accurately target each type of adopter as implementation moves along. The model can be elaborated on, and probably has some errors, because it is based on conjecture rather than measurement at this point. Even so, it is still useful for strategic insights.

Now for the real question: Is the crossing the chasm trap Moore warned us about present here?

According to Moore, if the technology being adopted is discontinuous, then a chasm exists. Because the ad hoc, common sense, event oriented methods of Classic Activism are so different from the methods of Analytical Activism, a very wide and deep chasm does indeed exist. Therefore real world proof alone will probably not be enough to cause enough early majority environmental organizations to make what to them is a painful and risky commitment.

I believe that Moore speaks with the voice of experience. As much as we may want to believe otherwise, most of the early majority will behave true to form and hold back, even as all three types of proof mount all around them. It is not better proof they are waiting for, but something more, something to make the switch a lot less discontinuous, something to make leaping the chasm look a lot less intimidating.

Crossing the Chasm with Incremental Change Projects

That something more is easily provided with little practical things they can do to change, instead of big things. Let’s call these incremental change projects. If enough of them are done, an educational threshold is reached that allows the big, bold, discontinuous project of adopting Analytical Activism to now be seen as the next logical step, a step that no longer looks as intimidating as it did at first.

The first incremental change project, in the form of The First Experiment, is about 30 minutes long. Because this first step is so important, a complete sample first experiment has been written up in the chapter on The First Experiment. It contains all you need to run it on a small group of people.

First experiments can vary widely on what they test. The important thing is that each experiment be useful. That is, it must educate, collect valid data that can be used to test a hypothesis, or do both. The sample first experiment mostly educates, because the sample size is small and not randomly selected, and therefore is statistically invalid and biased. But those limitations can be easily overcome by taking the same experiment and performing it with a randomly selected, larger sample size.

Imagine that an organization tries the tiny experiment and loved it. Over the next few weeks they try many more, and have some fascinating discussions. This educates them in what Analytical Activism is all about.

On the basis of that, the organization decides they are ready for the next incremental step. They want to give Analytical Activism a further try, but not go all out at first. They would like to play it safe and not take any chance of endangering what they are currently doing. They choose to work with an expert on Analytical Activism to design their own artificial world experiments—ones that would be large enough and well designed enough to be valid. This allows them to figure out how to better solve the problems that are part of their own mission.

Suppose they commit to training in experiment design and in a few months are designing, performing, and interpreting their own experiments. After about six months of this, the results become apparent—it works! Those involved in the experiments begin to apply the principles of Analytical Activism to many of their problems. But what really gets them excited is the knowledge they have acquired from proving a mere handful of key hypotheses gives them a multitude of new insights that allows them to take their problem solving strategy in an entirely new direction.

Then the organization decides to take the next incremental step, which is to try Analytical Activism in a single department. The argument is this is a low risk, low cost investment. When someone points out that it is really zero risk, because that department is the one running the experiments and thus is already doing Analyti-
cal Activism, a few heads turn and slowly began to nod, in a quiet realization.

What has happened here is that an early majority environmental organization has become an early adopter. Because they can now see that Analytical Activism is probably going to work for them, it is now low risk. They have also proven to themselves that it offers their organization some potentially large benefits. The incremental change projects have transformed them into an early adopter, and an eager one at that, so there is now no chasm to cross.

This then is how the chasm can be crossed—with a series of flexible, well designed incremental change projects that any organization can try.

Aversion to discontinuous change is not the only reason for change resistance. Others include The Not Invented Here Syndrome, turf battles, addiction to present practices, competing solutions making it hard to determine which is The Next Better Way, and the biggest of them all, lack of ability to evaluate a new technology correctly and independently. For example, at one point in this quest one environmental manager wrote me:

“I don’t know who is right - you, Jared Diamond and Collapse, Amory Lovins, Paul Hawken - et al – the list is long. I admire you for trying however. I have the same response to your work that I do for theirs - I don’t know which one will push the tipping point.”

We must remember that ability to evaluate a new technology on the basic of logic alone is only present in the innovators. The rest have to substitute something else for that ability, such as reliance on the opinion of others, experimental proof, or, our favorite, self-education through incremental change projects.

Now we can explain the early majority incremental change projects node on the Transformation to Analytical Activism model on page 198. These projects are necessary for artificial world proof AA is better and/or real world proof AA is better to be enough to cause the early majority to change into early adopters and convert. Without this node, the solution would probably stall when trying to cross the chasm.

Next let’s add what we have just learned to the Transformation Strategy Map we have been building one layer at a time.

Adding the Crossing the Chasm Risk to the Strategy Map

On the next page one defect, two flaws, and one fix have been added to the strategy map.

Starting with the defect, crossing the chasm resistance increases the tendency of using a problem solving process that works on easy problems, but fails on more difficult problems. This is because until the chasm is crossed, the present process of Classic Activism only works on easy problems.

There is already considerable proof that Classic Activism is not working. Therefore there must be a better way. But that better way is seen as scary, unknown, and risky. Conventional wisdom says to stick with the tried and true low risk method of Classic Activism.

However the main reason crossing the chasm resistance is on the map is we are thinking ahead to solution efforts. When we try to resolve the dependence on Classic Activism flaw with the solution, we are going to encounter a great deal of change resistance. The chief form of this change resistance, according to Moore’s theory, is crossing the chasm resistance.

This is a potentially grave defect, because there are two flaws causing it. Both have already been discussed. These flaws allow the defect of crossing the chasm resistance to appear because this is a discontinuous change and the early majority prefers incremental change.

What makes the resistance so serious is these two causes are unchangeable. (This is indicated by the dashed line box around them.) Becoming process driven, switching to structural thinking, and modeling instead of winging it are a huge, possibly insurmountable discontinuous change. Just as the Enlightenment was the largest new paradigm to ever visit scientists of the 17th century, Analytical Activism, or something like it, will probably be the largest paradigm change to visit the environmental movement of the 21st century. And, according to Moore’s theory, the early majority prefers incremental change and nothing is going to change that.

What can be done? Unchangeable flaws cannot be changed. So we must work on what they affect, which in this case is crossing the chasm resistance. As we discussed in the previous section, this can be overcome in the all important early majority by incremental change projects. This becomes a fix.

The dashed arrow indicates an inverse relationship. An increase in incremental change projects causes a decrease in crossing the chasm resistance. As we argued in the previous section, it should work so well that there is no longer a chasm for most of the early majority, because incremental change projects has changed them into early adopters.
However it is a little obvious that this fix alone is not going to solve the problem. To do that we need to go deeper and finish the map.

This brings us to the real goal of Solution Convergence: getting the fixes and structural changes levels of the strategy map right. While the transformation models are important, the strategy behind them is what matters. This is because most ambitious difficult undertakings are won or lost at the strategic level. The best strategy cannot save bad tactics. But if a strategy is top class, then average or even below average quality tactics can still carry the day.

The Complete Strategy Map

The complete Transformation Strategy Map is shown on the next page. The structural changes layer has been filled in. This layer shows how the solution strategy is dominated by the Growth of Analytical Activism loop and the three packages of solution elements. Because deep structural change is the only way to solve problems like this one, there is only one node on the fixes layer. The rest are where they should be: on the structural changes layer.

Solution Strategy Overview

According to wikipedia.org, “strategy is a long term plan of action designed to achieve a particular goal, as differentiated from tactics or immediate actions with resources at hand.” Strategy is the few things that make the big difference. Tactics is the many things that make the little difference. Both are necessary.

In an SIP strategy map, the many tactical moves necessary to understand and solve a problem are organized into easily understood layers. Each layer explains
why the behavior in the one above it is occurring, or how the layers above it can be made to change so as to solve the problem.

The solution strategy in this map centers on creating the Growth of Analytical Activism loop and providing the solution elements necessary to make that loop grow into one strong enough to solve the problem. For better management the solution elements are organized into three packages.

If we can make this loop grow into a solid, mature structure the problem is solved. Or, as Eric Wagoner described it when he first encountered the Transformation Strategy Map and pointed to the bottom loop, “We're here, aren't we? This is where you think we are and you want to get this loop growing, don't you?”

Structural change reduces or eliminates flaws or defects by causing the dominant feedback loops in a system to change radically. It does this by adding, changing, or removing nodes in the system.
But we must go deep. Not just any structural change will do. As we wrote in a previous chapter:

“Deep structural change is structural change that causes loop dominance to change significantly and indefinitely. The result is the system now behaves so differently it seems to have ‘flipped’ into a new mode, such as from sustainable to unsustainable, which on a global basis was triggered by the Industrial Revolution. Deep structural change is what is required to solve any difficult complex social system problem, because the solution requires the system to behave fundamentally differently indefinitely.”

The Growth of Analytical Activism loop is deep structural change. How it works was described earlier on page 59.

There is no silver bullet to solving truly complex problems. This problem is no exception. As the map shows, there is no one key to ensuring the Growth of Analytical Activism loop grows fast and large enough. Instead, it takes three distinctly different packages to do this, which in turn take a total of ten solution elements working closely together.

If we can make the Solution Convergence layer of the map happen as shown then the problem is solved. Here is an overview of how the solution works:

Solution Mechanics Overview

First we make the Growth of Analytical Activism loop start growing. Its growth is kicked off by the Initiation Package’s precipitating event (1st Phase) and shortly after that, many incremental change projects (2nd Phase). As the loop starts to grow, more and more of the three types of proof Analytical Activism is better appears. Most of this is logical proof only at first. But this and the incremental change projects are enough to cause the solution elements in the Top Talent Package (3rd Phase) to begin to appear. This eventually causes enough top talent specialists and a guiding coalition to appear to begin serious work on the solution elements in the Analytical Method Application Package (4th Phase). This causes the Growth of Analytical Activism loop to strengthen immensely, due to large amounts of artificial and real world proof.

As the loop grows, the three types of proof Analytical Activism is better become so strong and convincing that dependence on Classic Activism begins to fall. Eventually it falls so far the Illusion of the Right Process loop collapses and Analytical Activism becomes the dominant problem solving process. This eliminates the faulty analysis of difficult problems defect once and for all. This causes problem solvers to begin to push correctly on the right high leverage points, and the problem is solved.

Drilling down still further, here’s how the solution works in detail:

The Three Packages

It is important to think in terms of packages. If the objective of each package is achieved, the solution will succeed. We expect the actual solution elements to look quite different from those sketched here. However the packages objectives will probably be fairly stable.

What follows are the components of a strategic plan. Thus this is a very high level solution without much detail. This will occur later as more innovators, early adopters, and early majority supporters take up these ideas and mount a serious transformation effort. That will cause different and better packages from the ones we are about to present to appear, because this book is only a small part of the precipitating event.

Let’s examine each package to see how it helps the Growth of Analytical Activism loop to grow.

1st and 2nd Phases – The Initiation Package

This contains the Precipitating Event and Incremental Change Projects solution elements. The goal of this package is to correctly and sufficiently initiate the solution. After that it has a life of its own.

1st Phase - The Precipitating Event Solution Element

This is where the battle will be won or lost. If the published concept of Analytical Activism points strongly enough in the right direction, that is where the arrow will fly.

The goal of this solution element is to establish the Growth of Analytical Activism as a self-perpetuating reinforcing feedback loop.

This is done by widespread publishing of the core concepts, so as to gain enough initial supporters. The core concepts are:

1. As over 30 years of solution failure on the complete problematique has shown, an entirely new problem solving approach is needed.
2. There is a reason for this failure. Environmentalists are failing to solve the global environmental sustainability problem because they are pushing on low leverage points instead of high leverage points.
3. They are doing this because they are using an intuitive problem solving process instead of an analytical approach.
4. If environmentalists would switch to a process that fits the problem, as science did back in the 17th century when it adopted the Scientific Method, they would be able to correctly analyze the problem and find the high leverage points necessary to solve it.

5. A suitable process is Analytical Activism, which is the use of the Analytical Method to achieve activist goals. The Analytical Method is a refined form of the Scientific Method for achieving objectives reliably.

6. The first step of the Analytical Method is to identify the problem to solve. The second step is to choose an appropriate process. A process capable of solving the sustainability problem is the System Improvement Process.

7. Diligent and widespread application of the System Improvement Process (or any suitable process) will allow the environmental movement to at last correctly analyze the problem, find the correct high leverage points, and push on them correctly until the problem is solved.

8. However, for this to occur the environmental movement must abandon its dearly held paradigm of Classic Activism, and take up the new paradigm of Analytical Activism.

These concepts and many others are being conveyed with the upcoming publication of *Analytical Activism*, articles, thwink.org, the sustainability forum, lots of informal conversations, and so on. This material contains the core concepts and the logical proof they are true. This is all that is necessary for the first few innovators and early adopters to take the first steps.

After that the arrow has left the bow.

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The Dynamic Behavior of the Precipitating Event

Every solution element except Incremental Change Projects causes structural change to the human system. This changes its dynamic behavior. Below is one way to describe how the Precipitating Event does this:

And here is another way to describe the same thing:

Over the short term this solution element establishes the Growth of Analytical Activism loop. But long term it establishes the Inner Fulfillment loop, which is the key loop in the long run.

There is little doubt the Precipitating Event is the most important solution element of them all. The same was true for the Corporate Proxy Movement and the Second Age of Reason, where the Powell Memo and the invention of the Scientific Method played this role.
2nd Phase – The Incremental Change Projects Solution Element

The goal of this solution element is to cause the beginning of the early majority to cross the chasm, and thus prevent the transformation of the environmental movement to Analytical Activism from stalling after an initial flurry of interest. This will resolve the crossing the chasm resistance flaw.

Most people and organizations are justifiably cautious about big, bold projects that require sudden large changes. They prefer practical, simple, small steps forward, which is what incremental change projects are. They allow people and organizations to change one small step at a time.

An incremental change project is a project whose novelty is below the threshold for psychological rejection. For members of the early majority, this means a project seems to be so close to what they are used to that it seems practical and risk free. The idea is to introduce change so gradually that people and organizations will adapt to the changes, rather than reject them.

Incremental change is one of the many tools of organization change management. This discipline has become a centerpiece of modern business management, where the greatest competitive advantage is how fast your company can change to what’s needed to excel in a particular marketplace.

Incremental change is required when an organization is faced with the need for discontinuous change, but lacks the ability to change that fast because their change management skills are low. They probably do not use the term “change management,” nor do they have anything approaching a formal change management process.

The problem (really the opportunity) of how to cope with the need to change is so widespread that an entire consulting field and book genre has appeared to help companies master the critical skill of change management. One example is the book Discontinuous Change: Leading Organizational Transformation, by David Nadler and others, 1994. Here’s what the book has to say about discontinuous change, change management, and organizational transformation—all of which the environmental movement needs to master: (Italics and comments added)

“The companies that survive in the coming decades will be those that are able to respond quickly and effectively to changing environmental conditions. This puts a premium on certain capabilities—adaptiveness, flexibility, and responsiveness. Successful firms will learn and act at a faster rate than the competition [The real competition is the New Dominant Life Form, who so far is learning at a faster rate than Homo sapiens.], and their leaders will have no choice but to be effective anticipators and managers of large-scale change. This simple premise is easy to understand, but difficult to put into practice—as illustrated in the many examples of organizational dinosaurs that failed to adapt.

“Part of the difficulty in adapting to change may be that many aspects of organizational life reinforce stability—that is, they are designed to ensure that any variations are modulated over time, eventually returning to the status quo, especially to policies and practices that worked in the past [such as Classic Activism]. In this respect, most organizations, like individuals, are resistant to change.

“In broad terms, large-scale change is usually triggered by some kind of destabilizing event [such as the sudden realization that the environmental movement is failing to achieve its objectives], an event of sufficient scope and magnitude to create significant disequilibrium in the organization.

“Change management [is] a core organizational competency.”

The primary purpose of incremental change projects is to turn early majority environmentalists and organizations into early adopters, so they can cross the chasm without falling in. But these projects are a Trojan horse—they also teach organizations how to adapt more quickly to changing needs by introducing the new mindset of following a formal process to achieve a goal. Most of these projects are experiments, so the process is the Scientific Method, wrapped in the larger process of the Analytical Method.

From an individual perspective these methods are merely a form of science. But from an organizational perspective, they are mild forms of change management—how can we change our old ad hoc, intuitive methods of problem solving into formal, analytical ones that do the job better? This plants the seed that the ability to change to the most appropriate process needed to achieve your objectives is the most important competitive advantage an organization can have. This ability is change management. It is the equivalent of Darwinian self-evolution.

The Incremental Change Projects solution element consists of:

1. A large selection of off-the-shelf projects to choose from, and various associated materials on self-education on how to run experiments, how to design them, how to perform an analysis, and so
on. These projects vary in size and difficulty, allowing the next project to be only a little bigger and tougher than the one before it.

2. The status of analyses and experiments in progress.
3. The results of analyses and experiments, in an accessible, easily searched, online format.
4. Additional materials as necessary, particularly those dealing with change management.

The Dynamic Behavior of Incremental Change Projects
We have already discussed how incremental change projects reduce crossing the chasm resistance in the Transformation Strategy Map, to the point where the unchangeable flaws of this is a discontinuous change and early majority prefers incremental change are overcome.

The goal of Incremental Change Projects is to cause most of the early majority to cross the chasm, and thus prevent the transformation of the environmental movement to Analytical Activism from stalling after an initial flurry of interest. This is done by Eliminating the Chasm. Let’s take a look at how this solution element works using the diagram below:

The First Experiment becomes the current project. Project content and its size determine the amount of project work. After a delay due to the time it takes to execute the project plus the time it takes for results to take affect, benefits to the individual or organization begin to appear. After another delay of those benefits becoming more obvious and acceptance that these changes are working occurs, willingness to try a bigger change increases. This in turn increases the size of the current project and the loop starts over again. The next projects come from the large stock of Off-the-Shelf Incremental Change Projects.

Once size of the current project grows large enough, the person or organization will be ready and eager to take the final step and adopt Analytical Activism. All resistance to such a large discontinuous change is gone, because it no longer looks so discontinuous. Instead, it now looks like a prudent, practical, low risk way to solve difficult problems.

At this point the chasm has vanished and the goal of this solution element has been achieved.

3rd Phase – Top Talent Package
The goal of this package is to provide and focus the top talent necessary for correct analysis of difficult problems. This will help resolve the key defect on the Transformation Strategy Map: faulty analysis of difficult problems.

Because this is a large, endlessly complex, rapidly changing problem, we need a large number of top talent specialists. As shown on the Transformation to Analytical Activism model on page 198, these specialists include top talent speakers, writers, modelers, experimenters, solution element managers, and process managers. How to get thousands of people with these skills all working together over a long period of time is what the Top Talent Package is designed to do.

This is no different from what the Corporate Proxy Movement accomplished, starting with the cannon shot of the Powell Memo. Ron Hazen, in The Right-Wing Express article quoted earlier, summarized the critical importance of top talent this way:

“Starting with just a handful of groups, including the Heritage Foundation, in the early ’70s, the conservatives built a new generation of organizations – think tanks, media monitors, legal groups, networking organizations, all driven by the same over-arching values of free enterprise, individual freedoms and limited government.

“Stein describes how the message machine works. If Rush Limbaugh wants something on
vouchers – it’s immediately in his hands; if Fox News’ Bill O’Reilly needs a guest to talk about the ‘death tax,’ he’s got him from one of the think tanks. Stein estimates that 36,000 conservatives have been trained on values, issues, leadership, use of media and agenda development. These are not the elected officials, but rather the cadre of the conservative network. Stein figures that the core leaders of the Big 80 groups he studied are about 2,000 people who make between $75,000 and $200,000 and have all been trained in the Leadership Institute.”

We face a similar task. We need to “build a new generation of organizations… all driven by the same over-arching values,” whose “core leaders” … “have all been trained” at the same institution.

The Top Talent Package emulates what the Corporate Proxy Movement Machine did with four solution elements. The foundational element, Unified Top Talent Training, provides the educational and unification factors, as well as part of inner fulfillment. Certification then measures how well individuals and organizations are applying that education. Peer Reviewed Journals judges what the best emerging work on solving the sustainability problem is, and communicates it to the many top talent specialists and the rest of the environmental movement and the world. Finally, the Guiding Coalition emerges to guide the entire transformation and subsequent solving of the main problem. This self-focuses the top talent specialists in the most efficient and effective manner possible.

The Unified Top Talent Training Solution Element

The goal of this solution element is to resolve the flaw of lack of training in appropriate analytical techniques.

This is done by providing unified training in the common set of tools and attitudes necessary to solve the global environmental sustainability problem, using the most efficient and effective means available. Central to this common set of tools is Analytical Activism, the Analytical Method, the System Improvement Process, structural thinking, modeling, and being process driven.

However, the attitude of the mind is more essential than the tool in the hand, because it is the mind that moves the hand. Therefore the common set of attitudes is where high quality training is most needed. The top attitude is the adoption of Analytical Activism as the environmental movement’s central problem solving paradigm, and the abandonment of Classic Activism. Not far behind is the need to work together in a tightly unified manner, just as a colony of honey bees does.

“Using the most efficient and effective means available” means the training must be of the highest quality. During startup, training will need to occur through self-study, workshops at conferences, online discussion, and so forth. But for Unified Top Talent Training to achieve its goal, training at the equivalent of a master’s degree level is essential. If an MBA is the standard in the business management world, then an MAA (Master of Analytical Activism or such) must become the standard in the world of serious environmental problem solving. Otherwise we cannot have any realistic hope of overcoming a more educated foe.

It will not be hard to establish a suitable program at a leading college in each region of the world, probably starting in Europe and the United States. As we discussed before when explaining the first link in the auto-activation chain:

“It will probably be best if a very small number of existing colleges are chosen, so that the Environmental Movement is as united in thought and deed as possible, and is not distracted by the task of setting up its own equally good institutions, which is probably not possible. Two that can serve this role in the English speaking world are the Massachusetts Institute of Technology (MIT) and the London Business School. Both have strong curriculums in business management and systems dynamics, and therefore can cover the requirements for training in the big four of Analytical Activism: process, application of the Scientific Method, structural thinking, and modeling, at the management level as well as the tactical level. These are the only two English speaking colleges in the world with MBA and systems dynamics programs, because the latter is so rare. Fortunately, both are widely acknowledged as among the best in the world.”

The environmental movement needs to transform itself in less than ten years if it is to begin pushing on the correct solution adoption resistance high leverage points in time. Thus another training need lies in change management. We must get our own self-transformation right the first time.

The Essentials of Managing Change and Transitions, by the Harvard Business School Press and the Society for Human Resource Management, 2005, is an excellent place to begin to master change management. The book makes several pertinent points:

This is a process change – There are five main types of organizational change: structural, cost cutting, process, cultural, and leadership. A process change “focuses on
how things get done.” Since Analytical Activism is a process, this is a process change.

Implementing one type of change often leads to another. Changing to Analytical Activism at the level of the entire environmental movement will lead to structural change. This is where entire operating units are created, merged, or abandoned. An institutional program to handle Unified Top Talent Training will be a new operating unit. So will independent units necessary to handle Certification, Peer Reviewed Journals, and Knowledge Base Management. New departments and organizations to perform analyses, design solution elements, and run experiments will be needed. An overall alliance or guiding coalition of some sort will be necessary. Finally, some departments and organizations will need to be abandoned, because of obsolescence.

This is a crisis change – Experts have identified three types of change due to timing: proactive (anticipatory), reactive, and crisis. A crisis change occurs when “the signals of needed change have multiplied and intensified to the point at which the organization can’t deny them. Competitors have already initiated major changes [such as the Corporate Proxy Movement Machine], and the consequences of ‘sitting on the sidelines’ are now showing up in the firm’s financial performance.”

The “signals of needed change” in our case include the failure of the United States to ratify the Kyoto Protocol in 1999, the rabid anti-environmentalism stance of the George W. Bush administration starting in 2001, the publishing of the Death of Environmentalism memo in late 2004, and the way the third edition of Limits to Growth lamented in 2004 that “Humanity has largely squandered the past 30 years.”

Because this is a crisis change, the environmental movement has received “a damaged reputation in the eyes of customers [such as members and politicians], suppliers [such as donors], and society [environmentalists are now widely seen a tree huggers and just another special interest]. Panicked leaders, under enormous time pressure, are focusing more on what worked in the past than on what new strategies may be best for the future [such as trying Classic Activism all the harder].”

There are numerous dependable means to handle crisis change management. It’s really just a variation of change management in general. In the long run, the best method is to change to a management style that is proactive.

The eight step change process – In 1995 John Kotter identified an eight step process “that managers could take to create enduring change.” The steps are:

1. Establish a sense of urgency.
2. Create a powerful guiding coalition.
3. Develop a compelling vision.
4. Communicate the vision.
5. Remove obstacles to acting on the vision.
7. Consolidate gains and push for more change.
8. Anchor new approaches in the company’s culture.

The transformation problem is a change management problem. Thus its solution must employ something like the above steps.

The Dynamic Behavior of Unified Top Talent Training

There is another way to describe the goal of the Unified Top Talent Training solution element. The goal is to increase the strength of the Capability of Top Talent loop to the point where it can solve the global environmental sustainability problem. How this can be done structurally is shown in the loop below:

![Diagram](image-url)
environmental industry results will become apparent. The industry will see this and know why it happened, which will increase its willingness to invest in new problem solving technology. There is a delay in setting up new training programs or improving existing ones. After that the maturity of training programs will increase still more, and loop A starts over again.

Eventually the other loops begin to grow. As environmental industry results increase considerably, so will the reputation of the field of environmentalism. It will be seen as a more attractive career, one with much more of a chance of making a difference. This will cause more and better people to be attracted to a career in environmentalism, which will increase the quality of people in the field. After this loop B behaves the same as loop A.

Loop C is the loop we want to see grow the most. Significantly better environmental industry results will increase what matters most to knowledge workers: inner fulfillment. Because their industry is doing better, environmentalists can now feel better about themselves. Their peer esteem, self esteem, and self fulfillment will rise. And it will rise again every time industry results improve still more. As inner fulfillment goes up, so will quality of people, because a more fulfilled person is more productive.

In addition, people with a high sense of fulfillment will attract people seeking that, because it is so hard to find. The people attracted will tend to be above average performers, because it is above average people who focus more on the higher levels of Maslow’s Hierarchy of Needs. As a result, quality of people will increase. The rest of loop C is the same as the other loops. Loops B and C could be called Quality Attracts Quality.

It may take five or ten years, but eventually loops A, B, and C will grow strong enough to provide the top talent necessary to help resolve the faulty analysis of difficult problems defect. When that happens, the goal of the Unified Top Talent Training solution element has been achieved.

The Certification Solution Element

The goal of this solution element is to help resolve the flaw of no reliable standard measure of actual problem solving ability. A certification is a reliable standard measure of actual problem solving ability.

Certification is similar to politician ratings. A certification is a number measuring how well an individual or organization is likely to solve future problems. It is based on a composite of factors, similar to the way health inspectors use several dozen factors to grade the health quality of a retail food establishment.

<table>
<thead>
<tr>
<th>Certification Example</th>
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<tbody>
<tr>
<td><strong>Factor</strong></td>
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<tr>
<td>1. Achievement - Percent of goals achieved during last five years.</td>
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<tr>
<td>2. Difficulty - Average difficulty of goals attempted during last five years, on scale of 0% to 100%.</td>
</tr>
<tr>
<td>3. Process Maturity - Organizational or personal process maturity level, on scale of 0% to 100%.</td>
</tr>
<tr>
<td>4. Training - Average staff certification level in problem domain, or personal certification level in problem domain.</td>
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Certification Rating 44%

Above is an example of how a certification might be calculated. The first two factors, achievement and difficulty, measure proven problem solving ability. Because this is what certification is supposed to measure, the weights for these two factors total 80%. The other 20% measures potential ability, using the process maturity and training factors. This is useful because it is an indicator of future potential, which may not have shown up yet in achievement. Notice how the weights total 100%.

There are many industries, such as public restaurants, where a rating of 90% to 100% is an A, 80% to 89% is a B, 70% to 79% is a C, and below that is unacceptable.

The example shows how a rating could apply to an organization or an individual. If an individual, then achievement and difficulty would cover only those projects that person had worked on.

Let’s assume an organization was rated above. Their certification rating is a dismal 44%, which is so unacceptable the organization is probably in crisis.

Reading the tea leaves of this certification, it appears this organization is not doing too well in achieving its goals. It is achieving only 20% of them. But there is a valid reason for that: it has been trying to solve very difficult problems, with an average difficulty rating of 90%. If the certification had left out the difficulty factor, it would be misleading.

The certification factors show why achievement is only 20%. It’s because process maturity and training are low. If these are improved, the achievement rating will rise. Until they are improved, this organization should work on less difficult problems.

Breaking a certification down into discrete factors and measuring them separately allows different types of certification users to make better decisions. For example, a donor may look mostly at the achievement rating, and base funding decisions on that. A manager whose
potential certification has for improving the problem solving capability of the environmental movement. This is not only because there’s nothing like certification in the movement, but because we have designed certification, and the other solution elements, to work together to resolve all the defects and flaws holding the movement back from its fullest potential. Once it achieves that potential, the movement and the many brilliant dedicated people within it are going to astound the world.

Next, let’s examine the structure of how certification resolves the flaw of no reliable standard measure of actual problem solving ability and thereby helps to resolve the key defect of faulty analysis of difficult problems.

The Dynamic Behavior of Certification

Certification is such a powerful structural change that it introduces three new feedback loops to the environmental movement, as shown below.

Each of these loops has a strong effect. Taken together, their emergent power is so potent it could cause all the other solution elements to spontaneously appear except the precipitating event. This is because certification changes agent motivation in ways the other solution elements do not even begin to touch.

Proof of this is the effect credit ratings have had on for-profit corporations. As we quoted earlier on page 45 when demonstrating the analogy between politician ratings and credit ratings: (Italics and bolding added)

“The Dynamic Structure of Certification

![Diagram of the Dynamic Structure of Certification]

Moody’s credit ratings, first published in 1909, met a need for accurate, impartial, and independent information.

“Now, almost a century later, an ‘investment grade’ credit rating has become an absolute necessity for any company that wants to tap the resources of the capital markets. The credit raters hold the key to capital and liquidity, the life-blood of corporate America and of our capitalist economy. The rating affects a company’s ability to borrow money; it affects whether a pension fund or a money market fund can invest in a company’s bonds; and it affects stock price. The difference between a good rating and a poor rating can be the difference between success and failure, prosperity and bad fortune.”

In a similar manner certification would become “an absolute necessity” for any environmental organization that wanted to tap into the human and financial markets of today’s competitive world.

We will discuss these loops in terms of organizations, because that is where their greatest impact will be. But similar loops apply to individuals as well.

The Capability of Top Talent loop shares three nodes with the loop of the same name presented earlier. The added structure is the route from environmental industry results to quality of people. Let’s start by following that new route.

As environmental industry results improve, certification scores go up. The scores are public knowledge, so this will increase attraction of the best and brightest to those organizations with the higher scores. Higher scores will also increase attraction of funding to the best organizations, which will also serve to increase attraction of the best and brightest, because those organizations can afford to pay them more. After the delay it takes people to hear about this and change jobs, the quality of people working at organizations with higher scores will increase. (Not shown is the loss of good people from organizations with lower scores will cause those organizations to be selected out of existence.) As before, this increases quality of environmental industry effort, which after a delay, causes better environmental industry results. The loop then starts over again.

However, Capability of Top Talent is not the most powerful loop. That title goes to the Redirection of Investment to High
**Fitness Strategies** loop, because it is not quality of people that makes the biggest difference in quality of environmental industry effort. Instead, it is fitness of problem solving strategies that makes the biggest difference by at least an order of magnitude.

Why? Because it is strategy that wins the day, much more so than who carries out that strategy. This may be seen in the way the cycle of evolution selects out weaker agent strategies, allowing only the fittest to survive. These genetic or memetic strategies are then carried out by the next generation of agents. It is not those agents who make much of a difference. It is the strategies they inherited from the previous generation.

Let’s step our way around the most powerful loop of them all, **Redirection of Investment to High Fitness Strategies**, starting with the solution element that creates the loop. As you read, notice how the loop taps into the full power of the evolutionary algorithm.

Every time a source of funding makes a decision on what organization or what project receives funding, selection has occurred. The more correct the decision, the greater the fitness of those that survived the decision. In this simple causal flow model, attraction of funding to the best organizations is a function of two inputs: certification scores and high reliability of measure of problem solving ability. Certification, if done reasonably well, has a high reliability compared to no certification at all. After the delay between scoring and decisions, attraction of funding to the best organizations increases, which increases fitness of problem solving strategies. The higher the fitness, the higher the quality of environmental industry effort. Those organizations with low scores attract less funding or none at all, which causes them to have less influence on the system, and in the long run to either die or adapt.

The loop will work because we now have a quantified, universally comparable, independently calculated measure of problem solving ability. *This did not exist before, so this is true, deep structural change.* Tough funding decisions can now be based on actual data. Before certification, grantmakers, foundations, governments, and donors of all stripes had to hold a finger to the wind and mostly guess on who was most likely to leverage their money. But with certification, they can make the same all powerful and correct decisions that credit decision makers have been making with ease since 1909.

Because of these correct decisions and rising certification scores, the fitness of problem solving strategies will increase dramatically. This is because those organizations with better strategies now have more money to pursue those strategies. Those organizations are more fit, financially and strategically. The result is quality of environmental industry effort will rise. It won’t go up just a little. It will increase significantly with each increase in fitness of problem solving strategies, because strategy is the defining factor in achieving difficult goals of any kind.

After the usual delay, quality of environmental industry effort will lead to better environmental industry results and then better certification scores as well. Those scores will be higher for those organizations with better strategies. In the next cycle of the loop they will receive even more funding than those with inferior strategies, as the invisible hand of evolution “creates” its ceaseless wonders.

The third loop is a balancing loop, also called a goal seeking loop. These types of loops “balance” the runaway behavior of reinforcing loops by seeking some sort of goal. Here the **Incentive to Improve** loop plays the balancing role.

Certification scores will start out low. They will be much lower than the performance goal of most organizations, which will probably be somewhere in the 95% to 99% range. (A goal of 100% would be past the point diminishing returns, and so is unreasonable.) The difference between a score and the goal is the performance shortfall. Mathematically this is: goal − score = shortfall. Using the earlier certification example, a goal of 95% minus a score of 44% equals a shortfall of 51%.

That is a huge and embarrassing shortfall, so competition to get better scores will be intense, especially because funding is now riding on scores. This will cause the next round of certification scores to increase. This in turn will cause a decrease in the performance shortfall. However, it will not be enough of a decrease at first to cause competition to get better scores to fall to zero. That will come to pass only as scores approach the goal, at which point this balancing loop will have done its job of “balancing” related reinforcing loops to the goals (implicit or implied) that exist in all dynamic structures.

Over time, as these three loops reach their full strength, the defect of **faulty analysis of difficult problems** will vanish and the transformation problem will be solved. However, the certification solution element needs help if that is to proceed at maximum speed. This is why the other solution elements are needed from the beginning, such as:
The Peer Reviewed Journals
Solution Element

The goal of this solution element is to radically increase the growth of the Analytical Activism accepted body of knowledge. This is done by publishing hypotheses and proof they are true in peer reviewed Analytical Activism journals.

The secondary goal is to help resolve the flaw of no reliable standard measure of actual problem solving ability. Peer reviewed articles solve problems. Thus the number of articles an individual or organization publishes is a rough measure of their problem solving ability, as is how prestigious the journals or conference proceedings they are published in, and how many citations an article receives over the years.

Every peer reviewed article explains how some problem has been solved. For example, an article on “The CDC’s Diabetes Systems Modeling Project: Developing a New Tool for Chronic Disease Prevention and Control,” was published at the 22nd International Conference of the System Dynamics Society in 2004 at Oxford, England. The article presented a solution to how to better manage control of diabetes in the United States. The solution was a simulation model of the US population that showed the underlying causes of diabetes, their trends, and how the medical system was responding with various treatment plans. The model allowed CDC, who was coordinating the country’s overall solution to the diabetes problem, to better manage that solution.

Peer reviewed articles are as central to the advance of modern civilization as the sun’s rays are to life on our planet. Just as sunlight is the source of the energy it takes to keep the many cycles of nature going, peer reviewed articles are the continuous source of the new, reliable knowledge it takes to keep the many wheels of civilization going forward.

The intellectual edifice we call civilization has now grown so tall and complex that further construction has become dependent on one key ingredient: reliable knowledge. If even one single brick is laid that was formed from unreliable knowledge, the tower of civilization will began to lean. If a second unreliable brick is added, it will begin to sway and wobble. Adding just a few more will cause it to tilt so far that it will topple, and come crashing down, because it will be unable to reliably produce the complex goods and services that billions of people in the industrialized world are now dependent upon.

There is only one source of sunlight: the sun. And there is only one source of reliable knowledge: the Scientific Method. But however reliable that knowledge may be, it does not “touch down on the earth” until it has gone through the sieve of peer reviewed articles, to ensure that it really is reliable.

Thus the production of the reliable knowledge that civilization depends upon goes through a two step production process: creation and acceptance. It is created by the Scientific Method, and it is accepted by publication in a peer reviewed journal.

According to wikipedia.org, “A peer-reviewed journal is an academic periodical that has some sort of peer review process to ensure its accuracy. This often involves having several people read the article without knowledge of its author before accepting it, as well as a rigorous editing and fact-checking process. Peer-reviewed journals are generally considered the most reliable academic sources.”

Worldwide, there are now about 24,000 peer reviewed journals, publishing some 2,500,000 articles per year. The purpose of peer review is to ensure these articles are of impeccable quality, so that people can use, build upon, and cite these articles with confidence. The incentives to publish peer reviewed articles include career advancement, higher salaries, more research income, more prizes and prestige, and most important, greater research productivity and progress.

Today the defining characteristic of a bona fide field of modern science is the presence of a number of peer reviewed journals for that field. If they are present and their quality is high, the field has arrived. It has reached the critical mass of professional acceptance and rigor needed to blossom still further into a domain whose output will be useful to other fields and to society.

But where are the peer reviewed journals for the environmental movement? Alas, there are none.

We touched upon this point much earlier on page 24 when discussing the importance of modeling and the Death of Environmentalism memo. The special series on “the alleged Death of Environmentalism” in Grist Magazine had this to say: (Italics added)

“Of all the points made by [the Death of Environmentalism essay], perhaps the most telling is in a follow-up post on the Breakthrough Institute blog: ‘Nearly every profession, from public health to business to law, has research studies, conferences, and peer-review journals dedicated to evaluating what’s working and what’s not. ... The environmental community has nothing like this.’”

There are peer reviewed journals for ecology, environmental science, alternative energy, and so on. But none of these are “dedicated to evaluating what’s working and what’s not” on solving the complete global environmental sustainability problem, or the complete...
problematicque, as the Club of Rome first began calling it long ago in 1972?

For example, a peer reviewed article on the potential use of wind power to replace a certain amount of fossil fuel use worldwide addresses a technical problem. Such articles often prove that a clear and simple alternative is available.

But where is the article, using rigorous analysis and experimental proof, that probes to the core of why society is not switching to the use of alternative energy, even if it is more expensive? Where are the articles analyzing what environmental activism methods work, and which do not? Where is the blockbuster article that dives into the question on the mind of every long term, frustrated environmentalist: Why are we failing as a movement to solve the most important and urgent problem Homo sapiens has ever faced?

Until those peer reviewed articles begin to appear, environmentalism is not yet environmentalism, because it is not yet science.

I believe there is a large, globally practiced field that has yet to find its scientific grounding. Today it is called activism. Tomorrow it will be called Analytical Activism. Analytical Activism is what Classic Activism will become once it is reborn as activism based on a proven, reliable method for achieving activist goals. That method is the Analytical Method.

I also believe that the first solid sign this is beginning to occur will be the appearance of the first high quality peer reviewed Analytical Activism journals. After that there will be no turning back, and we will soon be able to wave goodbye, and good riddance, to Classic Activism.

Analytical Activism journals will focus on the use of the Analytical Method to achieve particular activist goals. One goal is solving the global environmental sustainability problem. But there are others whose day will come, once the top problem of environmental sustainability is solved. These other activist goals include the reduction or elimination of poverty, war, crime, discrimination, and unnecessary suffering of innumerable kinds.

Perhaps, right now, as I write or as you read, someone is close to creating the first true Analytical Activism peer reviewed journal. It would have articles like “The Race to the Bottom among Politicians: A Universal Mechanism for Explaining the Cyclic Behavior and Existence of Corruption in Politics” or “The Use of Independently Quantified Feedback Loop Mechanisms in Establishing Races to the Top in Political Elections and Governance, with Experimental Explorations in Politician Ratings and Proposal Ratings.” Hopefully the journal’s editors would take pity on their readers, who would be mostly serious environmentalists, and offer less jaw breaking article titles.

As of October 2006 some sustainability peer reviewed journals exist. At the risk of offending their editors, these are only pseudo journals because they either practice Classic Activism or have not yet made the full jump to Analytical Activism.

A good example is an article in the Fall 2006 issue of Sustainability: Science, Practice, & Policy. The article was Sustainability and resilience: toward a systems approach, by Joseph Fiksel. In its first sentence the article pleads that “A comprehensive systems approach is essential for effective decision making with regard to global sustainability.” I agree. Until this happens the field is stuck in Classic Activism. Articles like this one are promising because they show the field is becoming aware that an analytical approach is needed, such as Analytical Activism.

But the field is still far short of full realization that all eleven key process elements presented in the An Assessment of Process Maturity chapter are needed. For example the article “explores several fundamental questions:

1. What is the current state of scientific knowledge about how complex industrial systems can achieve both short-term continuity and long-term ecological integrity?
2. What scientific advances are needed to better understand the linked behavior of complex social, economic, and biophysical systems?
3. How can this knowledge be applied to the design and management of future technologies and infrastructures required to meet human needs, particularly energy and mobility?”

It is good to see these questions being asked. But the fact that they must be asked indicates how far the field still has to go. Above all, the questions also show little awareness of the need for a process that fits the problem.

The article is a fine survey of the current state of the field of the science of sustainability. But because the field is not yet driven by a process that fits the problem, it is not approaching it properly, such as from the perspective of the three subproblems of the System Improvement Process. These are (1) the social side of the problem (change resistance), (2) the technical side of the problem (proper coupling), and (3) staying in the goal state (avoiding model drift).

On the first subproblem, buried in the second question is the word “social.” The questions and the rest of the article show no awareness that the social side of the problem is the crux. Instead, the article focuses on the technical side of the problem. The section on the “state
of sustainability” lists only proper practices, like what Interface, Chevron, and General Motors are doing. The section on the “need for a systems approach” begins with:

“One approach toward sustainability is offered by industrial ecology—a framework for shifting industrial systems from a linear model to a closed-loop model that resembles the cyclical flows of natural ecosystems.”

The “cyclical flows of natural ecosystems” is only the technical side of the problem. By focusing the reader’s attention on that, the article and the field it represents, makes readers think that is the crux of the problem, when in fact it is not. It is the easy part. The world already has the proper practices (technologies) to solve the technical side of the problem. The real problem to solve is the systemic change resistance to adopting these practices.

Until sustainability journal articles begin to reflect all eleven key process elements of process maturity, and not just the ones for Classic Activism, they are not true peer reviewed journals. They are Classic Activism journals, as biased and trapped in that paradigm as the voluminous writings of the alchemists were before the discovery of the Scientific Method.

The Dynamic Behavior of Peer Reviewed Journals

The potential of Analytical Activism peer reviewed journals is they can accomplish two things: One is to radically increase the growth of Analytical Activism accepted body of knowledge. The other is to help resolve the flaw of no reliable standard measure of actual problem solving ability. How this can be done is shown in the four feedback loops above.

The main loop is Ability to Solve Difficult Activist Problems. This is fatally weak now. It starts growing in strength when either peer reviewed journals or certification starts. Let’s begin with the journals as we walk around the loop.

As the quantity and quality of peer reviewed Analytical Activism journals grows, so does the quantity and quality of Analytical Activism accepted body of knowledge. Today that body of knowledge is mostly based on the accumulated hunches and habits of Classic Activism, so it is pitifully weak in solving difficult problems. But as it begins to grow correctly, after a delay there will be an increase in industry results. This book is concerned with the environmental industry, but Analytical Activism applies to any industry, because like all of science’s most basic tools, it is domain neutral. Thus these loops apply to any industry, even politics.

As industry results improve, certification scores will rise. These scores will be widely published, and even touted by those organizations with high scores. Higher scores will increase attraction of the best and brightest to the industry and to those organizations with the higher scores. After a delay for the time it takes to make decisions and change jobs, this influx of new top talent will cause the quantity and quality of peer reviewed Analytical Activism journals to grow even more, and the loop starts all over again.

There are three other loops helping the main loop grow in strength. To the right is the Redirection of Investment to High Fitness Strategies loop. This is identical to the loop by the same name discussed earlier, with one improvement: certification now considers how many articles an organization or individual is contributing to peer reviewed journals, which is a valid measure of problem solving ability. The more articles published, and the more prestigious the journals they are published in, the higher the certification score. That
increases the reliability of measures of problem solving ability. As that goes up, so does correctness of funding decisions. As discussed before, that in turn increases fitness of problem solving strategies. After the delay of the time it takes to turn plans into actions and actions into results, quality of industry results will increase. This will increase the next round of certification scores, and the best strategies loop starts all over.

*Thinking in loops is a whole new way of thought.* It has totally changed the way we can look at the world, so much so that it is possible to enter a new analytical universe. I sincerely hope that soon you soon enter this new universe, because all human system behavior is the result of exquisite but hidden structures just like the ones we are poring over here. When I look at these four loops, I don’t see four loops. I see four jewels whose value to civilization is priceless—if they are made visible, and if their value is utilized.

Returning from this reverie to the diagram, the next jewel we can pick up and hold to the sunlight is **Quality Attracts Quality**. That quality does attract quality is a well known law of human behavior, so why not incorporate it into our solution?

Earlier I wrote that, “The incentives to publish peer reviewed articles include career advancement, higher salaries, more research income, more prizes and prestige, and most important, greater research productivity and progress.” Thus there is an untapped reservoir of top talent outside the environmental industry just waiting for a chance to publish in peer reviewed journals, for a variety of reasons. According to Maslow’s Hierarchy, the top reasons are not financial. They are the inner needs of peer esteem, self esteem, and self fulfillment.

As the quantity and quality of peer reviewed Analytical Activism journals increases, those outside the industry will take notice. Many who have been sitting on the fence way finally say to themselves, “I’ve always wanted to make a difference. This is the biggest problem in the world. So why not go ahead and make a difference and a big difference at that, and at the same time fulfill my own inner needs?” That last thought may be subconscious. But it is there nevertheless, because they have seen the increased visible potential to increase one’s own inner fulfillment. As this rises, so does attraction of the best and brightest to such an extent that many will make a move. Once they do, the quantity and quality of peer reviewed Analytical Activism journals will increase even more, and the **Quality Attracts Quality** loop begins another cycle.

Once a person is in the industry, a different motivational loop comes into play. This is the **Climbing the Levels of Maslow’s Hierarchy** loop. From their perspective, visible potential to increase one’s own inner fulfillment has been replaced by actual inner fulfillment, because they are now in the door and can start **Climbing the Levels of Maslow’s Hierarchy**. This begins when a person first starts to publish peer reviewed articles. This causes the quantity and quality of peer reviewed Analytical Activism journals to increase. Actually seeing their work published, and knowing how many people are going to benefit from it and how many respect you for writing it, increases actual inner fulfillment. Because top talent specialists are knowledge workers, an increase in inner fulfillment causes an increase in productivity and retention. This in turn increases quantity and quality of peer reviewed Analytical Activism journals, and the loop starts all over again.

These four loops explain how this solution element accomplishes its goals. Perhaps they also explain how the environmental movement can accomplish its goals, because it is these four loops, more than any others in this chapter, that come the closest to what really matters to environmentalists.

**The Guiding Coalition Solution Element**

*The goal of this solution element is to resolve the environmental movement is fragmented flaw. Until that flaw is resolved, the movement will continue to be ineffective in solving the sustainability problem due to dissipation of effort.*

A coalition is “a temporary association of rival groups.” Coalitions come into existence when their members are faced with a crisis that threatens them all, unless they band together to jointly surmount the crisis, after which they usually go their own separate ways.

It would seem that environmental organizations are not rivals, because they are all contributing to solving the same problem. But each competes for the same members: the general public. Each also competes for the same limited pool of public and private funding, for media attention, and to get its solutions accepted, often over the solutions of others. Competition can be healthy. But it can also be wasteful and counterproductive.

Change, especially urgent complex change, requires coordination and central leadership to move it forward successfully. Without a guiding coalition, large change efforts usually fail.
The Dynamic Behavior of a Guiding Coalition

How a guiding coalition can cause the Effectiveness of the Environmental Movement to grow to the point where it can solve the problem is shown above.

The strength of the guiding coalition starts out small. It starts to grow with the precipitating event of publication of the concept of Analytical Activism or something like it. This causes those in the coalition, which will probably be very informal at first, to increase their support of two key behaviors: willingness to take an analytical approach and coordination of effort.

Taking the analytical approach will soon increase identification of the correct leverage points. More coordination between coalition members will increase their ability to push together on leverage points.

There are many kinds of leverage points in the structure of a complex social system. Nearly all are low leverage points. If you push on them, little will happen, or if it does it will not lead to lasting change. For example, trying valiantly to elect “good” politicians will make little difference if they are still in the minority, or if the political system rewards politicians who use falsehood and favoritism more than those who don’t, as is the case today.

But high leverage points behave much more favorably. If you push on them a small amount of effort leads to a large amount of change. If you have chosen the correct high leverage points, and are pushing with sufficient force, the amount of force on high leverage points can be enough to begin to solve even the most difficult of problems. After the delay it takes for actions to become results, the quality of problem solving results will increase. If it was the coalition that was behind this, that will cause the widespread conclusion united action is better to grow, and the loop starts over again. It grows with each cycle of effort until the problem is solved.

After that the temporary coalition disbands, unless it has decided a permanent alliance is needed to keep the problem solved. Or it may transfer permanent solution responsibility to a government organization, such as the United Nations Environmental Program.

There is another type of leverage point used in solving complex system problems. These are intermediate leverage points. Pushing on these does not lead directly to solution. Instead, it leads to achieving an intermediate goal, whose attainment is required to solve the final goal of solving the problem.

Here the intermediate goal is to make the Analytical Activism accepted body of knowledge grow. We need it to do that for two reasons: to increase the widespread conclusion united action is better and to give us the
means for identification of the correct leverage points. If we cannot achieve this intermediate goal, we cannot solve the problem.

Right now the environmental movement has no large body of reliable knowledge on how to solve difficult problems. Let’s see how the Growth of Reliable Knowledge loop can change that.

Once the strength of the guiding coalition starts growing, the members of the coalition will see the wisdom of devoting a large amount of force to intermediate leverage points. These intermediate leverage points are the thousands of hypotheses that are necessary to correctly model the problem, model the solution, and create the solution elements necessary to implement the solution. This force is applied by running the process chosen to solve the problem. After the delay it takes to execute the process, hypothesis generation will increase. Then, after the delay of the time it takes to run experiments to test the hypotheses, experimental proof will began to appear. Then, after another delay to write up the findings, submit them to journals, and get them peer reviewed and edited, publishing of peer reviewed articles will increase. Because publication equals acceptance by the field of Analytical Activism, this will increase the Analytical Activism accepted body of knowledge. Once that starts to happen the Growth of Reliable Knowledge will become an established reinforcing feedback loop and continue to grow of its own accord, until it has grown enough to solve the problem.

The Guiding Coalition solution element is part of the Top Talent Package because the coalition is required to encourage and manage the other solution elements in the Top Talent Package. These are Certification, Peer Reviewed Journals, and Unified High Quality Training. As the Effectiveness of the Environmental Movement loop grows, the coalition will have a greater and greater incentive to promote these other solutions elements, as well as additional ones.

This completes the Top Talent Package and the third phase of the solution. Next is the fourth phase, where the real work occurs.

**4th Phase – The Analytical Method Application Package**

The goal of this package is to make the Growth of Analytical Activism loop grow until proof Analytical Activism is better becomes so strong that the environmental movement adopts Analytical Activism as its central problem solving approach.

The Growth of Analytical Activism is the same as the Growth of Reliable Knowledge loop we just covered. Each is a slightly different view of the same thing. By incorporating the Growth of Reliable Knowledge loop in the same structure as the Effectiveness of the Environmental Movement loop, it becomes easier to see the role of a guiding coalition in making the Growth of Reliable Knowledge loop grow so as to solve the transformation problem and then the sustainability problem as soon as possible.

This package contains the solution elements needed to make Analytical Activism grow until it becomes the de facto standard for the majority of the environmental movement. These solution elements follow from the lower nodes in the Growth of Reliable Knowledge loop. With the delays removed, that branch looks like this:

From right to left, the first node, amount of force to intermediate leverage points, is managed by the coalition. The hypotheses generation node is handled by the Hypotheses Generation solution element. The experimental proof node is handled by the Experimental Proof element. The publishing of peer reviewed articles is handled by the Peer Reviewed Journals element. Because it appears that element is also needed to get the top talent needed to get the fourth phase of the solution going, the journals element is in the Top Talent Package. Finally, the Analytical Activism accepted body knowledge needs the Knowledge Base Management solution element if that knowledge is to achieve its fullest potential.

But what force in the solution will cause these three solution elements to work smoothly together? Thinking more broadly, what will cause the entire Growth of Analytical Activism loop to grow as fast as possible to the highest level possible, and stay there indefinitely? This indicates the need for a solution element to focus on the
process of the loop as a whole, which is the role the Formal Process Management solution element plays.

Let’s examine the four elements in this package, starting with the most important one of all:

The Formal Process Management Solution Element

A process is a repeatable series of steps to achieve a goal. It follows that the goal of this solution element is to optimize the process used to achieve the goal of solving the global environmental sustainability problem.

You could also say the goal is to maximize (really optimize) process efficiency. Process efficiency is the ratio of process output to input. Since the environmental movement has a very limited amount of input it can muster to solve the problem, the more efficient the process is, the greater will be the output. As we showed in the solution evolution model, if the knowledge produced by the process is sound enough and large enough, the problem is solved. Therefore success boils down to one thing: process efficiency.

Process creation, improvement, and management is a well known area of business management. Please see the literature for much more on this solution element. The key perspective to keep in mind is that everything people do to achieve a goal is part of a process, and all processes can be improved.

Choosing the right process and managing it well is the second step of the Analytical Method. How appropriate a process is for the problem at hand and how well it is managed determines, more than any other factor, how well the rest of the steps are performed.

Note the last step. If this is done well the process is self-managing, and will relentlessly close in on its target no matter what.

Because process is so important, a sample process has been used in this book and A Model in Crisis. This is the System Improvement Process. Unless you have a better one, it is a reasonable process to choose for step two of the Analytical Method.

But things will change. Here is what Kent Beck, inventor of the wildly popular software engineering process of Extreme Programming and author of the first book on it, had to say about those who had adopted Extreme Programming. He found they tended to go through a series of stages, each of which took years:

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“1. First you do it by the book.
“2. Then you change the process to work for you.
“3. Then you no longer care whether you are doing Extreme Programming or not.”

The Hypotheses Generation Solution Element

The goal of this solution element is to generate a steady stream of hypotheses that, if proven true, rapidly move our problem solving process forward one step at a time until the problem is solved.

Think of a hypothesis as an assumption that, if it turns out to be true, is going to be wonderfully helpful in solving the problem. For example, part one of this book hypothesized that learning the Truth Test will allow people to easily detect most of the fallacies they encounter during that time honored periodic ritual known as election season. While some hypotheses can be proven by logical inspection, most cannot. They require experimentation.

This leads to the working definition of a hypothesis: A hypothesis is a statement of cause and effect that can be proven true or false by experimentation. This definition deliberately excludes untestable statements of cause and effect, such as the existence of a fifth dimension that cannot be detected with the senses. (Actually we can never prove anything to be true. We can only fail to prove it false, which means it is really only “probably” true.)

Our hypotheses are generated by following the four steps of the System Improvement Process. Steps two and three, System Understanding and Solution Convergence, generate the most hypotheses. The System Understanding step generates its hypotheses in the form of an analysis model of why the system behaves the way it does. The Solution Convergence step takes a different approach. Its hypotheses consist of an implementation model of how the solution is supposed to work when implemented, and the particular solution elements that drive the implementation model. Thus there are three main types of hypotheses to test: analysis models, implementation models, and solution elements. Everything else takes a back seat to these three, because if they are true, everything else is relatively easy. This is because they are strategy and everything else is tactics.

Next, let’s cover how we actually test models and solution elements by experimentation.
Model testing – A model consists of nodes and relationships. Each is an assumption. In a very simple model every node and relationship can be tested by seeing if it holds true in the real world. More complex models require a completely different approach, however. Since we are dealing with difficult problems in this book, we will cover only how to test complex models.

First a model is logically tested. Ideally many others beside the model builder(s) participate in this. If they are experts, this testing step is a form of expert opinion. Logical testing starts with an inspection walkthrough. If it’s a simulation model, this is followed by running the model to see if its dynamic behavior makes logical sense. If it does, it passes.

Next the model is subjected to artificial and real world experimentation. Just like a theory, the model can be used to make predictions, such as certain changes to the model result in certain new types of model behavior. If a parallel cause and effect can be made to happen in an experiment, the model is confirmed.

If enough experimentation is done, a confidence level can be determined for a particular cause and effect relationship. For example if an experiment is run on a large number of subjects, and the experimental design is sound, then you can statistically determine the probability of that cause and effect happening the next time it’s tried. That probability might be 95% or, if a large enough sample is used, 99.9%. In this manner the important behaviors of a model can be ascertained to have a range of confidence levels.

Once you have an implementation model that is fully tested and meets your acceptance criteria, implementation of the solution is merely a matter of getting the implementation model to run as planned.

There is considerable literature on model testing.

Solution element testing – These are tested the same way models are: by experimentation. Solution element sub components can be tested separately, and reused in different elements or different versions of the same element.

The Experimental Proof Solution Element

The goal of this solution element is to determine the probability that hypotheses are true or false, and whether a hypotheses is worthy of modification.

Recall that the five steps of the Scientific Method are:

1. Observe a phenomenon that has no good explanation.
2. Formulate a hypothesis.
3. Design an experiment(s) to test the hypothesis.
4. Perform the experiment(s).
5. Accept, reject, or modify the hypothesis.

Experimentation is steps 3, 4, and 5. The goal of this solution element is to be able to perform step 5 reliably.

According to the solution evolution model, this solution element is where analytical activists will spend most of their time. That model hypothesizes that for full Analytical Activism, environmentalists should spend approximately 10% of their time in transmission of experimentation results to users, 6% in hypotheses generation, and 84% in experimentation. But this may be low, because the most prolific inventor of all time, Thomas Edison, felt that:

“None of my inventions came by accident. I see a worthwhile need to be met and I make trial after trial until it comes. What it boils down to is one per cent inspiration and ninety-nine per cent perspiration.”

The inspiration is hypothesis generation. The perspiration is experimentation.

The Knowledgebase Management Solution Element

The goal of this solution element is to optimize the value of accumulated knowledge to the user community.

Knowledge is useless if it cannot leap into a user’s mind when needed, unless it’s already there. And even then, mere information is not nearly as valuable as information organized to suit a user’s needs.

An aggressive knowledgebase manager would constantly monitor how the knowledgebase was being used. They would be measuring what knowledge that was needed was not found, what the quality impact of what was found was having, and so on. These metrics would allow them to greatly improve the value of the knowledgebase by improving quality of transmission, without running a single additional experiment.

As one example, suppose you needed to read up on the experimental proof behind a certain solution ele-
ment, so you could better manage an implementation of it. But you are not a scientist type and the experiment is so sprinkled with scientific jargon it would choke a hobbit.

The problem is that’s normal for peer reviewed articles. This brings up an unsolved subproblem. Presently the peer reviewed journals industry handles most scientific knowledgebase management, particularly the latest knowledge. This is supplemented by textbooks, conferences, and so on.

Scientific peer reviewed journal articles suffer from a variety of shortcomings. One is each article is written for a specific group of scientists, using their language, which makes most of them indecipherable by outsiders. Worse yet, many authors puff up the impressiveness of their work by using words, phrases, sentence structure, and concepts that cannot be understood by anyone but those trained in the overly ornate language of academese.

Then there’s the problem of excessive references to “anchor” papers on existing literature, which creates unnecessary clutter and density. Lots of references are subtly encouraged by journals, because each reference increases the apparent value of the journal industry. Furthermore, each reference improves the stature of the author(s) it points too. Because doing that can cause those authors to feel obligated to return the favor, the average number of references per paper has grown so high that most journals now impose limits on the number of references per paper.

The mindset of “a paper is not a good paper unless it has lots of references and is anchored in existing literature” creates tunnel vision. This prevents a field from looking outside its current paradigm. Since it can’t look outside, it looks only inside, and tends to build on what already exists, instead of the innovative lines of thought that are required to solve daunting problems, such as the sustainability problem.

Another problem is pressure to publish or perish. Researchers (experimenters included) are judged on the quantity of papers published, and the number of references citing their work. This ratchets up the quantity of published knowledge. But it does nothing to improve its quality.

These problems point toward the need for a new alternative to knowledgebase management. It would be more individual meme centered. When a new useful basic research or solution component meme is discovered or engineered, that is what would be published and added to the knowledgebase. This would replace what happens today, which is a dozen long papers rhapsodizing on the two hundred old memes related to the one new meme, by “anchoring” it in the literature with mouthfuls of unnecessary but oh so impressive references. This high noise versus signal ratio obscures the meme that matters and makes reading about it such an intolerable time burden, that it is no surprise that it is so difficult (read impossible) to keep up with anything but a micro-specialist portion of a field. This is a major roadblock, because solving complex problems like sustainability requires interdisciplinary knowledge.

These forces put the knowledgebase manager in a tricky position. The way out is to look back at the goal of this solution element, which is to optimize the value of accumulated knowledge to the user community. Doing that requires setting up a suitable process. Let’s examine some of the things to consider in that process by taking a look at the replication section of the solution evolution model, as shown below.

According to the model, knowledgebase management is replication management. While it is too late to control knowledge soundness, in a good solution evolution process that is not much of a problem. The real issue is how to get all those selections out to all the users who need them. In other words, how can failed to replicate be minimized? This is the same as how can replication success be maximized?
I will not attempt to answer that question fully here, because it lies beyond the scope of this book. But I can say that if I was managing this knowledgebase, I’d start by designing a process to do it. And then, using the feedback loops that well designed metrics can provide, I’d improve the process until it was good enough. That would probably lead to modeling the replication portion of solution evolution in much greater detail.

Notice the new ideas from old ideas multiplier on the right. The better the knowledgebase management, the bigger this is. And the bigger it is the more the Building the New from the Old loop (not shown) can increase the rate of hypotheses generation, which can improve the entire solution evolution process. Thus there is more than replication management in this solution element—there is also enhancing the cycle of memetic evolution.

When a meme reaches old age, it dies. The model represents this sad fact with the sound and unsound knowledge obsolescence rates. The average knowledgebase meme lifetime in the model runs was 20 years. Now what would happen if this could be increased?

An easy way to answer that question is to run the model and see what happens. Starting with the values for run 3, full Classic Activism, we can increase the lifetime to 30 years. What would be the new problem difficulty capacity for 95% success?

The old one was 268. The new one turns out to be... the same thing! What happened? Why is this?

The answer is this run was starting from Classic Activism. That is an unoptimized process, which causes it to be packed full of bottlenecks and surpluses. When we look at the graph from run 3 (shown below) we can see that after about 20% of the run, when solution success suddenly hits its ceiling, the sound and unsound solution components keep piling up to more than we need. Thus there is a surplus of them. In a situation like this, all increasing meme lifetime will do is cause even more memes to pile up. It will have no effect on difficulty capacity, other than to cause it to be reached sooner.

But if we start from full Analytical Activism and increase the lifetime from 20 to 30 years, what do you think will be the result? That is an optimized process, so if the 20 year lifetime is causing a bottleneck it could make a big difference. Will it?

Once again, the model is so complex I couldn’t say for sure what would happen. But intuitively I expected it would help. And help it did, because when I started with the settings for run 10, and then increased the lifetime to 30, and then increased problem difficulty to its new maximum for 99.9% success, I was amazed. It went from 1,000 to 1,434, a 43% increase. And when I tried a 50 year lifetime, it shot up to 1,926 years!

But what about increasing replication success? Might that help just as much? Starting with the settings for run 10, we see that replication success is dead flat at 85%. Raising it to 100% allows only a 1,178 new maximum problem difficulty for 99.9% success.

The model is trying to tell us that the best place for the knowledgebase manager to put his or her time is probably not replication success, as we had intuitively assumed earlier. It is average knowledgebase meme lifetime.

It’s not at all hard to see that the model (really the system) is also saying, “If you want to manage me, you must understand me.”

This completes the presentation of the transformation solution elements, which brings us to the:

**Process Step Output Summary**

The key input from the System Understanding step was the strategy map and the high leverage points. Other important inputs were The Corporate Proxy Movement Machine, the dueling loops, the New Dominant Life Form, the five types of new technology users, and the crossing the chasm risk. The process revolution and solution evolution simulation models both offer numerous insights. This is a lot of valuable input.

Using this input, the Solution Convergence step identified four main risks. If they and the defects and flaws in the strategy map can all be resolved, the problem is solved.

This was done by converging on a transformation causal flow model that is the same as the one for the corporate proxy movement, but has enough differences to work for the environmental movement. If the Powell Memo could precipitate the creation of the corporate proxy movement model, then the precipitating event of the publishing of a longer memo, this book, can do the same for the environmental movement.

But this will only be true if the assumptions in the model are sufficiently correct. None have been thoroughly tested, but in comparison to the Powell Memo and the corporate proxy machine it spawned, it looks...
just as promising, perhaps even more so since it is based on knowledge of how all process revolutions occur.

The Solution Convergence process step has one additional output that is so large it has been given its own chapter. This output is *The Transformation Simulation Model*. Nicknamed the strategy map model, it models the solution from a different and more rigorous viewpoint than the transformation causal flow model. Its prime objective is to show environmentalists how to manage a successful implementation of the solution. It clearly shows what must be done and why, if we are to resolve the defects and flaws in the strategy map.

For both models, the transformation starts when the precipitating event of publishing the concept of Analytical Activism occurs. It then gains steam as the auto-activation chain of the three types of proof proceeds. Once a sufficient amount of all three types of proof is present, the majority of the environmental movement is converted and the transformation problem is solved—in theory.

But in fact we don’t know what will happen, because both models rely on many untested assumptions. This is not a problem however, because the real purpose of the models is to illustrate that there is a better way, which in itself is a new paradigm. What that better way actually is, and how to get there, is what tomorrow’s analytical activists will lead us too.

The actual sample solution is expressed as the implementation model (the causal flow and strategy map models) and the packages of solution elements. The solution has four phases, each of which leads to the next automatically happening. The phases are:

**Phase 1. The precipitating event.** This converts a very small percentage of innovators through logical proof alone.

**Phase 2. The Incremental Change Projects solution element.** This serves to convert early adopters and additional innovators. It can also change some early majority activists into innovators and early adopters, thereby resolving the crossing the chasm risk.

**Phase 3. The Top Talent Package.** This serves to convert the early adopters via artificial proof, which comes from experiments. Later, as real world experiments are performed, it serves to convert the rest of the early majority. Once that happens, the late majority eventually follows.

**Phase 4. The Analytical Method Application Package.** This is necessary for reaching an extremely high solution success confidence level and a high problem difficulty process capacity, so that the complete problemematique can be solved and stay solved.

Risky projects are risk management driven. The four top risks of solution failure are resolved this way:

**Risk 1. Failure to learn from the past** – This has been done by studying the largest similar successful social movement transformation, which was the takeover of the political system in the United States by the conservative movement, on behalf of the New Dominant Life Form. That this movement is also our opponent (especially in the US) is a pleasant bonus, because now that we understand their strategy, we can better counter it.

We also studied the largest similar successful intellectual transformation: the Second Age of Reason, also known as the Enlightenment. Studying this transformation allowed us to see the importance of an auto-activation chain consisting of the three types of proof a new paradigm is better than the old one.

Hopefully we have learned enough from the past to engineer the future to unfold the way we intend.

**Risk 2. Up against a supremely capable foe** – The foe is the New Dominant Life Form, more commonly known as the modern corporation and its allies. I believe that the analysis performed in this book takes us so far along the road toward deep and correct understanding of this opponent, that it is highly likely we can counter its success and prevail.

Why do I believe that? Mostly because of discovery of the invisible structure of The Dueling Loops of the Political Powerplace and its exploitation by the New Dominant Life Form. That invisible structure, and its equally invisible exploiter, is ruling our lives. Now that we can see the structure and the memetic life form exploiting it, we can control that part of the memetic world, just as physicists and chemists could control the physical world once they understood what it was made of: elements and molecules acting in a predictable fashion due to certain forces. The memetic world is agents and coalitions acting in a predictable fashion due to the forces of feedback loops and memetic evolution and infection.

**Risk 3. Failure to cross the chasm** – This is a big risk that has tripped up most who have tried to cross the chasm. This risk is eliminated by the Incremental Change Projects solution element.

**Risk 4. Failure to preserve conceptual integrity** – As we said before, the other three risks are big, but this one surpasses them all. If the conceptual integrity of the product is not preserved then all is lost, because the other three risks and many more will fail to be resolved.

Because of the gravity of this risk, we close this chapter with a discussion of how it can be resolved:
Resolving the Greatest Risk of Them All: Failure to Preserve Conceptual Integrity

The System Improvement Process is designed to solve complex social system problems. The global environmental sustainability problem is certainly a complex social systemic problem. Thus it does not take long before the output of the process threatens to become too large and complex to understand. This is a catastrophe in the making, because the single most important prerequisite to complex project success, conceptual integrity, is on the verge of being destroyed. It is the fourth and greatest risk. If it is not resolved, then all the other risks are in peril.

To see why this is so, let’s turn to the manager of the largest software engineering project of all time, the IBM 360 operating system, which ultimately consumed 5,000 person years. It was IBM’s greatest success because it laid the foundation for decades of industry excellence and dominance. The manager of that project, Fred Brooks, had this to say in *The Mythical Man Month* in 1975: (Italics are his)

“I will contend that conceptual integrity is the most important consideration in system design. It is better to have a system omit certain anomalous feature and improvements, but to reflect a single set of design ideas, than to have one that contains many good but independent and uncoordinated ideas.”

**Conceptual integrity** is the presence of “a single set of design ideas” that form the strategic backbone of a concept that is so large and complex it consists of many smaller concepts. The complexity is managed by preserving the key sub concepts that make the difference in whether the overall concept remains the one desired.

It would behoove us to listen to Fred’s words, because they have been proven to be true many times. We must not let the conceptual integrity of the project this book represents slip from our grasp, or all is lost.

To prevent this from happening, I have attempted to articulate in these pages every important aspect of a sample solution path, analysis, and solution as clearly as possible, and as completely as is needed. Consequently this book may appear to contain far more detail than is necessary, and it may not be an easy read in places. But if it was a shorter book and an easier read, too many factors crucial to project success would have been lost.

It is not easy to express what the conceptual essence of this book is. To me it’s using deep slashing strokes of analysis that penetrate to the true core of the problem, instead of pseudo analysis that only appears to do so. It’s the magnificent but invisible social structures in the human system that are the true cause of systemic change resistance, improper coupling, and model drift. Seeing this correctly and deeply enough is where the seed of integrity first crystallizes and begins to grow. It continues to grow as each new analysis or solution hypotheses appears, and grows again as each hypothesis is proven to be true or false. Over time this growth forms the new, multifaceted conceptual structures that could be our new world, and will be, if their conceptual integrity is preserved.

However this is merely the practical nuts and bolts side of solving the problem. There is another dimension even more necessary for project success: education. Because this book is attempting to precipitate a large, permanent behavioral transformation, the educational dimension is the greater need. The result is this book does not only give a man a fish. It does not just present a process, an analysis, and a solution on a silver platter and walk away. Instead, it teaches a man to fish by delivering that platter as part of a days long banquet of educational delights, with dish after dish serving up concept after concept of how to catch that fish.

We are approaching the end of part two of that banquet. In this chapter we have picked up the gossamer threads of the structure of a solution that, if its integrity can be preserved, holds every promise of solving the transformation problem, which in turn will allow solution of the sustainability problem. As we move closer to the end of this book, let us hold onto those threads carefully, and not let them slip from humanity’s grasp.
Chapter 11

The Transformation Simulation Model

This is the most ambitious chapter in the entire book, because it presents a blueprint for how to do something that’s never been done: a self-engineered transformation of an entire social movement. But if transformation can happen accidentally, as it did for the Enlightenment and the birth of democracy, and if we can correctly understand the social structures involved, then why not make it happen deliberately? Nothing less will solve the problem.

This chapter presents The Transformation Simulation Model. This is the implementation model from the Solution Convergence step of part two. The model shows at a strategic level how to implement the sample solution, how to manage it well, and why it should work. While the model is complex, so is the problem it seeks to solve. The purpose of the model is to maximize the probability of a successful transformation of the global environmental movement from Classic to Analytical Activism.

This book is trying to provide the nuts and bolts you need to walk out the door and start implementing these ideas tomorrow. This will work only if you first study the theory behind these ideas, because no one can write a cookbook solution on exactly what to do. Only a deep understanding of why the system has behaved the way it has in the past, and how it is likely to behave in the future, will allow decision makers to correctly decide what to do as the human system responds to attempts to nudge it towards sustainability.

Our Strategy

Every good plan has a central strategy. The central strategy of the implementation model is to make the auto-activation chain work correctly. The first link in this chain is the precipitating event. The key hypothesis is that if we use our human system engineering skills to design the right precipitating event, each successive link in the chain will appear automatically. Once they have all appeared, the transformation problem is solved.

Let’s review how the auto-activation chain in the model works. The four links are the four phases of the solution. They are:

1. The precipitating event of publication of the concept of Analytical Activism.
2. Incremental Change Projects.
3. The Top Talent Package.

Each link in the chain contains the solution implementation memes that will grow to become the next link in the chain. If each link is correctly engineered, the chain will work. Here is a quick review of each link:

Link 1. The precipitating event – This must contain the memes that cause enough supporters to convert to Analytical Activism to cause the next link to appear. Because there is only logical proof so far that Analytical Activism and the first iteration of its application to the problem is a better way, this link must be strong enough to cause conversion through logical proof alone. This agrees with Geoffrey Moore’s theory of the five types of new technology users, where the first type to convert to using a radically new technology is the innovators, on the basis of logical proof alone.

Link 2. Incremental Change Projects – Now we have a very small group of Analytical Activism supporters converted by the first link. This group of core supporters then designs, promotes, and manages the Incremental Change Projects solution element. If there is a centralized way for participants to publish the results of their mini-projects, such as a website, publications, and meetings, then the core supporters can use that feedback to continuously improve the mini-projects. If this is done well enough, then enough early adopters will convert to cause the next link to appear. They will convert mostly due to artificial world proof in the experiments, and to a lesser extent because of logical proof.

Link 3. The Top Talent Package – It will take a number of supporters to get this link going, or at least a considerable amount of the right investment in the right organizations, as happened in the first few years after publication of the Powell Memo. This package mimics the way the Corporate Proxy Movement Machine was built. The key to that machine was think tanks populated by the very best talent in the US. The second key was they were all trained at the Leadership Institute, which caused and allowed a high degree of unification. The third key was that the top talent was well paid, respected, and could clearly see the results of their influ-
ence. As a result, more and better talent was attracted, which had the side effect of starving the talent available to progressives, and the intended effect of success of the conservative movement.

Once there is enough top talent, they will activate the next link.

**Link 4. The Analytical Method Application Package** – Once this link is activated the transformation problem is solved, because there are now enough environmentalists and environmental organizations practicing Analytical Activism to solve the sustainability problem. This link is where the real work begins on the main problem.

Of the four links, the first is the most important. Like the DNA in a new egg that under the right conditions grows into the full plant or animal, the memetic DNA in the first link grows into the entire chain. A critical difference is a memeplex can be self-improving after being born, but, at least with present technology, a genetic being cannot change its own DNA. Thus the self-improving memes in the first link are its most important ones. They allow the growing life form to adapt as the solution unfolds. This explains why the ninth step of the Analytical Method is to continuously improve the process as opportunities arise.

Our second strategy is to build the simulation model on the main features of the Transformation Strategy Map. This allows implementation managers to more directly use the model to plan and manage a successful implementation of the solution elements, because as implementation progresses, they can see how the defects and flaws are being resolved.

Our third strategy is to encourage a unified approach to auto-activation chain management. An organization, either formal or informal, needs to guide the evolution of the many memes as they grow into the first, second, third, and fourth links in the chain. In non-memetic terms, this means an initial core group of innovators must prepare for a successful precipitating event. Then a larger group of innovators must prepare for a successful Incremental Change Projects phase, or whatever looks best as the second link. Then an even larger group of innovators and early adopters must prepare for a successful Top Talent Package phase. Finally a large group of innovators, early adopters, and some of the early majority must prepare for a successful Analytical Method Applications Package phase. After that, the solution should be completely self-managing.

But it all starts with the first strategy of building the solution around the four links of the auto-activation chain.

**Model Overview**

Before we plunge into the simulation runs, let’s do a model walkthrough to see how it works.

The model is generic. It applies to any problem and any process. We will be using it to better understand the differences between Classic and Analytical Activism, and how the transformation from one to the other can best be managed.
The model consists of the Core Stocks system and about a dozen much smaller subsystems. The subsystems support the Core Stocks system, which is shown below.

**The Core Stocks System**

This system is arranged in three sections. These correspond to the symptoms, defects, and flaws sections of the Transformation Strategy Map. Right now the symptom of solution success is low. The main defect causing this is the **Illusion of the Right Process** loop. The main flaw that has allowed this defect to appear is **Lack of Dedication to the Process Itself**.

Certainly the node that billions of people have their eye on is solution success. This node is a measure of how successful civilization has been in solving the complete sustainability problem, so solution success is near zero right now. Because there are so many sustainability subproblems, like desertification, top soil loss, ocean plankton dieoff, and so on, it needs to be somewhere around 99% or above to solve the complete problem. To be more exact, the Problem Definition chapter argues it should be at least 99.9999% if a solution horizon of 100,000 years is used.

A solid arrow shows a direct relationship. A dashed arrow indicates an inverse relationship. A dotted arrow is used for constants and lookup tables.

Notice the two solid arrows pointing into solution success at the top. The model hypothesizes that analysis correctness times percent necessary force on high leverage points equals solution success, with an adjustment for the effect of analysis on success. In other words, how correct our analysis is together with how hard we are pushing together on the right high leverage points determines how successful we will be in solving the problem. All the model does is turn cause and effect relationships like this into simple, explicit equations. Unless it’s a constant each node is an equation. When a simulation is run, the equations work together to produce the dynamic output of the model.

The defects section of the model is dominated by the **Illusion of the Right Process** loop and the Analysis and Solution Component stock. This stock contains the output of the problem solving process being used. For example, if we defined it to contain the solution elements needed to solve the transformation problem, when we started it would be empty. Later when the problem was solved it would contain the solution elements presented in the Solution Convergence chapter.

In the solution evolution simulation model this stock was named Unsound and Sound Solution Components. Here it is named Analysis and Solution Components, to emphasize the importance of analysis.

The problem difficulty is the number of Analysis and Solution Components required to solve the problem. For realism the difficulty starts out low at the beginning of a simulation run, and then increases to represent the more difficult problems that appeared as the environmental movement discovered them. In the simulation runs representing Classic Activism this causes a high
solution success at first and a low one later.

Basically the Illusion of the Right Process loop works like this:

The present process of Classic Activism has such low process efficiency that there is a high cost per analysis component and a low component lifetime. This causes a low amount of Analysis and Solution Components to be produced, and they are not applicable for very long. Because this is enough to solve easy problems at first, solution success starts out high. Using the effect of success on attraction of investment, the higher the success the higher the attracted total investment rate. The more the investment, the greater the analysis creation rate. This causes more components to be produced and the loop starts all over again. It grows until diminishing returns causes the cost of more components to grow so high that the stock of components levels off.

The loop is an illusion because at first it seems that everything is working just fine, because the sustainability problem is being solved. This creates a strong psychological dependency on the process being used, because if it’s working, why change anything? All it took was a few decades of this, the 1960s and 70s and some of the 80s, for this to occur. After that the environmental movement was married to the paradigm of Classic Activism for solving this particular problem.

The dire consequences of that grand illusion became apparent as the environmental movement moved into the late 1980s and on. As we will show in the simulation runs, solution success started to fall. And it kept right on falling, because due to the strength of the illusion there was no significant attempt to find a better process. As a result solution success kept right on falling, and falling, until it became so low that something had to be done. This is where we are today. According to the model, low solution success due to Illusion of the Right Process is the structural problem we must solve.

It can be solved if we take our analysis deeper, into the underlying flaws. This will show what is allowing the defects to appear, which will allow us to diagnose the fundamental causes of the problem. If we don’t go this deep, we will never know what is really causing the symptoms, and will be unable to solve the problem.

The flaws section of the model is dominated by the Lack of Dedication to the Process Itself loop and the Process Components stock.

This stock contains the many components that define the problem solving process being used. For example, Analytical Activism has 9 steps. The sub process I’ve developed for this book, the System Improvement Process (SIP) has four steps. Steps 2, 3, and 4 each have three substeps, giving SIP a total of 4 + 9 = 13 components. Adding this to the 9 steps of Analytical Activism gives 13 + 9 = 22 components. Thus when this overall process is mature, the Process Components stock would have 22 components. It seems to be a very productive process, judging by what the Scientific Method has done for science and what the System Improvement Process has done for my work. Thus it has a high process efficiency.

By contrast, Classic Activism is barely a process, and has only 4 steps: identify the problem, find the proper practices, tell the people the truth about the proper practices, and if that fails, exhort and inspire people to adopt them. This is only 4 components, which is why Classic Activism cannot achieve anything but low process efficiency.

The Lack of Dedication to the Process Itself loop works like this: The attracted total investment rate not only increases the analysis investment rate. It also increases the process investment rate. But since Classic Activism is not process centric, its process budget adequacy is low. This causes most investment to go to analysis creation instead of process creation. The result is a system starved for enough Process Components to give the high process efficiency necessary to solve difficult problems. It’s a simple loop with a tragic consequence.

This chapter is not the place to go into full detail about the model. However we do need to review some of the subsystems at least briefly.

The Strategy Map Factors Subsystem

As shown on the next page, this subsystem models the main further defects and flaws. These are then used as factors that affect other subsystems or the Core Stocks system. The defects and flaws that seem to matter the most have been brought over from the Transformation Strategy Map, renamed so as to be a model variable, and rearranged. A few new variables were then added to bring in those aspects of the real world needed for the model to make dynamics sense.

The four flaws in the middle of the diagram are so crucial to resolve that they are varied in the simulation runs to explore the effects of resolving them. Let’s take a look at each flaw, from left to right.

Problem solving measurement reliability – This is called “no reliable standard of actual problem solving ability” on the Transformation Strategy Map on page 209. Without a reliable measure of the problem solving ability of a process, you cannot manage the process. Nor can employees choose the best company to work for. Nor can donors choose which organizations most deserve their funds. For these reasons, if the environmental industry has “no reliable standard of actual problem solving abil-
Chapter 11. The Transformation Simulation Model

Let’s return to the correlation between funding and actual analytical ability node. This not only affects funding decisions. It also affects employee decisions. As it increases, so does percent pay to top talent. As this goes up, so does the top pay multiplier. This is used on the Analytical Activism Supporters subsystem (not yet shown). As it increases, so does the rate that Proficient supporters are turned into Expert supporters. This is because top pay is what it takes to attract and keep top talent.

This factor is improved by the Certification and Peer Reviewed Journals solution elements.

Quality of training – This is called “lack of training in appropriate analytical techniques” on the strategy map. As the solution evolution model in the System Understanding chapter stressed, quality of effort, and not quantity of effort, is what makes all the difference on difficult problems.

As quality of training increases, percent sufficient skills to solve complete problematic increases, which in turn increases the sufficient skills multiplier. This affects the graduation rate on the Analytical Activism Supporters subsystem. The more the skills, the higher the graduation rate.

This factor is improved by the Unified Top Talent Training solution element.

Potential for inner fulfillment from environmental career – This is called “lack of sufficient inner fulfillment” on the strategy map. According to Maslow’s Hierarchy of Needs, sufficient inner fulfillment is not just a major factor in worker motivation—it is the factor, once a person’s survival and security needs are met. As the potential for inner fulfillment increases, so does the intellectual motivation multiplier. This is used on the Analytical Activism Supporters subsystem to increase the rate Proficient supporters become Expert supporters.

Problem solving measurement reliability varies from 0% to 100%. For simplicity the model assumes it equals the correlation between funding and actual analytical ability, that is, it is a perfectly accurate measurement. The higher the correlation, the higher the percent funding directed to fittest strategies. The higher that is, the higher the fitness of strategies multiplier, which is one of the factors used elsewhere on the model.

The fitness of strategies multiplier is called “high fitness problem solving strategies are not favored at the environmental movement level” on the strategy map. If this is low, then the movement has a poor problem solving strategy in general, and vice versa.

The fitness of strategies multiplier is used on the Core Stock system. As it increases, so does the analysis creation rate. This makes sense, because the better the strategy, the more Analysis and Solution Components the movement will be creating.

"lack of training in appropriate analytical techniques" on the strategy map. According to Maslow’s Hierarchy of Needs, sufficient inner fulfillment is not just a major factor in worker motivation—it is the factor, once a person’s survival and security needs are met. As the potential for inner fulfillment increases, so does the intellectual motivation multiplier. This is used on the Analytical Activism Supporters subsystem to increase the rate Proficient supporters become Expert supporters.
Notice how on the model the last three multipliers mentioned are the Quality of Effort Factors. That’s how important quality of effort is in solving difficult problems.

This factor is improved by several solution elements working together. They are Unified Top Talent Training, Certification, and Peer Reviewed Journals.

**Environmental movement unification** – On the strategy map this is called “environment movement is fragmented.” As it goes up, so does percent necessary force on high leverage points. This is such an important factor that it directly affects solution success, as shown on the Core Stock subsystem.

This is a grave and potentially fatal flaw. If unification is low, then no matter how many Analysis and Solution Components there are, solution success will be low. That it is currently low is shown by this popular joke: “If you get ten environmentalists in a room, how many opinions will you get about how to solve a difficult problem? Eleven.” But if you got ten businessmen in a room and asked the same question, you would more likely get a consensus to band together and form an alliance to study the matter.

This factor is improved by the Unified Top Talent Training and the Precipitating Event solution elements. Both logically show the need for unification. By training together and being trained in the same way, strong psychological bonds are formed that serve as the foundation for unification.

* * *

The bottom of the Factors subsystem is used to calculate the value for process budget adequacy. It is currently deplorably low, about 20%, due to reliance on Classic Activism. But it could go gloriously high, to 100%, if the movement transformed itself into using Analytical Activism as its central process.

The model assumes that is exactly what happens as resistance to process budget adequacy changes from 100% to 0%, since the value for CA process budget adequacy is 20% and the value for AA process budget adequacy is 100%. Now then, what determines resistance to process budget adequacy? There are five variables affecting it. These are:

- **Normal resistance** – This equals 30%. It the normal amount of resistance to process budget adequacy exhibited by most people and organizations. 30% represents a low resistance, which is about right, because given proof they should invest in their problem solving process, people and organizations will change. But there will be some change resistance.

- **Increase in resistance due to early majority prefers incremental change multiplier** – This equals 100%. This may sound too high, but it should be high, because the transformation from Classic to Analytical Activism is a very large discontinuous change. It requires becoming formal process centric. When you consider that most people cannot even define what that means, you can begin to see the magnitude of the change. In addition, it requires changing from event oriented thinking to structure oriented thinking. That too is totally foreign to most people and is such a difficult change that it took me about two years, even though I already had a degree in systems engineering! Finally, it requires changing from a common sense, which is very common, to using the Scientific Method to prove whether a proposition is true or false, which is uncommon. Putting these three changes together, they cause at least a 100% increase in resistance. This multiplier plus one times the normal resistance of 30% equals a resistance to process budget adequacy of 60%.

- **Increase in resistance due to early majority prefers discontinuous change multiplier** – This also equals 100%. It is high because the early majority strongly prefers incremental change to discontinuous change, and as the early majority goes, so goes the late majority and the laggards. The effect of this multiplier is to increase normal resistance by 100%. Combined with the discontinuous change multiplier, this increases resistance to process budget adequacy to 120%.

- **Decrease in resistance to process budget adequacy due to incremental change projects** – This rises from zero to 50% once incremental change projects begin. This 50% has the effect of reducing the 120% mentioned above to 60%, which is great news.

- **Decrease in resistance to process budget adequacy due to success** – As solution success rises after Analytical Activism is introduced, resistance to investing in the process falls. The amount of decrease is calculated by comparing current solution success to the before AA success rate. This simulates how people think. A lookup table curve is used that assumes that as solution success increases to twice as good, the resistance decrease will rise from zero to 80%. This 80% has the effect of reducing the 60% mentioned above to 12%.
Thus when all five variables affecting resistance to process budget adequacy are considered in run 10 they change resistance from 100% to 12%. Returning to the Core Stocks system, this results in process budget adequacy increasing from 20% to 90%. This drastically increases the process budget, which increases the process investment rate, which increases process creation, which increases the number of Process Components.

The New Technology User Types Subsystem

The subsystem above contains five stocks representing the five new technology user types. The simulation starts out with all of them committed to Classical Activism. During a simulation run, the users are born, die, convert to Analytical Activism, or convert back to Classical Activism. The birth and death percentage rates are both fixed at 2%. The conversion percentage rates depend on how well the transformation solution is working.

If you study the subsystem closely you can see how conversion for each user type is handled, so we will only explain it at the high level.

The model assumes that there are normally 5% innovators, 10% early adopters, 40% early majority, 30% late majority, and 15% laggards. It starts with these percentages and the birth rates follow these percentages.

The solution will fail unless it considers what it takes to convert each different user type.

Innovators convert due to logical proof alone, so all it takes to convert them is more Process Components. They understand the importance of process in solving difficult problems. If all of a sudden enough new Process Components appear they will convert. This is done by the precipitating event, which suddenly adds 150 Process Components.

Early Adopters convert due to artificial world proof. This comes from experiments, which provide new reliable hypotheses, which in turn become new Analysis and Solution Components. As more of these appear than were normally created by the process of Classic Activism, the early adopters see stark proof that Analytical Activism is a more effective.

The Early Majority is a tougher sell. They demand real world proof. This comes from successful real world experiments, which is the same as successful implemen-
tations of portions of the solution. Thus what they are waiting for is an increase in actual solution success. As this begins to happen as a result of using Analytical Activism, they convert.

The Late Majority follows the herd, which in this case is the Early Majority. After a peer pressure delay of 5 years, they follow the Early Majority wherever it goes.

Laggards convert due to survival and security pressures. The model handles this with a very simple relationship. As percent analytical activists rises from 80% to 100%, laggard conversion per year rises from 0% to 2%. This of course is such a slow rate that most laggards die before converting. Sadly, this approximates the real world. To assume anything better would be committing the sin of excessive optimism.

How the Incremental Change Projects solution element accelerates conversion can be seen in the upper middle area of the diagram. Once incremental change projects activated goes from false to true, incremental change projects effectiveness rises from zero to 30%, which is the incremental change projects effectiveness goal. That this is not 100% reflects the fact that even the best incremental change projects will not be 100% effective.

This causes two other variables to rise. One is the early majority to early adopter conversion percent. This rises to 30% times the maximum early majority to innovator conversion percent, which also happens to be 30%. 30% times 30% equals 9%, which become the early majority to early adopter conversion percent.

The Analytical Activism Supporters Subsystem

Let’s examine the subsystem containing the stocks the new technology user types covert to, as shown.

An Analytical Activism supporter is Untrained, Proficient, or Expert. Supporters enter this subsystem by birth or conversion. The birth rate of Analytical Activists is assumed to be percent analytical activists times the population’s normal birth rate. Births and conversions are added to the stock of Untrained Analytical Activists.

There they sit until one of three things happens: They may die due to old age. Or they may convert back to Classic Activism if solution success with Analytical Activism is worse than with Classic Activism. But hopefully most will, due to the sufficient skills multiplier factor discussed earlier, graduate and become Proficient.

And there they will sit until one of three similar things happens: Again, they may die due to old age. Or they may convert back to Classic Activism for the same reason as before. But some, and we hope this is the majority, will make such strides in their abilities due to way the top pay multiplier can attract and keep the best and brightest, and to the way the intellectual motivation multiplier can increase productivity, that they will transcend this mundane world of proficiency and become an Expert.
Finally, there they will sit for a long time, because there is no higher level of problem solving ability. But the day will come when even an Expert dies, or converts back to Classic Activism for the same reason as before.

The purpose of this subsystem is to show how factors elsewhere in the system can affect the quality of effort multiplier. This is essential to solving the problem, because on difficult problems it is not quantity of effort that matters. It is quality.

Untrained supporters are assumed to make no contribution to quality of effort, because in a well managed process they are not working on a thing—they are in training. It is only Proficient and Expert supporters that affect quality of effort.

The all important quality of effort multiplier is calculated by first assuming that productivity of experts versus proficient equals 5. This means the an Expert has 5 times the effect on quality as a Proficient supporter. 5 times the number of Expert supporters plus the number of Proficient supporters equals raw productivity. That and the curve in effect of raw productivity on quality of effort is used to calculate the quality of effort multiplier. The total population is always 100. The curve assumes that as raw productivity rises from zero to 300, quality of effort rises from 20% to 100% via an S curve. The 20% represents the low quality of either a small population of Proficient and Expert supporters, or a low number of experts compared to those who are merely proficient. The 100% represents the best the process of Analytical Activism can do.

Returning to the Core Stocks system, we see that the quality of effort multiplier plays a huge role in both stocks. It is used to calculate analysis creation and process creation. This is because quality is vital to both types of work.

* * *

This completes the details of the model overview. The key to understanding how the model works is to think in terms of the two core stocks: Analysis and Solution Components and Process Components. Everything else in the model affects how much is in these two stocks. In general the more Process Components you have, the more Analysis and Solution Components you will be able to create. The more of that you can create, the higher solution success will be. And the higher that is, the happier all of us will be—for a long, long time.

The Transition Simulation Runs

Above are the simulation runs showing how the sample solution, if implementation goes as planned, can convert the movement from Classic to Analytical Activism. This is a long and perilous transition. Its length is determined by how long it will take the four auto-activation links to successively grow big enough to solve the problem. In the table the four links are the four phases of the solution.
Run 1 – As in the solution evolution model, we start with a problem difficulty of 100. This corresponds to the easy problems the environmental movement worked on at first, using Classic Activism. As you might expect, a problem this easy will have a very high solution success. The result is shown below:

According to the assumptions in the model, that’s exactly what happens. Easy problems are solved quickly, with a solution success of 99.9%. In the first few decades of the modern environmental movement, success on so many easy problems lead to the warm, comfortable illusion that the movement was using the right process. It could do no wrong. Soon the entire environmental sustainability problem would be solved.

Run 2 – But all was not well in the world of Classic Activism. It only takes a small number of Analysis and Solution Components to solve easy problems. But what about more difficult problems? Let’s try a much larger problem difficulty of 250.

Now things are looking grim. As soon as classic activists started encountering more difficult problems, they began running into some embarrassing solution failures. Run 2 has a solution success of 62%. That means that 38% of the time those classic activists were standing around looking at train wrecks and wondering what went wrong.

The model’s hypotheses of exactly what went wrong can be seen in the graph. Notice the low amount of Analysis and Solution Components and the very low amount of Process Components. The latter is the cause of the former, as shown in the mini strategy map below:

This map shows the basic problem with Classic Activism. It achieves low success on difficult problems because of a low amount of Analysis and Solution Components, which in turn is caused by a low amount of Process Components. This happens because of the Illusion of the Right Process loop, which in turn happens because of Lack of Dedication to the Process Itself loop.

How many environmentalists do you think know that this is the fundamental reason why they are unable to achieve their goals?

The basic problem with Classic Activism is the process does not fit the problem. We will see how bad that fit is in the next run.

Run 3 – Now let’s raise problem difficulty to the number that represents the insanely difficult problems the environmental movement faces today. This includes the quagmire of so called sustainable development that is growing more unsustainable, not less, the recurring failure to reign in the burning of fossil fuels, and the relentless loss of forests, coral reefs, wetlands, and ecosystems. The number representing the difficulty of all these problems put together is 1,000. How well would you expect Classic Activism to perform on a problem that difficult? And how will it do if the problem difficulty starts low and ends high?
The graph shows how the appearance of *Silent Spring* in 1962 and other events caused an explosion of solution success in the 1960s and 70s. But starting around 1980, the curve took a nosedive and never recovered. The reason is the problems kept getting harder and harder, but the process used was never improved. If that continues to be the case, the graph approximates what will happen. It is a dismal scenario.

But this scenario can be changed. If environmentalists take up mankind’s greatest tool, reason, and apply it to this situation, they will come to one outstanding conclusion: *they need a process that fits the problem*. Let’s see how they can switch to that process, one step at a time.

**Run 4** – The transformation from Classic to Analytical Activism starts with one decisive step: the precipitating event. This is the publication of the concept of Analytical Activism. This is an engineered event similar to the publication of *Silent Spring* in 1962 and *Limits to Growth* in 1972, and even *Common Sense* in 1776. Those precipitating events were not fully engineered, but they worked. This one is, and in fact must be, because the problem it is solving is much more difficult.

*Silent Spring* solved the problem of no attention being paid to environmental degradation. *Limits to Growth* solved the problem of no integrated model of the immediate causes of the sustainability problem, which meant the problem was not yet fully identified. In retrospect, all either did was to identify a problem. Now it must be solved. Generally identifying a difficult problem is an order of magnitude easier than actually solving it.

*Common Sense* solved the problem of what the American colonies should do about an unjust mother country. But the colonies were only a small fraction of the world’s population, and what they did has been repeated thousands of times. The type of problem facing us, the global environmental sustainability problem, has never been solved. And it involves 100% of the world’s population. It is of a class of problems so large, so complex, and so critical to the survival of *Homo sapiens* that it is probably about two orders of magnitude more difficult than any problem mankind has solved before.

How would the curves in Classic Activism look if only the precipitating event occurred, and the other three auto-activation links were not yet operational? This would be like the publication of *Silent Spring* and *Limits to Growth*, if there was no program and process in place to take those two events all the way to problem solution, which there was not.

The run results show that a precipitating event alone has very little effect on the system. The event occurs in the year 2010. As you can see, it barely causes the solution success curve to change course, before settling back to its old one in a few decades. The same is true for the Analysis and Solution Components curve. But what is interesting is for the first time the Process Components curve rises sharply. This is because the precipitating event instantaneously adds 150 Process Components. It also adds 50 Analysis and Solution Components. More process than solution components are added because this book and related materials is far more concerned about process efficiency than anything else. Process must come first.

Without the next link in the auto-activation chain, the precipitating event behaves just as the hula hoop fad did—it’s popular for awhile, and raises people’s hopes, but because it leads to nothing, there are no additional components created. As a result, both component curves slowly fall right back down to their usual shape. What would happen if we allow the next link in the chain to be activated?

**Run 5** – In this run the Incremental Change Projects solution element is turned on. It is now automatically activated when 1% of the population converts to Analytical Activism. This will occur, because in run 4 we can see that percent analytical activists rises to over 5% for at least a while.

The results show that the first two links alone are not enough. The only curve that changed at all is percent analytical activists. It rose to about 25% and then, like all fads, died back down again. The only difference between runs 4 and 5 is this time it rose higher and took longer to return to its original trajectory. We must do better if we are to make this process revolution succeed.
Run 6 – The next logical thing to try would be to see what happens when the third link in the chain is turned on and allowed to automatically activate. The third link is the Top Talent Package. It activates when 10% of environmentalists become analytical activists. We know it will be activated, because about 25% became analytical activists in run 5.

The purpose of modeling is to gain insights into a system. We will learn much more about the system if we set the four flaws on the center of the factors subsystem to the values they appear to have in Classic Activism and start there. For Classic Activism these goals are all low, at 20%. For Analytical Activism they have a high value of 80%. These are the four factors that the Top Talent Package is designed to change from low to high. Thus they are the goals of that package. They are listed in the simulation runs table. Let’s run the model and see what difference it makes to turn on the Top Talent Package but leave all four of its goals at the level representing Classic Activism.

There is no difference. All four curves are identical to run 5, down to the last pixel. The reason is that even though the Top Talent Package was activated, if none of its factors change from their Classic Activism values, then nothing else is going to change either. This run is also a good way to check that the model is running as designed.

Run 7 – The four top talent factors are:
1. Environmental movement unification
2. Problem solving measurement reliability
3. Quality of training
4. Potential for inner fulfillment

Suppose you were the design manager for solution implementation. Which of these four factors would you try to raise first?

We have stressed over and over that solving difficult problems is a matter of quality, not quantity of effort. That principle would point to quality of training as the factor to increase first. But, trying that has almost no discernable affect! The curves don’t budge. Why is the model behaving this way?

I didn’t know either, so I had to ask the model. It tells me the reason is that there are not enough analytical activists to make much of a difference, even if they are highly trained. Looking at the run 6 graph, the percent analytical activists rises to only a peak of 25%. And it doesn’t stay there long. As a result, there are not enough newly trained analysts to make much of a dent in solving the problem. The lesson here is that in complex social system problems, intuition is not a reliable guide.

What about inner fulfillment? If Maslow is right, shouldn’t raising that motivator make a big difference with those top talent intellectuals? Again, it makes no difference at all yet, because there are still too few analytical activists to motivate. The same holds for problem solving measurement reliability.

This leaves only environmental movement unification. Will that make a difference? Let’s raise it and find out.

But if we did that we would be falling into a lazy mental rut, and would become dependent on the model to tell us everything. Better would be to remain dependent on mankind’s greatest tool: reason. We can do this if every time we make a change, we try to predict the results before running the model. In a way we are installing a learning feedback loop inside ourselves.

So, examining the model before running it, what do we find? Environmental movement unification directly increases percent necessary force on high leverage points. And that directly increases solution success. None of the other top talent factors has anything close to this high of an influence on success. Thus a good hypothesis would be to predict that if unification was raised from low to high, that would have a very significant effect on improving success. Now that we have made our prediction, let’s run another experiment by running the model. Whatever happens, we will have learned how to form better hypotheses.

Because raising any of the four top talent factors will began to provide the top talent needed for the Analytical Method Application Package, we must turn that package on. It activates when the percentage of the population trained in the method reaches 25%. That is a lot, but it takes a lot of people and organizations working smoothly together to make the deep, fundamentally correct breakthroughs that are needed on difficult problems. Now that this package is on, all four links in the auto-activation chain are on.

Let’s run another experiment and see if our hypotheses that increasing unification from low to high will make a very significant difference is true or not.
The results are dramatic. Our hypothesis was not proven false, so it is probably true, because it also has logical proof.

The graph shows that the problem is not solved, but at last there is a large jump in percent analytical activists. And solution success started to go back up significantly. But for some reason it stalled. So did the rise in analytical activists, which, after a spectacular climb to 64%, dropped just as quickly. By the end of the run both curves were almost completely right back to where they were in the previous run. In the long run, nothing has changed. Why?

The answer lies in the other three factors. They are all still low. The precipitating event and high unification had the marvelous effect of causing plenty of classic activists to convert to Analytical Activism. But because the three quality of effort factors are all still low, most of those converted stayed in the Untrained stock. So few graduated to Proficient, and almost none transcended to Expert, that the quality of effort multiplier was barely increased. The dynamic behavior of these three stocks and their negligible effect on the quality of effort multiplier is shown below:

As a result of most of those converts remaining untrained, the actual process of creation of new process and solution components was unchanged. Thus when the ones the precipitating event provided gradually died due to obsolescence, there was no rush of new ones to replace them. In the end nothing that really mattered had changed, causing the system to revert back to where it was.

This scenario could easily happen. In fact, variations of it have happened many times. How many good ideas to improve our chances of solving the sustainability problem have appeared, only to become forgotten willows in the wind when they failed due to incompleteness or lack of follow through on the initial event? Numerous environmental books and projects have done exactly that, at the local, national, and international level. Each follows the same pattern: The event appears. Expectations are raised. The book or project gains the attention of environmentalists, the press, and the public. But it leads to no real lasting improvement, and in a few months or years is quietly forgotten. It was another fad.

This scenario shows what would happen to the book you are reading and the project it represents, if we let it.

But as the model argues, we can avoid becoming another shooting star that soon burns out by offering a complete solution that has a high probability of working, due to being based on a complete and thorough analysis of system structure. Let’s see how this solution could work, by proceeding further with the transition from Classic to Analytical Activism one very sound step at a time.

Run 8 – Because we determined that quality of effort was the roadblock in run 7, let’s raise quality of training. According to the factors subsystem, an increase in quality of training will increase the sufficient skills multiplier. Looking at the Analytical Activism Supporters subsystem, we see that will increase the graduation rate. This is normally 50% per year, meaning it takes 2 years on the average to turn Untrained analytical activists into Proficient ones. A higher graduation rate will increase the stock of Proficient analytical activists. This should make a notable difference.

Because it is so crucial, let’s increase quality of training a little at a time so we can learn more about how the system behaves. Let’s raise it from 20% to 40%.
There is not much difference. According to the model, being timid about improving quality of training is not going to help much at all. We must get serious.

**Run 9** – Because quality of training is critical, let’s see how it behaves in some detail by raising it from 40% to 50%. This is not much of a change, so it should not make much of a difference.

During run 8 the upper loop is always dominant, because quality of training is too low to make the other loop dominant. But in run 9 there is enough, which causes the lower loop to “run away” until all classic activists are converted or various other limits are reached.

Quality of training is a constant. It does not change during a run. What does change is all the other variables except the other constants. One is the success goal. The only other one is a constant calculated from quality of training, which is the sufficient skills multiplier.

The success goal is used to calculate the two conversion rates. If solution success is below the goal, conversion back to CA is greater than conversion to AA, and vice versa. Thus the tipping point in this structure boils down to whether quality of training is high enough to make conversion back to CA greater than conversion to AA. If it’s greater the transformation fails. Otherwise it succeeds.

Diagrams like this allow managers to dissect tricky situations and more rationally determine what to do. Every variable and arrow on the diagram becomes an assumption that a team can discuss and come to consensus on. If doubt exists, it is a breeze to run some experiments or make measurements. In this manner what were formerly difficult or impossible decisions to make rationally can be made with confidence.

**Quality of Training Tipping Point Loops**

- **Conversion Back to Classic Activism Due to Solution Failure**
  - solution success
  - untrained decrease
  - quality of training
- **Conversion to Analytical Activism Due to Solution Success**
  - analysis, solution, and process components creation
  - proficient decrease
  - sufficient skills multiplier
- **Untrained AA Supporters**
- **Proficient AA Supporters**
- **Conversion to AA**
- **Conversion Back to CA**
- **Success Goal**
- **Rate of Graduation**
- **Delay**
Chapter 11. The Transformation Simulation Model

How the three types of Analytical Activism supporter stocks behave is shown below:

The supporters graph in run 7 showed plenty of Untrained AA supporters, but only a few Proficient ones and almost zero Experts. This time, due to quality of training, the Untrained supporters graduate into Proficient supporters. But because measurement and inner fulfillment are still low, there are still no Experts. This is what is preventing closing the gap to achieving 99.9% success.

What might happen when a manager discovered this tipping point is he or she would start thinking, “Why raise quality of training any further than 50% for now? Wouldn’t our limited resources be better spent on the other two factors that are still low?” This is promising and worth investigating. A quick check shows that increasing potential for inner fulfillment has almost no effect, and increasing measurement reliability has about the same effect as increasing quality of training the rest of the way. So let’s continue increasing quality of training, which is what the next run does.

Run 10 – Once past this tipping point, how much more improvement can we get by raising quality of training all the way up to its goal for Analytical Activism? The goal is 80%. It’s hard to predict how much of a difference it will make, because too many variable and loops in the model are involved. So I will not make a prediction, but instead will trust the model.

The results show a small improvement. Solution success rises slightly from 83% to 88%. But from a “close the gap” perspective, the gap of 17% in run 9 was cut to 12%. So actually this was a large improvement.

The other improvement is run 9 took about as long as it would take a turtle to crawl from China to Chinatown to reach 80% success: 93 years. Run 10 reduced this to 68 years. Considering how much damage could be done to the environment in the difference between the two runs, 25 years, this is a notable improvement.

In addition, the sooner success starts to occur, the sooner those believing that there is a better way are vindicated. But except for the very young, few of the problem solvers kicking off the solution in 2010 will be around for the pleasant news that begins to occur from around 2050 to 2070. This is why we’ve got to get the precipitating event and the other links right, so that the solution is self-managing, and not dependent on its originators.

Run 11 – There are only two remaining quality of effort factors left to raise from low to high: problem solving measurement reliability and potential for inner fulfillment. Which should we raise next?

The most realistic thing to do would be to raise the one that will make the biggest difference first. Can this be determined by study of the model? How clearly is the model speaking to us?

The factors subsystem clearly shows that the measurement factor affect two multipliers, while the inner fulfillment factors affects only one. This implies the measurement factor is the one to increase next. But we must examine the rest of the model as well and not leap to any hasty conclusions, because we cannot afford to muff up. So what do those multipliers affect?

The top pay multiplier and the intellectual motivation multiplier both affect the transcendence rate. They affect it equally, so this does not help to make a decision. But the fitness of strategies multiplier affects the analysis creation rate. So the model tells us that raising the factor that increases that will have the most effect. This is the problem solving measurement reliability factor. A sanity check shows this is indeed true, and raising potential fulfillment hardly makes a difference. So we have made our decision. Run 11 will raise that factor from 20% to 80%.

But how much will it raise it? Can we predict that? Study of the model variables shows doing this will increase the fitness of strategies multiplier from 75% to 100%. But other than that, it’s not easy to see the exact effect this change will cause. Once again, the mind has fallen short, and we must rely on the model. But then again, the model is an extension of the mind.

Below are the results:
The solution outcome has improved slightly. Process Components has risen a little more. This caused a slight rise in Analysis and Solution Components, which made no significant difference in solution success, but did drop the number of years to 80% success from 68 to 60.

**Run 12** – Finally we arrive at the final transition run. Here we change the last factor, potential for inner fulfillment, from 20% to 80%. The result has been engineered from the start to bring the model to a 99.9% solution success confidence level. That is indeed the outcome, as the results show below:

According to the model, this is very approximately as good as we will be able to do—if the model is correct. It now takes only 52 years to reach 80% success. We would like to do much better, but that does not appear to be realistic, though we will examine that assumption later.

Now that all four factors in the Top Talent Package are at the high values needed by Analytical Activism, let’s see how all that impressive talent is deployed. The graph is shown on the top right.

The main difference between this and run 9 is we now have plenty of experts, which causes the quality of effort multiplier to shoot sky high. In fact, by the end of the run experts form the majority of supporters—just as they do in the think tanks of the Corporate Proxy Movement Machine. (Those in the think tanks are the actual problem solvers. The rest of the conservative movement are the implementers, funders, voters, and so on.) According to the model, achieving such a high amount of expertise requires two essential needs that experts have: the potential for inner fulfillment and top pay. Because run 12 meets these needs, the environmental movement now has all the brains it needs to solve the sustainability problem.

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This completes the overview of the Transformation Simulation Model. Next we turn to a number of powerful tools that will allow us to better understand it.

### Tools for Solution Analysis

So far the Transformation Simulation Model is no more than a collection of hundreds of untested, plausible hypotheses, with highly plausible emergent behavior. For us to be able to analyze how good a solution it is and how to improve it, we need the right tools:

1. The first is the interrelated concepts of **phase transitions** and **critical thresholds**. A phase transition occurs when a system moves from one mode to another, due to having crossed a critical threshold.

2. The second tool is the concept that at the macro level, the history of any complex social system is its history of phase transitions, which form a **phase transition chain**.

3. The third tool is **Social Force Analysis Notation**, which allows us to clearly visualize phase transition chains.

4. The fourth tool is the **Principle of Efficient Social System Solutions**, which says that the most efficient strategy for solving complex social system problems is to design the new system so that it is on the right side of the phase transition that requires the lowest amount of effort. If the desired phase transition doesn’t exist, then it must be created.
5. From this follows the fifth tool, which is the Principle of Efficient Solution Paths. This says that the most efficient solution path is the one with the most efficient phase transition chain.

Let’s examine these tools one at a time, starting with the foundational concept of:

**Phase Transitions**

A **phase transition** occurs when a system goes from one mode to another, due to crossing a critical threshold. In a simulation model the transition is usually neat and clean. In the real world the transition is usually a period of chaos, due to the rapid change involved. But after that period the system rapidly settles down to a new mode. Because of the period of chaos, the results of crossing a critical threshold is not entirely predictable.

All complex social systems are sensitive to small changes. Solving difficult social system problems requires finding out how to cause the system to go through a **phase transition** from the problem mode to the solved mode. If it is a well engineered phase transition, the system will require no further intervention to stay in the new mode, because the solution will be self-managing.

If a change causes a large favorable phase transition and the change requires only a small amount of effort, it is a high leverage point. Finding where the high leverage points in a system are and exactly how hard they need to be pushed to cause successful phase transitions is the second most important information problem solvers can have. The most important is the structure of the system.

A **complex system** is any system whose behavior cannot be predicted by examination of its parts. This occurs because of the phenomenon of **emergent behavior**, which is behavior that emerges from the structure of the system, and not from the mere presence of its parts. For example, it only takes about two dollars worth of chemicals to have all the elements necessary for a human body. But until those atoms of carbon, oxygen, hydrogen, calcium, and many more are arranged in the proper structure, all you’ve got is little bottles of chemicals sitting on a table. You do not have a human being, because a successful phase transition from chemicals to life has not occurred.

Because the systems we seek to understand in this book are complex, simulation models are required to determine their emergent behavior. Those models allow us to determine the effect different parts will have on the system’s behavior. Real world and artificial world physical experiments can also do this, but are prohibitively expensive and too slow for most work. However, physical world experiments are useful and even mandatory for confirmation of key model hypotheses.

A simulation run is an experiment. Rather than an experiment in the physical world, they are experiments in a world unique to the field of system dynamics—the world of computer simulation. Once you have created one of these worlds, as we have with the Transformation Simulation Model, you can run experiments to find out various things. What we want to find out is where the critical thresholds are that are blocking solution of the problem, and how those thresholds behave. So let’s review the theory behind critical thresholds.

**Critical Thresholds**

A critical threshold is the technical term for a tipping point. Earlier we defined a **tipping point** as what occurs when loop dominance changes. A tipping point exists when there is one set of loops working against another set of opposing loops to drive system behavior. Whichever set of loops is dominant determines which mode the system is in. Which set is dominant is determined by the **tipping point variables**. These are the variables whose values, when they change only a slight amount, can tip the system into one mode or the other. A **phase transition** occurs when a system moves from one fundamental mode to another, due to having crossed a critical threshold.

Let’s look at critical thresholds from a system dynamics perspective, using the model below:

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[Diagram of critical thresholds]
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This is about as simple as a critical threshold can be modeled. There is only one critical threshold variable: the outcome threshold. If the outcome exceeds the threshold, then the above threshold decision is active and the below threshold decision is not. If the outcome is below the threshold the opposite holds. If the outcome equals the threshold, then both decisions are active, but this is as rare.
Whichever decision is active determines which loop is dominant. If the outcome is above the threshold, the system is in the **Supercritical Region**. If the outcome is below the threshold, the system is in the **Subcritical Region**.

Suppose the system is subcritical. The supercritical loop will be inactive, which may mean it’s doing nothing or is doing less than the other loop. The subcritical loop will be active and dominant. This will cause the subcritical loop to continually decrease the **Factor of Concern**. This in turn will reduce the intermediate result, which will reduce the outcome. Since the outcome was already below the outcome threshold, the below threshold decision remains active, and the loop continues. It stops when the factor drops to the minimum.

How the model behaves is shown in the graph below. The vertical axis is the **Factor of Concern**.

In the top curve, a factor policy of 1.1 caused the supercritical loop to dominate. A policy of 1.0 caused both loops to be equally dominant, which is rare. It would be like two political parties each holding a 50% share of a country’s supporters. Because neither is stronger and can make a bigger difference, they are deadlocked forever. This has never happened in the real world due to micro random events that are not present in the model, though many party splits have bobbed around the 50% mark.

In the bottom curve, a factor policy of 0.9 caused the subcritical loop to dominate. Notice how when it hit the limit of its minimum, it arrived sooner than the top curve. This is an example of asymmetry. In most systems the subcritical region does not behave symmetrically to the supercritical region. A good example is any of the transformation model runs where, after the precipitating event, the system change from sub to supercritical. There is little sign of symmetry.

**Phase Transition Chains**

At the high level, the history of any complex social system is its history of phase transitions. Because each transition leads inexorably to the next, this history is a phase transition chain.

A **phase transition chain** is the sequence of phase transitions a system has gone through in the past or will go through in the future. Up to this point this book has called them **auto-activation chains**.

Phase transition chains are everywhere. For example, child development theory hypothesizes that all children go through the same phases. None can be skipped, because it is essential for allowing the next phase to occur. There is disagreement on exactly what the standard high level phase transition chains in child development are. For example, Jean Piaget theorizes that cognitive development requires the four stages of sensorimotor, preoperational, concrete operational, and formal operational.

Given their importance, wouldn’t it be handy to be able to see phase transition chains?

**Social Force Analysis Notation (SOFAN)**

SOFAN is a simple, insightful, flexible tool for visualizing how phase transition chains work. To introduce it gradually, let’s start by using it to illustrate how run 8 worked.

In run 8 the problem was not solved, because a 40% quality of training goal was insufficient to achieve the solution success critical threshold of 30%. What happened in run 8 can be expressed diagrammatically as shown below:

The diagram illustrates how a rising force never reaches the dashed line. This leaves a gap between the two. Because of that gap the 30% success threshold is never reached, which causes the **Conversion Back to Classic Activism Due to Solution Failure** loop to remain dominant. The important thing to concentrate on is how the diagram shows when and why a phase transition occurs. In this case it never occurred, because the rising force never reached the critical threshold.
Next let’s use SOFAN to express how run 9 worked. In that run a quality of training goal of 50% closed the gap, which allowed the problem to be solved. Here is the diagram:

The Quality of Training Tipping Point Occurs at Exactly 30%

The diagram shows how the rising force of success due to quality of training = 50% eventually causes success to reach the critical threshold of 30%. The model assumes success needs to reach exactly 30% for the desired phase transition to occur. When this happens, the system abruptly changes modes. The Conversion Back to Classic Activism Due to Solution Failure loop loses its dominance to the Conversion to Analytical Activism Due to Solution Success loop. The dynamic forces of this loop cause the number of Analysis and Solution Components to rise until they reach 1,000, at which point the problem is solved.

Below are the standard elements that SOFAN uses to express a system’s phase transitions:

Social Force Analysis Notation (SOFAN)

SOFAN differs from system dynamics, which thinks in terms of system structure and feedback loops. Instead, when using SOFAN, problem solvers think in terms of what it takes to move a system from one phase transition to the next. These are the two “goal posts” on the diagram. Each phase transition is caused by or causes a transition event, which should be carefully named. What happens between phase transitions is a phase, which may be named or numbered. During a phase there is a main feedback loop that is the true source of the dominant force for that phase, though it may sometimes be multiple loops or an entire subsystem. This force is indicated by the rising arrow, which represents the increasing dominant force during the phase.

When the quantity of this force reaches the critical threshold, the crossover point is reached. After this the system has entered the precondition region for a successful phase transition. (This is also called the subcritical region, and the system is said to be subcritical. However I find that “precondition” is more descriptive, because it says that the required conditions are now present. It is also less jargon.) Once in this region, a transition event can trigger a phase transition. The further into the precondition region the system is, the more likely the precipitating event is to succeed and the smaller or less perfect the event required. Before crossover the event will not succeed permanently, despite heroic effort or brilliant precipitating events, because the system is simply not yet ripe for transition.

Notice how The Quality of Training Tipping Point Occurs at Exactly 30% diagram for run 8 has no precondition region. That’s because the model tips at exactly 30%. But in the real world, things are murkier. There is a plethora of factors that actually cause tipping points to occur. Thus the best problem solvers can do is to predict the range of the critical threshold required for a phase transition and the probability of when transition will occur, given various values. This range is represented by the precondition region. It says the system reaction will occur somewhere about here and that the probability for a successful transition is increasing.

With this notation and our quest to solve the most difficult complex social system problem the world has ever faced still before us, we can now consider the following proposition:

The Principle of Efficient Social System Solutions

This principle says that the most efficient strategy for solving complex social system problems is to design the new system so that it is on the right side of the phase transition that requires the lowest amount of effort. If the desired phase transition doesn’t exist, then it must be created. Amount of effort means the total effort to move the system from the problem state to the solved state and keep it there. (For simplicity we are ignoring the trade-off between effort, time, and quality here.)
Once a system crosses a critical threshold and a phase transition occurs, if the threshold is sufficiently maintained then the new mode is now the natural equilibrium for the system. If the phase transition is well designed then the threshold can be greatly reduced and the system will not revert. An example of this is what happens once democracy enters a country—it usually doesn’t want to change back, even when the massive doses of education about the benefits of democracy it probably took to cause the transition are eliminated. This is because the new phase is self-reinforcing. The more the democracy the more the benefits for the people, and the greater the benefits, the more the people love democracy.

A solution that requires large doses of intervention to maintain is a precarious solution. It could tip back into the problem phase anytime. What holds a system in a phase is its dominant feedback loops.

The Principle of Efficient Solution Paths

The first principle implies the second. The concept of phase transition chains tells us that a non-trivial solution consists of a managed series of phase transitions. The Principle of Efficient Social System Solutions applies to the last phase. And it applies to all the other phases, because each is an intermediate system. Thus it follows that the most efficient solution path is the one with the most efficient phase transition chain.

These tools allow us to return to the Transformation Simulation Model and look at it from a very useful perspective: how its phase transition chain works visually, as shown above.

The Transformation Model Phase Transition Chain

Let’s follow the auto-activation chain all the way through, from left to right.

**Phase Minus 1** – The chain started long ago in the 1990s, when for me there was a growing realization there must be a better way. I could not put it aside. Like most environmentalists, I was under the Illusion of the Right Process. I felt the movement was doing the best it could under the circumstances. But as a systems engineer and business consultant, I could see not only that there was a strong need for a better way, but that with my problem solving skills maybe I could help find it. So in mid 2001 I crossed the commitment threshold and made a personal commitment to finding a better way. It became my top priority and a full time job.

The fundamental reason I did this is I was aware that problem solving success was falling like a stone, as more and more unsolved subproblems appeared. Anytime you have a growing backlog of new problems and you are not solving the top old ones, something is very wrong. One of my specialties was process improvement. Looking at the environmental movement, it did not take long to come to the firm conclusion that it was laboring under the Illusion of the Right Process. Breaking free from that illusion is what caused my personal phase transition. It was a quiet epiphany.

The first thing I did was to develop a six year plan, impose a suitable process on myself, and follow the plan and the process relentlessly. This was the System Improvement Process, which is described elsewhere. A little self-discipline goes a long way.
Phase 0 – What I had done was to move into Phase 0, which is driven by the **Personal Recognition of the Right Process** loop, assuming the System Improvement Process will work. This process has led me to conclude that for civilization to get on a viable path to solving the problem, the right precipitating event is needed to move the system into Phase 1.

This event will be the publication of this book and related articles, projects, conversations, work with organizations and environmentalists, and so on. The reason this event should work is that the system is well into the two precondition regions for a successful phase transition region to Phase 1. Probably the majority of environmentalists are in the first region in Phase -1. I and who knows how many others are laboring in Phase 0.

Since I’ve been in Phase 0 there has been a steady accumulation of new paradigm components. Soon there will be enough for a successful phase transition. Examples of these components are the concepts of Classic Activism, Analytical Activism, realization that the social side of the problem is the crux, the Dueling Loops of the Political Powerplace, the New Dominant Life Form, and Corruption Ratings.

Notice what we’ve done here. Like in a Feynman diagram, every line in the diagram has mathematical equations in the Transformation Simulation Model behind it (with the exceptions of phases -1 and 0). The model and the diagram both tell the same story of how the system moves from where it is now to where it needs to be. The advantage of the model is it does this rigorously and fairly completely. The advantage of the SO-FAN diagram is it is much easier to understand and can do something the model can’t: it can serve as the blueprint for our topmost problem solving strategy.

The key strategy of Phase 0 is that because the preconditions are by now quite sizable, the right precipitating event will be fairly straightforward to create. This will tip the system into:

**Phase 1** – The loop driving this phase explains why this book is so process centric. In fact this book is designed to do only two main things: (1) Prove to environmentalists that the number one reason they are failing to achieve their objectives is use of the wrong process, and (2) Offer a mature, complete example of a process that could do the job. If the precipitating event succeeds then percent analytical activists will start rising significantly, because we have broken the dominance of the **Illusion of the Right Process** loop, and replaced it with the dominance of **Discovery of a Better Process**.

The illusion loop name is from the Core Stocks model on page 233. The discovery loop is not on the model because it involves many subsystems. It starts growing when the precipitating event injects a significant number of process, analysis, and solution components into the system. This causes some innovators, on the basis of logic alone, to convert to the better process of Analytical Activism. Once converted, they help to create more components using the new process, which causes more to convert, which causes even more components to be produced, and so on, as the **Discovery of a Better Process** drives percent analytical activists higher and higher. Eventually it crosses the 1% critical mass critical threshold for causing the **Incremental Change Projects** phase transformation, which takes the system into:

**Phase 2** – The model hypothesizes that Incremental Change Projects will cause investment decisions to start moving from analysis creation to process creation. This shifts dominance in the Core Stocks system from the **Illusion of the Right Process** loop to the **Lack of Dedication to the Process Itself** loop. Because the second loop is no longer being neglected, its proper name becomes **Dedication to the Process Itself**, which is the loop driving Phase 2.

Such admirable dedication to what really does matter the most causes percent analytical activists to keep rising, because a better process is more efficient, which causes more analysis and solution components to accumulate. This causes early adopters to start converting in droves. Soon this causes the 10% critical mass to be reached, which triggers the **Top Talent Package** into being adopted by the environmental movement. This moves the system into:

**Phase 3** – Now the solution really takes off as several different dominant forces begin working simultaneously. No one force is supremely dominant in this phase. It takes all three of them to pull off a solution to such a difficult problem. Driving them all is the underlying feedback loop of **Redirection of Talent and Investment to Analytical Activism**. This loop is not shown on the model, because it is an amalgam of several loops.

Starting from the bottom of the diagram, the **quality of effort** force begins to grow because the Top Talent Package is leading to so much more top talent being attracted and trained. It grows right on up to the critical threshold needed to solve the problem, which is 80%. But long before it does, something not shown on the model begins to happen. Process, analysis, and solution breakthrough emergence begins. This is the same phenomenon that comes to any endeavor that has attracted and trained a large, unified team of the best problem solvers in the world. It happened on the construction of...
the Panama Canal, the English Channel tunnel, and the race to the moon. It can happen again.

Actually the phase transition post for quality of effort should coincide with the one for the end of Phase 4. But the diagram technique shown allows explanation of one of the more subtle aspects of the solution design.

Another dominant force is the percent necessary force on high leverage points. On the Core Stocks system this directly affects solution success. This is because analysis and solution components alone are not enough to solve the problem. You also have to use force in the form of votes, money, lobbying, writing, and so on to actually apply the solution.

The force on high leverage points is a function of one thing: environmental movement unification. Thus when the movement reaches the critical threshold of 80% unification, it has enough force to solve the problem, if there are also enough analysis and solution components. At this point another welcome development occurs: the environmental movement sees the beginning of acting with one mind emergence. After that the effective force of the movement becomes much larger than its actual numbers, because 80% of the army of problem solvers is now marching in step to the beat of the same drummer. If you have any doubts about the power of a unified movement, just take a look at the conservative movement in the US today and the role unification has played in its spectacular success.

The third force in Phase 3 is the way percent analytical activists continues to rise. Because so many analysis and solution components have accumulated, solution success starts to rise. This is real world proof the new process of Analytical Activism is a better way, which causes the early majority to begin converting. They are soon followed by the late majority. As a result it doesn’t take long for the 25% critical mass to be crossed, which triggers a phase transition to:

**Phase 4** – **Once this phase begins the transformation of the environmental movement problem is solved.** This allows solution of the main problem to begin in earnest. Due to having so many reliable, fully tested analysis and solution components and use of the Scientific Method, the **Building the New from the Old** loop cuts in at last. This loop is named on the solution evolution model on page 183. Its presence is only implied on the Transformation Simulation Model to keep that model simple.

This loop is so powerful that it and high quality of effort causes growth of analysis and solution components to accelerate tremendously around year 2045 of simulation run 12, as the graph below shows. After that it does not take long for the number of analysis and solution components to cross the 1,000 problem difficulty threshold, and the main problem is solved.

However this solution has a major weakness. It takes too long. It takes 52 years to reach 80% success and 72 years to reach 99.9%. Thus it will take about 50 years to reliably solve the bulk of the problem. As far as I and many others can tell, if civilization waits this long it will be so far into environmental overshoot that global catastrophe will be unavoidable. Furthermore, looking at the phase transition diagram, notice how the problem difficulty threshold is growing. Although it is drawn as a straight line, it is actually curving upward. The longer the sustainability problem remains unsolved, the steeper that curve will become. If it becomes steeper than the analysis and solution components curve, then guess what happens? The problem becomes insolvable because the two curves will never meet.

There must be a better way.
Accelerating the Solution

With the overview of how the phase transition chain works behind us, let’s see if we can accelerate the solution by compressing the chain. We start by redrawing the phases to scale, so that the diagram correctly shows how long each phase takes. The final phase reaches 99.9% success. Phases -1 and 0 are omitted because by the time you read this they are over. The scaled diagram above and the detail graph below tell the story.

The graph shows how building most of the actual solution takes only about 20 years, from 2050 to 2070. The 40 years from 2010 to 2050 are “wasted” while the system spins its wheels, as it accumulates enough trained percent analytical activists to start building the solution.

Let’s explore the model and test it to find out where we can realistically accelerate the solution. Our measure of improvement will be how long it takes to reach 99.9% success, which in run 12 takes 72 years.

A. New Technology User Types Percentages – In this subsystem we assumed the curve of user types followed a fairly normal distribution. The model assumed 5% innovators, 10% early adopters, 40% early majority, 30% late majority, and 15% laggards. Thus there were relatively few innovators and early adopters. How accurate is that assumption? What would happen if there was a much higher percentage of innovators and early adopters?

An experiment that sheds light on what the innovators percent might be is underway. As of October 2006 I’ve worked with three organizations so far.

The first was a large US environmental NGO, the Sierra Club, since mid 2005. By January 2006 the Club’s President, Lisa Renstrom, was convinced that the concepts in part one of Analytical Activism were sound. As she stated in an email, “I appreciate your long term view and think your basic tenants are solid.” This is encouraging. However, due to what appears to be organizational change resistance the Club as a whole did not convert at that time.

The second was an international NGO, the Club of Rome. After being accepted as a member in early 2006 I attempted to convert the organization by starting with what the business world normally starts with: an assessment of the organization’s process maturity. This attempt also failed due to change resistance.

The third was the sustainability department of Hatch, a global engineering consultancy with a staff of 7,500 of whom 5,000 are engineers. In mid 2006 the department converted in a matter of months, starting with a reading of the Dueling Loops paper on think.org. My guess is their change resistance was overcome by, as engineers, their being able to more easily fully comprehend the paper and what it implied: that an analytical approach using the right tools is better than a non-analytical approach using the wrong tools. More important is they are innovators, and thus will adopt a radically new technology on the basis of logical proof alone.
Three organizations is too small a sample to draw any reliable conclusions from. The sample was also not randomly selected. But still, one out of three has converted. This is slight experimental proof that the model’s assumption of 5% innovators is too low. Suppose we changed to a distribution of 20% innovators, 20% early adopters, 30% early majority, 20% late majority, and 10% laggards. Running the model with this new set of assumptions reduces the time it takes to reach 99.9% success from 72 to 63 years. The curves look about the same, only compressed, so there is no need to show the graph.

This is significant, but it is not the radical improvement we need, so let’s keep looking.

B. Skipping the Incremental Change Projects of Phase 2 – The experiment with one environmental organization, which has taken several hundred hours of my time, shows that in this case Incremental Change Projects were not needed for a large, typical environmental organization to come to accept the idea that Analytical Activism is a better way and they want to try it. Reading part one alone worked. So let’s change the critical point for activation what follows Incremental Change Projects, the Top Talent Package, from 10% to 1%, which is the value it is for Incremental Change Project activation.

The result is years to success falls from 72 to 67 years. This is about right, because on the To Scale diagram we found that Phase 2 took 6 years. Eliminating that phase should reduce time to solution by about 6 years, which it did.

Now what happens if we combine the (A) revised New Technology User Types distribution with (B) skipping Incremental Change Projects? The result is to reduce time to success from 72 to 61 years. This is barely better than change A alone. The lesson is that improvements are not additive.

C. A Bigger and Better Precipitating Event – The model assumes the precipitating event will add 150 Process Components and 50 Analysis and Solution Components. At the end of run 12 these two stocks are 694 and 1027 components. (Notice the overshoot in the second stock.) Thus the precipitating event provides 22% and 5% of what these two stocks need to solve the problem. Can this be realistically increased?

I don’t think so. It is possible to sketch out much of what the new process needs to be. But pinpointing the actual solution elements needed at this stage is just not possible. This is because that would require a team of highly qualified problem solvers working for a few years. Thus the precipitating event cannot provide much more than 5% of the solution.

But the event might be able to pinpoint more of the process needed, because that’s exactly what the Powell Memo did in 1971. So let’s raise the increase in Process Components in the event from 150 to 300. This would be 43% of what’s needed to solve the problem. The result is years to 99.9% success drops from 72 to 69 years. This is surprisingly small. The reason can only be that this is a low leverage point. We must look elsewhere in the system to try to accelerate the solution.

What if we could increase precipitating event Analysis and Solution Components? Would that have a dramatic effect? The model shows that leaving event Process Components at 150 and increasing Analysis and Solution Components from 50 to 200 components would reduce years to success to 62 years. 400 components would reduce it to 61 years. As you can see, the system is resistant to pushing here. In addition, this is not realistic. We must look elsewhere.

D. Reducing the Analytical Method Application Package critical point – This is currently 25% of trained analytical activists. It represents the point at which percentage of analytical activists using a much better process will suddenly shift into a whole new higher level of problem solving efficiency. 25% rather than a low percent was chosen because it appears that an industry wide mindset change is needed to shift gears.

But what if a lower percent was used? This is realistic, because it could represent just those analytical activists in certain organizations that were working together, and all were trained. So let’s try 10% and see how much effect that has.

The result is years to success drops from 72 to 70 years. This is not a high leverage point.

E. Increase average process component lifetime – The average analysis component lifetime dynamically changes from 12 to 24 years as run 12 unfolds. It increases due to higher process efficiency. But the average process component lifetime is a constant of 25 years. Increasing that will dramatically increase the number of Process Components, which, since it is very leveraged, should in turn dramatically increase Analysis and Solution Components, which directly affects solution success. So a logical analysis of the model points towards this having the potential of a high leverage point.

The result is years to success drops from 72 to 66 years. This is peanuts and it is not realistic. We must continue to look elsewhere in the model for high leverage ways to compress time to success.

F. Reduce the many delays in the system – A standard place to start in process improvement programs is reducing the delays in the system. If they could all be reduced to zero, the system would accomplish its goal
immediately. So let’s examine the many delays in the model and see which could be realistically reduced.

Starting in the Core Stocks system, we see success delay at the top. This is currently 5 years. This is about how long it takes to find out if a solution to an environmental problem has worked. It cannot be rushed, because you have to educate decision makers, who then must go through a long decision process themselves. Next the solution must be implemented. Then you have to wait for the modified system to respond with success or failure, or somewhere in between. All this takes a long time, so 5 years may be too low.

Next let’s consider analysis creation delay. This is 3 years, which is the time it takes to perform a thorough, high quality analysis. But with a well trained team this can ambitiously be reduced to 1 year. The result should be to reduce years to success. But a simulation run shows it increases from 72 to 75 years! Why is this? Have we found a flaw in the model?

Analysis of the model shows the culprit is the diminishing returns cost multiplier. As the number of Analysis and Solution Components increases, so does the cost multiplier, which increases the cost per analysis component. The diminishing returns curve is not very steep at first, causing a smaller analysis delay to have the expected effect of accelerating growth of analysis components. But when the curve becomes very steep, as it does just before there are enough to solve the problem, a short analysis delay causes such a quick change in the number of analysis components that the next year’s cost per component is higher than it would have been with a longer delay. The result is due to higher costs the time to solution is longer, because there is a limited investment rate.

Increasing the analysis creation delay from 3 to 6 years lowers years to success from 72 to 67 years. Does this mean we should try that?

No. This phenomenon is what’s known as a model anomaly. A model anomaly occurs when the model is built correctly but its behavior is incorrect. In the real world, as Analysis and Solution Components approached enough to solve the problem and it became extremely expensive to create the last few percent, project managers would see what was happening and use the correct costs. This very fine grained behavior is, however, too complex to put into the model.

Moving on, the next delay to examine is process creation delay. This has the same counterintuitive effect. Its impact on years to success is even smaller, and so it is not a candidate for radical solution acceleration.

There are two delays in the factors subsystem: a funding attraction delay of 5 years and a fulfillment attraction delay of 10 years. Experimentation shows these have a negligible effect. The same is true for the top talent package activation period of 5 years and the incremental change project activation period of 5 years. However, reducing the analytical method application package activation period from 10 years to 1 has a significant effect. This reduces time to success from 72 to 66 years. Have we found a delay worth seriously trying to reduce?

I think not. The Analytical Method Application Package is activated when percent trained analytical activists reaches 25%. That is when they start seriously using the Analytical Method. But after they start, it takes a long time to become proficient in its application. Remember now, we are talking about changing the behavior of organizations with hundreds of people, or in the case of governments and international agencies, thousands of people. They are not going to change overnight. There is simply too much bureaucratic momentum involved.

Looking at the Analytical Activism Supporters subsystem, we see that perhaps increasing the graduation and transcendence rates will help. But it currently takes untrained analytical activists 2 years to graduate to proficient. That looks as if it cannot be realistically reduced. But the time it takes proficient activists to transcend to experts probably can. It is currently 20 years. What might happen if we reduced it to 5 years, by changing normal transcendence rate from 5% to 20%?

The results are time to success falls from 72 to 64 years. This is very feasible, but only if we start with those who are already highly qualified, such as those with relevant degrees and many years experience in solving similar problems. So let’s add this improvement to A and B. A was a higher percentage of innovators and early adopters. B was skipping Incremental Change Projects. The result of A, B, and 5 years for transcendence is that time to success falls from 72 to 61 years. The surprisingly small difference is that in a complex social system, improvements are not additive because of the many interrelationships in the system. So, despite our efforts we have come up short. We have not found a breakthrough.

But we really need to find one. 72 years is depressingly long. There are billions of lives, born and unborn, riding on this. There has got to be a way to compress this solution. To find it, let’s start thinking outside of the box that most activists have been living in for over a hundred years.

The box of Classic Activism has enough nails, boards, and deadbolts to keep all but the most adventurous trapped tightly inside, where they are slowly suffocating. One of these deadbolts says that it takes a long time to see what works and what doesn’t. This is why
the environmental movement has changed solution strategies so slowly, if at all, after the golden years of the 1960, 70s, and some of the 80s.

Suppose for a minute that we could reduce the time it takes to determine if a solution component is going to work or not. Right now the model assumes this is 5 years. That is much faster than the movement has actually been moving, but this is for analytical activists. Can the current success delay of 5 years be radically reduced to 1 year?

I think it can, and here’s why: Today, when problem solvers look at the system to determine if a solution component succeeded or failed, they look at whether the system behaved more sustainably. That is, was pollution reduced? Was the rate of deforestation slowed? And so on.

There is, however, a better way. If we study the process steps that a solution component goes through, we can see that success in one step tends to be correlated with success in the next step, and the same for the next step, all the way up to the last one. In other words, there is a correlation between success in the first few steps and success on the one that matters most, the last step.

For example, if a solution component has done well in the laboratory and then pilot testing, all that’s left is to run it through the gauntlet of politics to get it implemented. This is a long series of steps, which, if well designed, have already started. Decision makers have already been involved in the testing and iterative refinement process. Hence the next step is not a garden variety solution component proposal, but presentation of hard proof it will work. After decision makers have worked with analytical activists for awhile, they will probably turn on a dime when proof a solution component will work is evident. They can then take that proof to their bosses, and those in turn can take it to the big cheese. Then it will be run through a legislature or an agency, where it will suffer the pangs and arrows of “improvement” via pork barrelism, the not invented here syndrome, budget considerations, and so forth. Next the implementers will get their hands on it, and whack away with more changes. It is a long and treacherous series of steps.

But this is all part of the problem to solve, so it has been anticipated. Our illustrious multitude of analytical activists is fully aware that the social side of the problem is the crux. Every one of those steps has been analyzed and dealt with. Overcoming each of them is built into the solution.

The key is this long series of steps can be analyzed to determine that, given success in the first step or two, what the likelihood of success in the final step is. I have little doubt that after this has been done for awhile, that analytical activists can predict with 95% confidence, in the first year after a solution component is released to decision makers, whether it will succeed or not.

Now, why is it worth trying so hard to do something that is so difficult? Because the success delay is a key bit of feedback loop information for the system. The lower the success delay, the faster both main loops will run, and the faster both core stocks will grow. The hypothesis that a 1 year success delay will make a big difference is easily tested. Changing it from 5 years to 1 year at year 2020 give the results shown below:

This is just what we were looking for: a conceptual breakthrough that will let us begin compressing the solution down to something Homo sapiens can live with for a long, long time. Years to success has fallen from 72 to 61 years. And, unlike the delay reductions we reviewed earlier, this one is big and realistic, all by itself. It also passes logical inspection as a high leverage point, due to the way the success delay affects both main loops so directly.

But what about that quick rise and fall of solution success in the 2020s? It looks almost like another Hubbert’s peak. Is it as real as Hubbert’s peak turned out to be, or is it a flaw in the model or another model anomaly? (The peak’s size and location, like all behavior in the model, is very approximate. But with model calibration it could become reasonably accurate.)

Let’s examine the model to find the cause of this suspicious peak. Varying the year the success delay reduction starts, we see that it occurs anywhere along the timeline. Thus it is not related to the various autoactivation mechanisms. Looking at the Core Stocks system where success delay is used to defer solution success, we see no obvious cause of the peak. Everything is standard modeling. Nothing seems amiss. But something must be causing that blip.

Looking under the covers, the simulation software engine handles delays by “saving up” a variable’s value and then “releasing” it when the delay period is over. This is done for each year. Thus for the 5 year delay that run 13 starts with, there are “successes” saved up for each of those 5 years. Then when each year is up, its
successes are released. Because run 12 had a constant delay, it had a smooth stream of released successes.

But run 13 did not. Its delay varied. When year 2020 came along, the saved up delays for 5 years all of a sudden had to be quickly released in one year. The simulation engine smoothed this release out to the smoothly rounded peak shown, instead of a sharp one. The mystery is solved. The peak is about what would happen if suddenly a bunch of data on solution success starts pouring in. Reducing the delay opens a floodgate of delayed data, and that data starts pouring in for awhile. Then, as things catch up, the flood is reduced, and reduced still more, until the solution success curve is back to normal.

What might happen if problem solvers faced this situation but had no model? They and the world would be elated when solution success started to soar. There would be deep bows all around, with the usual spate of glowing articles and talk show appearances, starting around 2022. But around 2028 there would be a lot of red faces as success started to fall. The problem solvers might even panic, because it was obvious the new solution was a turkey, and switch to another solution.

But with a model behind them, those problem solvers, could, like geophysicist M. King Hubbert, reliably predict long in advance what is going to happen. Based on a mathematical model of known oil reserves, discovery, and production, Hubbert predicted in 1956 that oil production in the continental United States would peak between 1965 and 1970. His prediction was initially mostly ignored and widely scoffed at. But in the end he hit it almost right on the button. Hubbert’s peak is now one of the most famous long range predictions of all time, because US oil production peaked in 1971.

**G. In search of another breakthrough** – We have been studiously trying to accelerate the solution. So far we’ve found a handful of small improvement and a single big one. Might there be more?

We’ve already looked at the delays. And we’ve looked at the New Technology User Type percentages, the auto-activations, the size of the precipitating event, and Process Component lifetime. There’s not much left. But there must be something.

Not seeing it in the model, I looked back to learn from the past. What was it that the Powell Memo did that caused the Corporate Proxy Movement Machine to spring into existence overnight? Well, one thing it did was to drastically increase the rate money flowed into that machine. Could we do the same?

Let’s perform an experiment by modifying the model so that the normal total investment rate suddenly increases from 100 to 300. That is not at all far fetched, because soon after the Powell Memo appeared in 1971, numerous sources of large amounts of funding opened their purse strings and kept them open, because what Powell proposed worked.

To keep things simple we assume that the investment rate increase occurs 5 years after the precipitating event of 2010. The results are shown below:

The stunning rise of solution success starting in the 2020s indicates another breakthrough. This one is even bigger, because time to success has dropped from 72 to 51 years. This is a 29% decrease. More importantly, the 35 year long solution success plateau has been replaced by a short one followed by an unrelenting rise in success until the problem is solved. That the rise begins in the 2020s instead of in the 2040s is what’s needed to give the world confidence that the solution is working. The alternative, to “Please be patient, this is going to work in awhile,” would sound like a broken record after a few decades.

But it’s only a real breakthrough if it can be done. Can it? I don’t really know, but there appears to be at least one way that could work, and indeed has worked well in the past. But this path forward is a radical break from conventional wisdom. But then again, perhaps it is not radical at all, because all it does is apply what has worked in one area of the human system to another.

The radical break is a new type of problem solving organization called solution factories. This concept is so promising it is developed fully in a chapter of its own on page 331, as another example of how an analytical approach can be used to solve the sustainability problem.

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This completes the Solution Convergence step. We have accomplished our goal of determining how to adequately push on the high leverage points identified by the System Understanding step. To keep this book short this has been done only at the strategic level. But if our analysis is reasonably correct, then these are the right high leverage points. And if they are the right points, then pushing on them adequately is relatively easy. Thus extensive detail is unnecessary.

Next we move into solution implementation.
Chapter 12

Process Step 4: Implementing the Model and the Map

This book started with the bold premise that it is possible to take an analytical approach to the global environmental sustainability problem and solve it, if it is still solvable. It then argued the only known way to do that is to use an approach derived from the Scientific Method. This is the Analytical Method.

The Analytical Method was then rigorously applied, down to the last dot in the System Improvement Process, a custom process designed from scratch solely for problems like this one. Because this is a most unconventional approach, the results are equally unconventional. But this is exactly what’s needed: a radical new way of thinking, instead of the old way, which has proven to be totally incapable of solving the difficult problems the environmental sustainability problems the world faces.

This new way of thinking is woven into the pages you are reading. These pages show there are really two problems here: the main problem of sustainability and the problem of how to transform the environmental movement into one capable of solving the main problem.

Based on the analysis and solution elements presented in part one, it appears the main problem is solvable. But only if the transformation problem is solved first.

Based on the analysis and solution elements presented in part two, it appears the transformation problem is also solvable. But only if the right preconditions are present and the right precipitating event appears. Let’s examine these requirements.

The preconditions for the right precipitating event to work seem to be present. They are the same ones required long ago in the 17th century, to transform science from groping in the dark to the Scientific Method. The main preconditions were (1) a strong, pressing need for a better way to produce reliable knowledge, and (2) the intelligence to see, from logic alone, that one problem solving process can be significantly better than another.

Precondition (1) is just as strongly present today, because the environmental movement now understands it needs a better way to produce reliable knowledge, in the form of solutions that work. Precondition (2) is present in abundance, because when comparing the 17th century to the 21st, the percentage of the population receiving a higher education has increased tenfold.

Since the right preconditions are present, the transformation problem will begin to be solved when the right precipitating event appears. Thus the entire solution depends on one thing: Can we create the right precipitating event and trigger a second Enlightenment?

I no longer have any doubt we can and will. Once a widespread, vivid, logically true picture of the core concepts in this book is painted, that is all that is needed. It will not be done by this book alone, but by a sustained combination of books, articles, speeches, conferences, and innumerable one-on-one conversations that paint the picture. As long as these efforts clearly convey the core concepts to enough environmentalists, a sizable number of innovators and early adopters will snap into a dramatically more productive mode, and they will never return. The new mode is Analytical Activism. The one they will never return to is Classic Activism.

How these two modes work is shown in the strategy map on the next page:
The Two Modes Strategy Map

This strategy map summarizes the entire argument of this book. Currently the modern environmental movement is in the Initial Failure mode. The immediate reason it is failing is it is pushing on low leverage points. This is caused by a faulty analysis. The flaw allowing this defect to appear is the process does not fit the problem. This fatal flaw exists because environmentalists have chosen Classic Activism as their problem solving process. It is their present solution and paradigm.

The root cause of why this solution approach fails is threefold: It is so informal it cannot easily be managed and continuously improved. It is so intuitive that it can only solve easy problems, ones that yield to the same approaches and rules of thumb we use on the problems we face everyday. Finally, Classic Activism uses event oriented thinking, which can only analyze the simple reasons the system behaves the way it does. This is not enough to solve difficult problems.

There is, however, a better way. If environmentalists come to accept the undeniable fact that today the process does not fit the problem, they will resolve that fatal flaw. This can be done with the second column, which contains the resolutions to the problems identified in the first column.

The Eventual Success mode is where environmentalists can be tomorrow, once they accept the diagnosis of the first column. The fatal flaw is resolved by the cure of changing to the process fits the problem. A suitable process is Analytical Activism. This fits the problem for three reasons: It is formal, so it can be much more easily managed and continuously improved. It is analytical, so it can solve difficult problems by decomposition and rigorous application of the Scientific Method to the complete problematique. Finally, Analytical Activism uses structural thinking, which allows the building of models of behavior that make the system’s behavior understandable and predictable. These three features will allow activists to solve difficult complex social system problems as easily as science and business have been solving their own problems.

Moving upward, Analytical Activism qualifies as a process that fits the problem. This will lead to correct analysis of the complete problem, including the crux of systemic change resistance. This in turn will lead to pushing on high leverage points, which will lead to The Age of Transition to Sustainability, because the modern environmental movement is now fully capable of solving the complete sustainability problem. The transformation problem is now solved.

In the hands of those who have read this book, the Two Modes strategy map is a simple, persuasive tool for explaining to others why they need to switch to a process that fits the problem.

Next, let’s look at implementation from a structural thinking viewpoint.
The Four Loop Problem Perspective

From a structural thinking point of view this is a four loop problem. Starting at the bottom of the dia-
gram, we see one loop representing the Wrong Solution and another one for the Right Solution.

The Wrong Solution is where environmentalism is today. Dependence on Classic Activism has lead to
pushing on the low leverage point of more of the truth.

A Correct Analysis shows this to be the case. This analysis is invisible to those working under the Illu-
sion of the Right Process. They cannot see that they are trying to make The Race to the Top among Poli-
ticians go dominant, solely by promoting more of the truth.

Because the structure of the problem is invisible to classic activists, they also cannot see that a The Race
to the Bottom among Politicians is presently the dominant loop. Like gravity, the force this loop exerts
on system behavior is pervasive and powerful. It seeps through the entire political system, affecting its every
motion. But if you cannot see the loops, the forces they exert and how to control them will remain as invisible
and uncontrollable as gravity was before Newton’s concept of gravity and three laws of motion were invented.

If activists switched to the Right Solution everything would change. If the right precipitating event is
successful, the three types of proof Analytical Activism is better will begin to grow. This will lead to the
Growth of Analytical Activism. As this occurs activists will redirect their efforts from the low leverage
point of more of the truth to the high leverage point of general ability to detect political deception. This will
rapidly cause the race to the bottom to collapse, as its Degenerate Supporters flee for their lives to become
Rational Supporters. As they do the race to the top will grow stronger and stronger, until finally it is the domi-
nant loop. Then the natural behavior of the system will be to address society’s real problems as fast as possible.
At the top of the list will be the sustainability problem.

This mode change, from the Wrong to the Right Solution, can happen in as little as one or two election
cycles if the Growth of Analytical Activism loop is well engineered.

From a structural thinking perspective, that’s how simple solving the problem is.
The key to implementing the solution to the sustainability problem is to understand that once the Race to the Top among Politicians goes dominant, that problem is solved, because then politicians will be competing on the basis of the truth. The highest political truth is how to provide for the greatest good for all for the indefinite future. Once the political system starts to pursue that noble goal, they will realize that the global environmental sustainability crisis is their highest priority and it will finally get the attention it deserves.

The key to implementing the solution to the transformation problem is engineering the right precipitating event. That in turn depends on a Correct Analysis. That reveals where the defects and flaws are, which allows problem solvers to resolve them with the correct fixes and structural changes. A Correct Analysis also focuses the efforts of social system engineers on the very few defects, flaws, and structural changes that make the difference. These key nodes are in bold. If the assumptions behind these key nodes can be proven to be true, the strategic backbone of the Right Solution to both problems is probably going to work.

On the other hand, an incorrect analysis (or to be more accurate, no real analysis at all) has led to the Wrong Solution. This is Classic Activism’s one-size-fits-all solution of more of the truth. It works on simple problems but fails on difficult ones because more of the truth is a low leverage point, due to the inherent structural advantage the race to the bottom has over the race to the top. (This inherent advantage is explained in detail on page 289.)

Political corruption is the use of falsehood and favoritism to gain and keep supporters. The result of the inherent advantage of falsehood and favoritism over the truth is that whoever uses the most falsehood and favoritism wins. This causes the Race to the Bottom among Politicians to be the dominant loop, because the more corrupt a politician is, the more supporters he has, and thus the more power he has and the more elections he can win.

But this is a Faustian bargain, because once a politician begins to use corruption to win, he joins an anything-goes, the-end-justifies-the-means race to the bottom against other corrupt politicians. He can only run faster and keep winning the race by increasing his corruption. This is why the race to the bottom almost invariably runs to excess, which causes its own demise and collapse—as well as environmental collapse if a prolonged race to the bottom has allowed the system to overshoot for much too long.

The dominance of the race to the bottom is the root cause of systemic change resistance. Our challenge is to cause the dominance of the race to the bottom to end as soon as possible, and then to prevent it from ever starting again. If we can do that civilization will enter an entirely new mode: a permanent race to the top among politicians, and all that it has to offer but has never been achieved. In the race to the top, politicians compete to see who can most improve things so that society benefits as a whole. Imagine what that would lead to.

But such tantalizing potential will remain forever beyond the reach of Homo sapiens unless those dedicated to solving the global environmental sustainability problem can perform a Correct Analysis. Because this is a complex social system problem, the only way that can be done is by applying the Analytical Method, along with a process designed specifically for problems of this type. Once the Correct Analysis is complete and the right precipitating event occurs, this will lead to replacing the Wrong Solution with the Right Solution on the Two Modes strategy map.

That in a nutshell is the Correct Analysis, the Wrong Solution, and the Right Solution. All it takes is four loops to explain this at the strategic level.

But it is one thing to explain a solution, and quite another to make it happen. Thus we need to take up the question of “Can we create the right precipitating event?” again.

I said before that I no longer have any doubt we can and will. But this is merely one person’s opinion. Therefore another question matters far, far more: Do you believe that Analytical Activism is a better way, and that the environmental organizations you work with should adopt it or a process like it as their central problem solving strategy?

If yes and enough others feel the same, then the problem is on its way to being solved. The Third Age of Reason and a successful transformation have silently begun. But if no, then the Third Dark Age will continue, just as silently, until catastrophic global collapse is upon us.

If you said yes, then the organizations you work with now have a strategy that will work: Analytical Activism. But how are they going to implement that strategy?

Fortunately the business world has a way to do this.
The Transformational Magic of Six Sigma

Six Sigma is a standardized, rigorous, data driven method for aligning tactics with strategy, until the tactics are so good the strategy succeeds. The tactics are the many processes that make up a business. The strategy is the business model a company is using to achieve its mission.

The core philosophy of Six Sigma is that “Everything your customers see from you of value is the output of a set of business processes.” The better the processes, the greater the value delivered to your customers. Once you start to see things this way some of your first questions will be “How can I transform my organization so that we can maximize the value of the output of our business processes? How can we do that as fast and efficiently as possible? How can we minimize the risk of a colossal failure?”

We saw in the chapter on An Assessment of Process Maturity that The Nature Conservancy answered these questions byperfecting its own world class custom process: Conservation by Design. But this took decades. And the process only fits that organization. And it only solves a narrow segment of the sustainability problem: how to conserve key ecosystems.

The alternative to a single custom process is a generic process that can create and refine the many processes that all businesses need to achieve their missions. This is the role Six Sigma plays. Think of Six Sigma as a process creator and refiner. Once you have defined your mission and business model, Six Sigma can do the rest. Even better, once mastered Six Sigma can be used to improve the business model itself.

Six Sigma was invented by Motorola and refined by Allied Signal (who merged with Honeywell in 1999), GE, and Honeywell in the 1980s and 90s. It is now the leading approach to process improvement and management in the US. It has surpassed others like Total Quality Management (TQM) and ISO 9000, due to its depth and breadth. The list of US companies that have adopted Six Sigma reads like a Who’s Who of the best of the best, such as DuPont, Microsoft, 3M, Sony in the US, Ford, Texaco, Texas Instruments, UPS, and Xerox. Six Sigma works on anything that can be measured, so the list also includes non-profits like hospitals and cities, agencies like NASA and the National Institute of Standards, and government departments like the US Air Force and Army. It is rapidly spreading to other countries and is becoming a standard college course.

Six Sigma has evolved from its quality control roots into such a comprehensive paradigm that it cannot be easily summarized, so we will not try. Instead, let’s turn to General Electric (GE), one of Six Sigma’s innovators and according to Forbes, the world’s second largest company in 2006. Here is how important Six Sigma is to GE: (Bolding is in the original)

“GE’s Evolution Toward Quality – GE began moving toward a focus on quality in the late 1980s. Work-Out®, the start of our journey, opened our culture to ideas from everyone, everywhere, decimated the bureaucracy and made boundaryless behavior a reflexive, natural part of our culture, thereby creating the learning environment that led to Six Sigma. Now, Six Sigma, in turn, is embedding quality thinking - process thinking - across every level and in every operation of our company around the globe.

“Work-Out® in the 1980s defined how we behave. Today, Six Sigma is the way we work. Six Sigma is a vision we strive toward and a philosophy that is part of our business culture. It has changed the DNA of GE and has set the stage for making our customers feel Six Sigma.”

The spark that was to grow into the world’s foremost practitioner of Six Sigma began over a century ago. In 1876 Thomas Edison opened the world’s first invention factory in Menlo Park, New Jersey. By 1890 Edison had organized his businesses into the Edison General Electric Company. Several competitors appeared. In 1892 Edison’s company merged with its main competitor to form the General Electric Company. In 1896 GE became one of the 12 original companies making up the Dow Jones Industrial Average. Today it is the only one still in the index.

GE learned a priceless lesson from Edison: relentless continuous process improvement is the only way to create a continuous stream of breakthroughs. It is a lesson that every environmentalist would do well to practice.

GE took that lesson to a new breakout level of performance in the 1990s when, according to The History of Six Sigma at isixsigma.com:

“Rumor has it that [Larry Bossidy of Allied Signal (now Honeywell), and Jack Welch of General Electric Company] were playing golf one day and Jack bet Larry that he could implement Six Sigma faster and with greater results at GE than Larry did at Allied Signal. The results speak for themselves.”

Today, here is how GE defines Six Sigma:

“Six Sigma is a highly disciplined process that helps us focus on developing and delivering near-perfect products and services.

“Why ‘Sigma’? The word is a statistical term that measures how far a given process de-
viates from perfection. The central idea behind Six Sigma is that if you can measure how many 'defects' you have in a process, you can systematically figure out how to eliminate them and get as close to 'zero defects' as possible. To achieve Six Sigma Quality, a process must produce no more than 3.4 defects per million opportunities. An 'opportunity' is defined as a chance for nonconformance, or not meeting the required specifications. This means we need to be nearly flawless in executing our key processes.

“At its core, Six Sigma revolves around a few key concepts:

- **Critical to Quality**: Attributes most important to the customer.
- **Defect**: Failing to deliver what the customer wants.
- **Process Capability**: What your process can deliver.
- **Variation**: What the customer sees and feels.
- **Stable Operations**: Ensuring consistent, predictable processes to improve what the customer sees and feels.
- **Design for Six Sigma**: Designing to meet customer needs and process capability.”

GE’s Six Sigma glossary sheds quite a bit of light on the nitty gritty of what Six Sigma actually is in practice:

“**Quality Approaches and Models**

**Six Sigma** - A vision of quality, which equates with only 3.4 defects per million opportunities for each product or service transaction. Strives for perfection.

**DFSS (Design for Six Sigma)** - A systematic methodology utilizing tools, training and measurements to enable us to design products and processes that meet customer expectations and can be produced at Six Sigma Quality levels. [This is how environmental organizations would create the startup versions of their processes to implement the meta process of Analytical Activism and the domain specific process of System Improvement Process. Six Sigma quality is essential to solve extremely difficult global problems like climate change.]

**DMAIC (Define, Measure, Analyze, Improve and Control)** - A process for continued improvement. It is systematic, scientific and fact based. This closed-loop process eliminates unproductive steps, often focuses on new measurements, and applies technology for improvement. [Once the first versions of processes are created with DFSS, they can then be improved with DMAIC. This is where most environmental organization improvement effort will go after transformation to Analytical Activism, the System Improvement Process, and Six Sigma, or other suitable processes.]

**Quality Tools**

Associates are exposed to various tools and terms related to quality. Below are just a few of them:

**Control Chart** - Monitors variance in a process over time and alerts the business to unexpected variance which may cause defects.
Defect Measurement - Accounting for the number or frequency of defects that cause lapses in product or service quality.

Pareto Diagram - Focuses our efforts on the problems that have the greatest potential for improvement by showing relative frequency and/or size in a descending bar graph. Based on the proven Pareto principle: 20% of the sources cause 80% of any problems.

Process Mapping - Illustrated description of how things get done, which enables participants to visualize an entire process and identify areas of strength and weaknesses. It helps reduce cycle time and defects while recognizing the value of individual contributions.

Root Cause Analysis - Study of original reason for nonconformance with a process. When the root cause is removed or corrected, the nonconformance will be eliminated.

Statistical Process Control - The application of statistical methods to analyze data, study and monitor process capability and performance.

Tree Diagram - Graphically shows any broad goal broken into different levels of detailed actions. It encourages team members to expand their thinking when creating solutions.

Quality Terms

Black Belt - Leaders of teams responsible for measuring, analyzing, improving and controlling key processes that influence customer satisfaction and/or productivity growth. Black Belts are full-time positions.

Control - The state of stability, normal variation and predictability. Process of regulating and guiding operations and processes using quantitative data.

CTQ: Critical to Quality (Critical ‘Y’) - Element of a process or practice which has a direct impact on its perceived quality.

Customer Needs, Expectations - Needs, as defined by customers, which meet their basic requirements and standards.

Defects - Sources of customer irritation. Defects are costly to both customers and to manufacturers or service providers. Eliminating defects provides cost benefits.

Green Belt - Similar to Black Belt but not a full-time position.

Master Black Belt - First and foremost teachers. They also review and mentor Black Belts. Selection criteria for Master Black Belts are quantitative skills and the ability to teach and mentor. Master Black Belts are full-time positions.

Variance - A change in a process or business practice that may alter its expected outcome.”

The above material from GE should give a rough introduction to what Six Sigma is and its potential to radically transform a company into one fully capable of meeting very challenging objectives. Now let’s look into how you can make this transformation happen.
Implementing Six Sigma in Your Organization

The book *Six Sigma: The First 90 Days*, by Stephen Zinkgraf, 2006, presents a clear plan for how an organization can successfully kick off its own transformation into a Six Sigma driven company. Not all of it is required reading, just as you need not use all of Six Sigma to get where you want to go. “Lean” or hybrid approaches are available.

Chapter 2, *The True Nature of Six Sigma: The Business Model*, presents a profit maximization model. Non-profits will need to identify what it is they are optimizing and use DFSS (Design for Six Sigma) to create a more appropriate business model.

Chapter 3, *Six Sigma Launch Philosophy*, is probably where you will begin to feel comfortable about taking your organization through change as radical and risky as Six Sigma. This is because the launch philosophy is based on Harvard Professor John Kotter’s eight stages of organizational transformation, as described in his 1996 best seller, *Leading Change*. If you become serious about a Six Sigma launch then you should probably read this book. Zinkgraf emphasizes that Kotter “defined eight stages that, if followed, will almost guarantee your transformation will be successful.” The stages are:

1. Establish a sense of urgency.
2. Create a powerful guiding coalition.
3. Develop a compelling vision.
4. Communicate the vision.
5. Remove obstacles to acting on the vision.
7. Consolidate gains and push for more change.
8. Anchor new approaches in the company’s culture.

Every step is powerful and mandatory. About the first step, Zinkgraf says that “Establishing a sense of urgency is the toughest part of deploying Six Sigma. As Jim Collins says in his book, *Good to Great*, ‘Good is the enemy of great.’ Kotter says in a complacency filled organization, change initiatives are dead on arrival.”

For me the most powerful step is number 6, *generate short term wins*, because it creates the reinforcing feedback loop shown.

Kotter capitalizes on this with step 7, *consolidate gains and push for more change*. This step essentially makes the loop appear sooner than it normally would.

Chapter 4, *Early Support: Selecting a Six Sigma Provider*, describes how to select and make the most of external consultants. It is the rare environmental organization who will already have enough Master Black Belts to train new belts, or have even one top manager who is already trained in Six Sigma, so you should assume that use of consultants is required.

The rest of *Six Sigma: The First 90 Days* elaborates on Kotter’s eight stages of successful change and organizes the launch into pre-launch, launch, and post-launch phases. A launch begins with “the first executive training session and ends with the first day of the first training wave of Six Sigma black belts. Black belts will be your future process improvement leaders.”

The book is oriented towards large businesses. Although the strategy also applies to medium and small environmental organizations, the tactics do not. Several other books are available to address this need. I was able to find several with a quick search: *Six Sigma for Small Business*, by Greg Brue, *The Small Business Guerrilla Guide to Six Sigma*, by Jay Arthur, and *Six Sigma for Small and Mid-Sized Organizations: Success Through Scaleable Deployment*, by Burton and Sams. There may be more, because there are over 600 books in print in English alone on Six Sigma.

**Why Six Sigma Is the Best Standard Process to Drive Your Organization’s Transformation to Analytical Activism**

Six Sigma comes with a gigantic bonus: At its core lies strong emphasis on the use of statistics and experimentation for process improvement. This knowledge is exactly what’s needed for the many experiments required to solve the sustainability problem.

When all is said and done and the sustainability problem is finally solved, analytical activists will have run hundreds of thousands of experiments. If these are run in a highly efficient manner, the problem will be solved in what I’d estimate is 5 to 10 years. Otherwise they will continue to be run with low efficiency and the complete problem will never be proactively solved. Instead it will be reactively solved, with the result that
solution options like preferred quality of life will be much lower.

Environmentalists are problem solvers. Difficult problems require the manufacture of copious amounts of new cause and effect knowledge. The only known way to produce this is experimentation, and the only way to do that efficiently is with the use of inferential statistics.

Six Sigma provides a generic process that can drive all of this. It also wraps it in a managerial approach that prevents the process from becoming bureaucratic or wasteful. Of all the standard process improvement and management methods that exist, Six Sigma appears to be the most mature, the most complete, and the most accepted by the corporate world.

Here is what you would learn if you took the two week Six Sigma Certification Program for Green Belts offered at Georgia Tech in late 2006: 101

**Module I**

- Define
  - The Adult Learning Process
  - Six Sigma Overview
  - Project Definition
  - Minitab Software Tutorial
  - Introduction to Basic Statistics
- Measure
  - Process Mapping
  - Cause and Effect Tools
  - Measurement Systems Analysis
- Analyze
  - Graphical Techniques
  - Process FMEA (Failure Mode Effects Analysis)
  - Confidence Intervals
  - Means Testing
  - Statistical Analysis

**Module II**

- Improve
  - DOE (Design of Experiments) Introduction
  - Full Factorial Part I
  - 2K Factorials Part I
  - Statapult Exercise Control
- Control
  - Control Methods
  - Introduction to SPC (Statistical Process Control)
  - Variable SPC
  - Project Closure

These learning objectives indicate how Six Sigma is heavy on statistics. But with today’s software the hard part is no longer calculation using arcane formulas. The hard part is understanding what inferential statistics mean, how they can be collected, and how they can be used to come to firm conclusions, usually with a surprisingly small investment.

Lots of statistics didn’t scare off Jack Welch. On the contrary, it attracted him: (Italics are in the original) 102

““What particularly attracted Welch to Six Sigma was its heavy reliance on statistics. This quality program would not be ‘fluffy,’ a word he used to describe previous, discredited GE quality programs. Welch truly hoped that this quality program would not sink in a tide of indifference, as previous ones had. ‘This is not the program of the month,’ he said. ‘This is a discipline. This is forever.’”

Rudy Giuliani, former mayor of New York City, had this to say about the importance of process in his keynote address at the IQPC Six Sigma Summit in 2006:

“There are really [only] two things that make an effective leader: philosophy and process. Some people have great ideas, but they don't ever accomplish them. Some people are enormously efficient, but they have no ideas. If you can put the two things together, having good ideas and goals, and being practical enough to know how to achieve them, then you can be very effective as a leader.” 103

There is an alternative. If you understand what formal process, Analytical Activism, and the System Improvement Process are, and you are an excellent manager, then you can probably manage the transformation on your own without using Six Sigma. To do this, study the 19 page chapter on John Kotter’s *Eight Steps to Change: A Systematic Approach* in The Essentials of Managing Change and Transition, by the Harvard Business School Press, 2005.

**Moving On to Solving the Problem**

This completes the introduction to Six Sigma. It is not a panacea. Nor is it the only road to Analytical Activism. But it is one way to get there.

Earlier in this chapter we asked this question: *Do you believe that Analytical Activism is a better way, and that the environmental organizations you work with should adopt it or a process like it as their central problem solving strategy?*

If you said yes, then part three is all about how you can get started.
Part 3. Now We Are Ready: Solving the Sustainability Problem

PART TWO DEMONSTRATED HOW THE ENVIRONMENTAL MOVEMENT can be transformed from Classic to Analytic Activism. After that we are ready to solve the sustainability problem.

This will not be easy. Even after a successful transformation it is not at all obvious how to apply the powerful tools of formal process, system dynamics, experimentation, social system engineering, memetics, and many more. This is because our journey is about to take us where no one has gone before. Part three points the way by taking the first few steps. Each chapter is designed to serve as a practical example of how to use the many tools presented in this book.

Application of these tools has led to the pleasant discovery that the sustainability problem can probably be solved relatively easily and quickly, by pushing on the right high leverage points. In other words, once the transformation problem is solved, so is the sustainability problem. The only serious requirement is that everyone in the environmental rowboat needs to be rowing in the same direction, by using a process that fits the problem and pushing on the same points in a unified manner.

Part three is by necessity loaded with conjecture. While every chapter is a practical example of how to apply the tools of Analytical Activism and the System Improvement Process, each chapter is also an untested hypothesis.

Thus part three starts where it should, with experimentation. Chapter 13 explains how environmentalists, and not just scientists, can quickly test hypotheses to determine whether they are sound. Because almost none of this is being done on the problem as a whole, particularly on root causes and leverage point behavior, this opens up a whole new route to solving the problem.

Then part three plunges into the highlight of the entire book: the analysis of the dueling loops in chapter 14. This may or may not be a breakthrough. That is for you to decide, first with logical inspection and then the acid test of experimentation. First your experiments will follow the process and evolve the hypothetical analysis and solution into a successful one in the small. This can then be seamlessly scaled up into success in the large, and poof—the change resistance part of the problem is solved.

After a small celebration, it’s on to the proper coupling part of the problem in chapter 15. Again, we do not rush in where angels fear to tread. We pause to apply our tools. They perform valiantly, as we charge downhill straight into an analysis of the second sustainability subproblem: how to properly couple the human system to the greater system it lives within, the environment.

Solving the proper coupling problem requires all of us to pull our horses up short, dismount, get down on our knees, and start looking for something so unconventional and so well hidden that the search goes on for a long time. But if we follow our process it will never let us down. Finally there it is, underneath layers of misconceptions: the true structure of the proper coupling problem.

Then, as we stand up to study the whole, the leverage points snap into focus. There they are, plain as day: the low leverage point most solutions have been intuitively pushing on, and only a few centimeters away, the two high leverage points. They are crisp and unencumbered, because the herd has been trampling on the system elsewhere. It does not take long to generate hypotheses for how to push on them, test them in the model, and converge on a promising solution.

If this analysis and solution stands up to further iteration and experimentation, then in chapter 16 we have said goodbye to the mindset of command and control, and hello to solutions based on the inherent efficiency that lies in all social systems—if you can find it. Soon activists around the world will be finding it, in what may someday be called solution factories, as developed in chapter 17.

Our journey ends in chapter 18 with a look at what you can do tomorrow morning, not to treat the symptoms, but to change the system. By now the process has taught us that difficult problems are systemic. They cannot be solved by treating the symptoms, as most lists of what you can do contain. Instead we must go deep and treat the underlying causes, using the right high leverage points, so that the human system naturally seeks to be sustainable forever.

Let us begin.
Chapter 13

The First Experiment

This chapter tells how to run great experiments, not in the dramatic breakthrough sense, but in the methodical craftsman-who-knows-his-tools sense. Experiments are the analytical activist’s central tool, the one used the most to penetrate to the very core of how to solve difficult social problems. Process can put you on the road to solution. Modeling can lead dazzling insights, key hypotheses and elegant solution strategies. But only experimentation can provide the actual proof that a road about to be taken will lead to success instead of disaster.

A great experiment is one that takes problem solvers a giant leap closer to their goal. The greatest leap of them all is your very first experiment, because once you or your organization takes this step, they have opened the door to the same hundredfold productivity increase that all of science experienced when it took the same step back in the 17th century. To take this first step, all you have to do is run The First Experiment.

The purpose of The First Experiment is to help people make the mental leap to thinking in terms of process driven cycles of hypothesis generation, model growth, and experimentation. This is the very heart of the new paradigm. The rest of this book will assume you have bought into the new paradigm, and that your work is now driven by the Analytical Method and the System Improvement Process, or similar processes.

As many chapters in this book have demonstrated, structural thinking can be used to generate a comprehensive set of hypotheses about the causes of a social problem and the solution. This collection of hypotheses is best expressed as a formal model of behavior, using causal flow diagramming or simulation modeling. But how do we know the model is correct?

That’s where experimentation comes in. Each node in a model is a hypothesis of how the inputs to that node cause the outputs from the node. In other words, each node is a cause and effect hypothesis. Science knows of only one way to determine whether a hypothesis is true: experimentation.

If you have worked on activist problems much at all, you have probably noticed a huge glaring problem: most activists do not test their key assumptions. Instead, they come up with one new scheme after another on how to solve a problem, and then optimistically rush out and try it. Hope springs eternal. Sometimes it works. Usually it does not. When it works they assume they were smart. When it fails they start over with another intuitive solution that is sure to work this time. Or they try the same solution again, but harder and some-how better.

It is time for classic activists to recognize the truth. When a solution works on difficult problems they were lucky, and when it fails there is a reason for that: the solution was based on one or more untested hypotheses.

There is only one way to correct this pattern of failure. It requires a whole new way of thinking, which begins by learning:

How to Run the First Experiment

This is about as simple as a social experiment can be and still collect meaningful results. Here is a one paragraph overview of how it works:

The experiment consists of a 5 page handout testing a single factor: whether or not a brief one page introduction to the Truth Test makes a difference. Half the handouts contain the Truth Test page and the others don’t. All contain actual political statements. Each statement is followed by multiple choice questions about how the reader feels about the politicians who made the statements. When everyone is done the answer sheets are handed in. The results are then are calculated, announced, and discussed. All this takes about two hours.

The First Experiment is a controlled experiment. Let’s explain what controlled experiments are and then how to run The First Experiment in more detail:

The most important thing about an experiment is the hypothesis it is designed to test. All experiments revolve around their hypothesis, just as the planets revolve around the sun. To understand or design an experiment you must start with its hypothesis, which for this one is:

Even a very brief exposure to the Truth Test can raise a person’s ability to detect political deception.

A hypothesis has two parts: the cause(s) and the effect(s). These become the independent and dependent variables in the experiment.

An independent variable is a factor that varies. Here it is whether or not a person is exposed to the Truth Test (presented on page 43). This is accomplished by using different second pages in the handouts.
Half are a brief introduction to the Truth Test and how to use it to spot fallacious arguments. The other half contain a “dummy page” which at a glance looks like the Truth Test, but is actually about a neutral subject related to political statements. The reason for the dummy page is so that both groups take about the same time to complete the questionnaire and both groups pause to read something new just before they are exposed to fallacious political statements.

A dependent variable is a measure of how subjects respond to the experimental conditions, which include the independent variable. The response is measured using the data in the answer sheets.

A controlled experiment divides the subjects into two groups: the treatment group and the control group. The treatment group receives the experimental treatment, which in this case is the handouts with the Truth Test. The control group receives no special treatment, which is the handouts with the dummy page.

If subjects are randomly assigned to the treatment and control groups, you have a controlled experiment. If the results of the two groups are significantly different, the difference must be due to the factor that varied between groups. This assumes there was no experimental error, such as experimenter bias, random assignment errors, or data collection errors.

Everything you need to run The First Experiment is at Thwink.org, including these 4 PDF files:

1. Handout with Truth Test - Print 5 of these for every 10 people.
2. Handout without Truth Test - Print 5 of these for every 10 people.
3. Additional Material - Print 10 of these for every 10 people.
4. Experiment Data and Results – Use this Excel spreadsheet to enter your data. The results will be calculated automatically.
5. Hollcraft Data and Results – Study this spreadsheet before you run the experiment. It contains actual data.

### A Sample from the Handout

Politician B – “In the last few years government has gotten bigger and bigger; industry has gotten larger and larger; labor unions have gotten bigger and bigger; and our children have been the victims of mass education. We must make this next century the century of the individual. We should never forget that a government big enough to give us everything we want is a government big enough to take from us everything we have. The individual worker in the plants throughout the United States should not be a small cog in a big machine.”

To what extent do you agree with this statement and its implications?

___ Strongly agree
___ Somewhat agree
___ Neither agree or disagree
___ Somewhat disagree
___ Strongly disagree

Why do you feel this way? __________________________

### A Sample from the Additional Materials

Statement by politician B – From President Ford’s closing statement, in the first Carter-Ford presidential debate on September 23, 1976. Ford’s assertion that “We should never forget that a government big enough to give us everything we want is a government big enough to take from us everything we have.” implies that big government is bad, without saying how big “big” really is. Also, the conclusion that big government will “take from us everything we have” does not follow from the premise. The conclusion is also gross exaggeration, because there has never been a government that has taken everything from its citizens. Ford is creating a false enemy here by raising the false fear that government itself is bad.

By contrast, in his debate statements Jimmy Carter did not engage in nearly as many fallacious appeals. For example, in his closing statement he said “I don’t claim to know all the answers. But I’ve got confidence in my country. Our economic strength is still there. Our system of government—in spite of Vietnam, Cambodia, CIA, and Watergate—is still the best system of government on earth.” Instead of pushing the fear hot button, Jimmy Carter did just the opposite. He appealed to the people’s intellect by saying that he didn’t have all the answers, and implying that he could figure them out as he went along. Thus he avoided making the false promises so common to political campaign speeches, where numerous false promises are made to woo supporters.

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The additional materials explain the fallacies, which can be quite involved. The explanations, the Truth Test, and the Dueling Loops provide the basis for a fascinating and potentially illuminating discussion after the experiment is completed. If you do a good job of preparing for the discussion and it goes well, the eyes of some of the activists in the group will begin shining with a certain spark that will soon ignite the flame of Analytical Activism.
Here are the steps to run the experiment:

**Step 1 – Preparation**

Print out half of the handouts with the Truth Test and half without it. Staple each set together, so that there are 5 pages in each set. The all important page 2 is not visible. Shuffle the sets of pages to be handed out ahead of time. Hand them out in any manner desired. If the experimenter is not the one who shuffled them, or shuffled them in a manner such that they lost track of which was which, then we have a double blind experiment and randomly selected treatment and control groups, and therefore a valid controlled experiment. This is important.

_It is crucial that the test subjects be unaware of the two types of handouts and the existence of the Truth Test, so do not discuss this beforehand._ Just tell everyone you will be running an interesting social experiment based on a mock election.

**Step 2 – The Actual Experiment**

The group silently reads the questionnaire and answers the questions. This takes about 30 minutes.

**Step 3 – Determining the Results**

When all are done, everyone hands in their answer page and keeps the other pages. The experimenter then hands out the additional material pages, which reveal who said what, where the fallacies are, and explain what the experiment is trying to do. While the group is reading this, the experimenter enters the answer sheet data into a spreadsheet, which then automatically calculates the results. This is very simple to do.

**Step 4 – Discussion**

After everyone has read the material, the experimenter leads a discussion. This can be very insightful and educational. Emphasis should be placed on how it was a double blind, randomly assigned groups, high quality controlled experiment. This is the gold standard of experimentation.

The results only hold for the total population if the full group was randomly selected, which is not the case if your group is friends or colleagues. But in spite of this the results will be useful because these groups are still somewhat representative.

After people understand the experimental design the results of the experiment should be presented.

The hypothesis is that those subjects with the handouts educating them about how to detect fallacious arguments will be less easily deceived. How the results support or do not support the hypothesis should be discussed. If the results support the hypothesis, then how this new scientific knowledge can be used to improve the way the human system is engineered is a lively topic, and a possible good note to end the formal discussion on. On the other hand, if the results do not support the hypothesis, that too is a fruitful topic. If the hypothesis is false, does that mean the Dueling Loops model is flawed? Or is it the experiment that has a problem? Or was the experiment okay but the group was so small that a statistical fluke occurred that is not representative of the population?

You should discuss the Dueling Loops and the high leverage point the experiment is testing. Please study The Dueling Loops of the Political Powerplace chapter so you can do this well. If people can understand how the Dueling Loops work then they will be able to see how their participation in this experiment can help greatly in solving the problem, and they will be more motivated to become experimenters themselves.

At some point you may want to discuss what logical fallacies are and which are the most common. Study up on this. A well run experiment should itself result in a small bit of training the population to be more immune to the immense power of political deception.

**Step 5 – Report the Results**

Report the results to Thwink.org by sending us a completed copy of the Experiment Data and Results, along with any comments and suggestions. Include a write up on the 5 to 10 most intriguing things the participants wrote on their questionnaires or said in the discussion. This helps us generate insights.
The Importance of Experimentation

That’s all there is to running The First Experiment. But experiments alone will not solve difficult problems. They are but a single step in a greater process.

This process was modeled earlier on page 183 as The Memetic Evolution of Solutions to Difficult Problems. The key loop is Building the New from the Old. It is only by building the new upon the old that knowledge advances.

But classic activists have not been using experimentation to build their mental models of how to solve the sustainability problem. Thus their process looks like the one shown below:

Without Experimentation All You Have Is Wild Ideas

Classic Activism leads to Building Bigger Wild Ideas from Smaller Ones, because the ideas are never tested. The loop starts with the initial new ideas. These are the first hypotheses, which causes hypotheses generation to begin. These are haphazardly assembled into the many mental models that classic activists are using to solve problems. Because they are untested they are Model Conjectures. As the models of how to solve the problem grow, they are used to create new ideas. But because they are based on conjecture and not proven fact, what is created is probably unsound new ideas from old ideas. These are used for more hypotheses generation and the loop starts over again.

The stock of Model Conjectures can grow quite large, as indeed many surefire solutions to the sustainability problem have. But none of them have worked, because a bigger wild idea is no better than a smaller one.

There is, however, a better way. It begins by realizing that the limitation to the above process is the hypotheses are never formally tested.

In the 17th century society’s problem solvers invented the Scientific Method. When combined with the Industrial Revolution in the late 18th and early 19th century, this caused scientific knowledge and technology to begin growing exponentially. It was as if a dam had split wide open and now nothing could stop problem solvers from solving one difficult problem after another. The dam that burst was the invention of what was holding back the above process, which is what all of science and industry had been using up to that point. The roadblock was there was no reliable way to test new ideas to see if they were true or false. What removed this barrier in one swift stroke was the invention of experimentation.

Today it is intuitively obvious that new ideas must be tested before they can be accepted and used as the basis for creating more scientific knowledge. But long ago it was not, because the definition of sound knowledge was what could logically be shown to be true. The problem with this is that while some logic is better than none, logic alone is unreliable when it comes to creating new cause and effect knowledge. It is too easy to make an error, particularly if you are biased and hope your hypothesis is true.

The historic result was the Building Bigger Wild Ideas from Smaller Ones process. But with the addition of experimentation, the process changed completely to the one shown on the next page.
This diagram shows how experimentation is the key to model driven problem solving. At last knowledge creators have a reliable way to move hypotheses from conjecture to fact: experimentation. The main loop consists of the thick arrows.

Recall that the steps of the Scientific Method are:

1. Observe a phenomenon that has no good explanation.
2. Formulate a hypothesis.
3. Design an experiment(s) to test the hypothesis.
4. Perform the experiment(s).
5. Accept, reject, or modify the hypothesis.

Experimentation is steps 3, 4, and 5. The diagram shows how once step 4 is complete, a hypothesis flows to one of three places: If it has been proven true, acceptance occurs and it flows on to Model Facts. If the hypothesis has been proven false and is not worth trying to modify, rejection occurs and it dies. But if false and it appears to still have some potential if it can be improved, modification occurs and it flows back to hypotheses generation.

Now as the stock of Model Facts grows, we no longer get probably unsound ideas from old ideas. Instead we get probably sound new ideas from old ideas. This increases the likelihood that the next round of hypotheses generation will contain hypotheses that are true or can be modified slightly to be true once experimentation occurs. In other words, the process is now producing high quality hypotheses.

As the stock of Model Facts accumulates, something that is not possible with Classic Activism occurs.

The percent of difficult problem solved starts to rise substantially and rapidly. The percent is calculated by comparing the solution components on Model Facts to the sound solution components needed to solve the problem. In the real world these are initially unknown and can only be discovered by this process. The stock of Model Facts grows until the percent of difficult problem solved reaches 100%, at which point the problem is solved.

But there is more of the process to consider, because in the real world we must consider solution component obsolescence.

The only thing that will happen for certain is change. This is especially true for difficult complex social system problems. As they change certain Model Facts become out of date and die due to obsolescence. This requires problem solvers to continually apply the process to keep the Model Facts high enough to keep the problem solved. If they do not do this, then Model Drift will begin and soon there will be a Model Crisis. This explains why a good solution includes a self-managing component that insures that dominant social agents have strong incentives to keep the problem solved.

Building the Knowledge Pyramid

The main loop is called Building the Knowledge Pyramid because to solve difficult problems, a stack of layers of sound knowledge must be built. This stack is conceptually represented in the pyramid shape shown on the next page.
The top four layers are models. The top two layers are particular model components that actually solve the problem. The very top layer is what kicks off the chain of engineered events that leads to solution of the problem. In this book the top of the pyramid is the precipitating event. In other problems it might be the initial solution elements.

Each layer is heavily dependent on the layer beneath it. If a layer is weak then the layer above it will be even weaker, which will cause the pyramid to come crashing down long before the problem is solved, as it becomes painfully obvious that the solution being constructed is not going to work. For the environmental sustainability problem this has already happened thousands of times at the local level and dozens of times at the international level.

The Model Facts stock represents the top four layers of the pyramid. The **Building the Knowledge Pyramid** process as a whole is the bottom layer.

If you have read parts one and two of this book and have made the personal decision to switch to Analytical Activism, then you have essentially decided to begin building a Knowledge Pyramid for yourself and your organization. This book contains everything you need to get started on that Herculean task. We wish you the very best of luck. But then again, it is not luck that is going to make the difference. It is something else.

The big three of Analytical Activism are process, modeling, and experimentation. The pyramid shows how a process that fits the problem drives the entire work effort. The process drives your modeling, which does two main things: First, it represents the core of your understanding of how the system with the problem behaves, including how various solutions should work. As the **Building the Knowledge Pyramid** diagram shows, modeling also generates a steady stream of new high quality hypotheses as the model evolves to reflect your increased understanding. Experimentation tests the crucial hypotheses. If they are correct they stay in the model. If not the model is revised. If experimentation keeps up with model growth then there is nothing to stop the model from eventually becoming complete and correct enough to solve the problem.

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**The Limits to Solving a Difficult Problem**

The three limits to solving a difficult complex social system problem are process maturity, model maturity, and experimentation capacity. Whichever has the lowest limit determines how far and how fast your problem solving efforts will go.

Once your organization decides to reengineer itself along the most efficient and effective lines possible, at first most of your reengineering effort will go (or at least should go) to process maturity, which is the first layer of the pyramid. This is because in the beginning process maturity will be your limiting constraint, since you have probably been using Classic Activism, which has a very low process maturity.

Then, since you are working on a difficult social problem, the process will guide you toward the second layer of analysis models. Once that is solid the third layer of solution models can be built. During this phase, as you and others are learning system dynamics, modeling is your limiting constraint.

As the second and third layers begin to grow and your modeling skills mature, a number of untested key assumptions will stand out like cardinals on a pine tree. It is at this point that you will find that experiment throughput capacity is now your limiting constraint, because modeling goes much faster than experimentation.

After this experiment capacity will remain the limiting constraint indefinitely. Thus experimentation is ultimately the most important element in your total process. This is not only because it is the long term bottleneck. It is also because as your experiments move up from logical (in the model) to artificial (on groups of people in an artificial setting) to real world experiments (on real subsystems like a city), they have the ability to scale up smoothly to the actual global solution. There is no definite line between when an experiment becomes part of the actual solution, just as there is no discernible line as one species evolves into another. This is because solutions to difficult problems are the result of memetic evolution.

To summarize, once an organization commits itself to Analytical Activism or a similar process, at the strategic level the key to success is process maturity. But at the tactical level it is modeling and experimentation.
Over time, generally within a few years, the limiting constraint to how long it takes to solve a problem is how well can experimentation keep up with the key hypotheses generated by modeling. Therefore:

**When It Comes to Solving Difficult Social Problems, High Experimental Efficiency Is the Crux**

Environmentalists are problem solvers. When Thomas Edison famously remarked that genius is 1% inspiration and 99% perspiration, what he was saying is the labor of a problem solver is 1% hypotheses generation and 99% experimentation, and that experimentation is the hard part. If you don’t achieve high experimental efficiency, you are not going to achieve your goal.

Edison’s goal was a continuous stream of breakthrough inventions. When he opened the world’s first invention factory in Menlo Park, New Jersey in 1876, he promised he would “invent some minor thing every ten days and some big thing every six months.” And he did.

Environmentalists have a different goal: solving the global environmental sustainability problem. It is a much harder problem than any of the problems Edison solved. But if you look at the sum total of all of Edison’s inventions, they were just as hard. What he did was create the Age of Electricity. He invented the world’s first practical light bulb. He invented and implemented the world’s second electric utility company, which by 1994 was serving 508 customers with 10,164 electric lights. All told, he patented 1,097 inventions, nearly all of them electrical based. It was this flood of new discoveries that precipitated the Age of Electricity.

It will be a similar flood of successful experiments that will precipitate the Age of Sustainability. Each experiment will prove or disprove a model conjecture. As the experimental output grows, so too will the stock of model facts, until the Knowledge Pyramid is tall enough to solve the sustainability problem.

Edison succeeded only because he was able to harness the power of high experimental efficiency. Environmentalists will succeed only if they can do the same. If they can’t then the pyramid will grow too slowly to solve the problem it time.

**The Goal of a Massive Experimental Effort**

Let’s be clear about the goal of the massive experimental effort that will be required to solve the sustainability problem. The goal is to first build an *analysis model* that is so sound that once it is built, how to solve the problem will be as obvious as how to eat an ice cream cone. The low leverage points that problem solvers have been mistakenly pushing on will pop into focus. So will the high leverage points they need to be pushing on instead. After that, further experimentation on solution element candidates and model evolution will lead to a *solution model* that, once implemented, will solve the problem. The solution model shows how pushing on the high leverage points will solve the problem.

The goal is these two models.

**The General Model of System Behavior**

Now then, where do the analysis and solution models fit into the greater scheme of things? *They allow us to create a glass box model of the human system process that we are improving.*

This perspective views the human system as a gigantic ongoing process. We will not be improving all of it—only the portion it takes to solve the problem. This perspective allows powerful insights into how to best approach experimentation, because to improve the process, all we have to do is find which inputs make the critical difference, and change them to the values that will solve the problem.

*The goal of experimentation is to more deeply and correctly understand the cause and effect relationships between a system’s inputs and outputs.* The better this is understood, the better we can decide how to change the inputs so as to improve the outputs. We touched on this earlier when discussing black box and glass box models on page 94. Let’s review those concepts and then take them a little further.

A *black box model* of a system has no idea why the causes lead to the effects. It only knows that they do. For example, few classic activists know why they sometimes make modest progress on solving the sustainability problem. They only know that they do, which causes them to keep trying the same problem solving process over and over.

The superior alternative is a *glass box model* explaining why cause and effect occurs. For example, once classic activists have a model that explains why they are failing to solve the sustainability problem, they will be able to change their approach to one that works. The change can be fast, in a few years, but it must be gradual and evolutionary, because no one knows exactly what new approach will work best. We must experiment to find the best new approach. Overall it may
be something like Analytical Activism. But what should the details be like? Which key process elements are the most important?

To answer questions like these we need a general conceptual model of how systems work from the perspective of experimentation. A suitable one, adapted from the large amount of literature available, is shown below. The causes and effects of the black box and glass box models have been replaced by the independent and dependent variables.

The four types of arrows represent what to consider when designing an experiment. **System inputs** flow into the system, such as the natural resources the human system acquires from the greater system it lives within, the environment. **System outputs** flow out of the system, such as the wastes emitted by the human system into the environment. They are the dependent variables.

When trying to understand and improve their performance, complex systems are best viewed as elaborate ongoing processes. A **system process** consists of the process factors that turn system inputs into outputs. A **factor** is anything affecting the relationship between system inputs and outputs. In a complex social system problem the factors of interest are the social structure that is in place.

Consider the human system as an example. If we are trying to solve the sustainability problem, most human system factors are beyond our control, and are uncontrollable process factors. We cannot change people’s normal life spans or the laws of physics. But we can change things like legislation, published articles, and the priority people give certain issues. What we can change are the controllable process factors. These are the independent variables we can vary in different experiments.

Notice the center of the diagram, which says that the better the glass box model of the system, the smaller the number of experiments required to solve the problem. This is the golden rule of advanced problem solving. The better the model, and the better your understanding of it, the more likely you will be able to find a small handful of key assumptions that, if proven to be true, would prove that the entire model is sound. *This can lead to ultra high efficient experimentation*, because instead of hundreds of experiments and decades of effort, you can prove the model to be sound with less than ten experiments, which can probably be run in less than a year. Each time the entire model is proven to be sound, it can then be used for a new, much deeper cycle of analysis or solution. Finally, when the last cycle occurs you are done.

For example, Einstein’s general theory of relativity, first published in 1905, was an immensely complex model. In 1911 Einstein published a related paper calling on astronomers to test two key predictions of the theory. One was that gravity can bend the path of light, in an effect called gravitational lensing. On May 29, 1919 Arthur Eddington, then Secretary of the Royal Astronomical Society, supervised observational experiments of the bending of starlight as it passed near the sun during a total eclipse. The results matched those predicted by Einstein’s general theory of relativity. This single experiment, combined with the elegance and explanatory power of the glass box model, was hailed as conclusive proof of general relativity over the Newtonian model.

As we proceed with this chapter on experimentation, notice how we are unable to talk about experimentation without talking about models. The two are

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**Glass Box Model**

<table>
<thead>
<tr>
<th>Causes</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>A correct and sufficiently complete explanation of the relationship between causes and effects.</td>
<td></td>
</tr>
</tbody>
</table>

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**General Model of System Behavior**

- **Independent Variables**
  - Controllable Process Factors
  - The System
    - The better the glass box model of the system, the smaller the number of experiments required to solve the problem.

- **Dependent Variables**
- **Uncontrollable Process Factors**

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**System Inputs**

The main goal of experimentation is to find the combination of controllable factors that, given a particular set of system inputs, optimizes system output. Another goal is to validate the model, so that it can be used to generalize to other and future problems.
inseparable. Models generate hypotheses, and experiments test these hypotheses, which allow the models to grow and generate still more hypotheses, in a never ending cycle that drives the advance of science and civilization.

Einstein’s models and those of the hard sciences tend to be equations that offer very fine grained predictive power. Those of the soft sciences tend to be general relationships, such as the way an ecological niche influences the evolution of those species competing to fill the niche. These more general relationships can be expressed in a large body of principles and facts, as seen in the fields of ecology and psychology. Or they can be expressed as mathematical equations if they can be assembled in a suitable model, such as system dynamics models. This allows the much greater predictive accuracy associated with the hard sciences to be applied to the soft sciences.

Using the General Model of System Behavior to Design Experiments

We will not go far into the statistical side of experimental design here. That is best left to those with specialist training. Instead, here we will cover the strategic design of experiments, which is where the battle is won or lost.

The general model allows us to intuitively see how experiments can be designed most efficiently. There are three main tactics to achieve high efficiency:

1. **Test more than one controllable factor at a time** – The goal of our collection of experiments is to find the optimum set of controllable process factors, because a complex problem will always require changing multiple factors to solve it. Therefore if we can figure out how to test multiple factors at once, instead of one at a time, it will take far fewer experiments to find the optimum combination. This can be accomplished by what are called factorial experiments.

   A **factorial experiment** is an experiment in which two or more factors are varied at the same time. Looking at the tables of simulation runs in this book, each run was an experiment. Usually only one factor was changed from one run to the next, for ease of presentation and greater understanding of the model. But the most efficient way to find the optimum combination of factors to solve the problem would have been a collection of factorial experiments.

   In *The First Experiment* only one factor is varied: exposure to the Truth Test. This is the old fashioned “one factor at a time” type of experiment. This is how most experimentation was done in the past, before factorial experimentation was invented by Sir Ronald Fisher in the 1920s at the Rothamsted (agricultural) Experimental Station in Hertfordshire, England.

   Here’s an example of how much more efficient the factorial approach is: Suppose we have constructed a model containing 11 key factors we suspect make the difference. Each factor can have two values, low and high. A “change one factor at a time” approach would take 2,048 experiments to find the optimum combination of the 11 factors, since the solution space size is $11^2 = 2,048$ combinations. But using a factorial approach where we change multiple factors at a time, it takes only 16 experiments to do a rough first pass of the solution space. The data from the first pass can then be used to “home in” on the optimum combination with only a few dozen more experiments. This example shows how, for models with many factors, the factorial approach is an order of magnitude more efficient.

2. **Use controlled experiments to eliminate the contaminating effect of all the uncontrollable factors and the controllable factors you are not testing** – A huge problem facing experimenters is all those arrows on the top and bottom of the diagram. In the real world there are millions of them. Unless we can design experiments where only the factors we are testing matter, we will be unable to draw sound conclusions from the results, because the results will be contaminated.

   To “control” the many factors that don’t matter, our only recourse is to use what are called controlled experiments, as discussed earlier in this chapter.

3. **Use the right sample size: not too many and not too little** – The third strategic aspect of efficient experimental design is setting the required sample size (number of subjects) for statistical significance. We can never be 100% sure an experiment has proved anything. But we can be 90%, or 95%, or even 99.99% confident a hypothesis is true if certain conditions hold. These conditions depend on the sample size and the variation of the results. The larger the sample size or the smaller the variation, the higher the confidence level.

   The general model helps us visualize the three things affecting system output. These are the system inputs, controllable process factors, and uncontrollable process factors. They are not uniform but vary continuously. For example, even the amount of solar radiation reaching the Earth varies by plus or minus 0.1%, due mostly to the 11 year sunspot cycle.

   If there is no variation then a single measurement will tell how a set of controllable factors affected output with 100% confidence. But because there is always at least a little bit of variation, and sometimes a lot,
multiple measurements are needed. This is why the sample size for an experimental group must be much greater than one. For example, in an opinion poll of a large population, a sample size of 1,000 is needed to give an error of plus or minus 3% at a confidence level of 95%.

If we do the above three things well, our experiments will lead to a correct analysis and a successful solution as fast and inexpensively as is humanly possible. But this will be true only when our experiments are guided by high quality hypotheses.

**An Example of What Happens When There Is No High Quality Model for Guidance**

High quality hypotheses can only come from high quality models. A high quality hypothesis is one that has a high probability of being true, makes a decisive contribution to an analysis or solution, and is based on reasoning that is easily inspected and highly convincing. The last trait makes it easy to pick which hypothesis to test next. High quality hypotheses cannot come from lucky guesses, because these have a low probability of being correct.

The Kuhn Cycle (presented on page 173) tells us that the models problem solvers use for guidance are continually decaying, as they drift from the Normal Science stage to the Model Crises stage. *This is where the model used by sustainability problem solvers is now, because the model is failing to show how to solve the problem.*

The Model Crisis stage is also where the model used by those attempting to end the Great Depression of the 1930s was. All initial attempts to fix the Great Depression failed, because there was no high quality model for guidance. No matter what governments did the problem deteriorated, such as in the United States, where: (Italics added)

> “In the nation as a whole, residential construction fell by 95%. Nine million savings accounts were lost. Eighty-five thousand businesses failed. The national volume of salaries dwindled 40%; dividends 56%; wages 60%.

> “And the worst of it, the most depressing aspect of the Great Depression, was that there seemed to be no end to it, no turning point, no relief. In 1930 the nation manfully whistled ‘Happy Days Are Here Again,’ but the national income precipitously fell from $87 to $75 billion. In 1931 the country sang ‘I’ve Got Five Dollars’; meanwhile its income plummeted to $59 billion. In 1932 the song was grimmer: ‘Brother Can You Spare a Dime?’ National income had dwindled to a miserable $42 billion.

“By 1933 the nation was virtually prostrate. The income of the country was down to $39 billion. On street corners, in homes, in Hoovervilles, 14 million unemployed sat, haunting the land. It seemed as if the proud spirit of hope had been permanently crushed out of America.

“It was the unemployment that was hardest to bear. The jobless millions were like an embolism in the nation’s vital circulation; and while their indisputable existence argued more forcibly than any text that something was wrong with the system, the economists wrung their hands and racked their brains and called upon the spirit of Adam Smith, but could offer neither diagnosis nor remedy. Unemployment—this kind of unemployment—was simply not listed among the possible ills of the system; it was absurd, unreasonable, and therefore impossible. But it was there.”

The economists wrung their hands and racked their brains because they had no model that could offer diagnosis or remedy. This forced leaders to take desperate, wild guesses at what to do, which made the depression even worse. In the end it was not a correct solution that solved the problem. It was luck. In the late 1930s along came World War II, and with it a sudden injection of massive spending into the system to fight the war. It was not until later that economists fully realized that this spending not only fought the war—it also fought the depression, and ended it with a proper dose of what is now called fiscal stimulus.

A new model explaining what had happened and what should be done emerged in the mid 1930s, when John Maynard Keynes published *The General Theory of Employment, Interest and Money.* But governments were skeptical about the model’s remedy, even though its diagnosis was beyond question. In the US alone, business investment had fallen from $15 billion in 1939 to an appalling $886 million in 1932, a drop of 96%. The main diagnosis was that something had to prime the money flow pump until business investment returned to normal levels. There was no one else who could do this besides the government. (This is a contentious diagnosis, which shows how immature the model remains even today, 70 years later.)

But the new model was immature. Although it could tell that ending the depression required governments to spend more, it could not tell how much more. Nor did it say how the money supply should be managed. The tragic result was that, for example, the American Federal Reserve System turned a small depression into a big one by decreasing the money supply by one-third from 1930 to 1931, according to a modern
analysis. And since the model didn’t say exactly how much government spending was required, governments spent too little. In the US, government spending rose from $10 billion on 1929 to only $15 billion by 1936. Europe and North America, where the Great Depression hit hardest, did not return to normal until World War II forced them to prime the pump harder than it had ever been primed before. Government spending in the US rose to the unheard of level of $103 billion, which totally eliminated unemployment and brought the US economy roaring back to life.

There was no shortage of suggested solutions when the Great Depression hit. But none were based on a proven model, so none were high quality hypotheses. The result was wild experimentation at the level of nations. Nothing worked. Only the fortuitous appearance of the Second World War solved the problem.

Today there is no shortage of suggestions on how to solve the sustainability problem. But to my knowledge, none are based on a proven model. The result is exactly what you would expect: wild experimentation while the problem grows worse. It is possible that the surprise appearance of a “wakeup call catastrophe” could wake the world up and cause an instant solution. But this is unlikely, because such a catastrophe would also weaken the human system so much, introduce so many new competing mega-problems, and delay the solution so long that critical environmental threshold points will have been passed, that solution of the sustainability problem would now be impossible.

**The Role of Micro Social Experiments**

How then are we to construct the high quality model we need to solve the sustainability problem?

This book is one long example of how that can be done. First you do what science did 400 years ago: switch to a process that fits the problem. Then you use the tools it takes to build the models you need. For difficult complex social system problems, the only known tool that can do this is system dynamics. Then you use that tool to build analyses and solution models. Finally you use experimentation to test these models as they grow. Once the models are mature they can be confidently used to solve the problem.

The limiting factor to this process is experimental efficiency. High efficiency can be achieved using two main strategies: (1) Find the key hypotheses that, if true, confirm the entire model. (2) Use micro social experiments instead of macro experiments.

Presently the common meaning of “social experiment” is macro social experiments. These test whether a particular government program (also called a policy intervention) will work on a major subsystem or the system as a whole. For example, the book *Social Experimentation and Public Policymaking*, by Greenburg and others, 2003, page 4, states that “social experiments” require that “treatment group members face changes in economic incentives, opportunities, or constraints” and that this excludes “trials that do not test policy interventions.”

The drawback is macro experiments are terribly inefficient, because they only test final solutions. They cannot test the smaller assumptions that make up the model. The result is no glass box model for guidance on what solution will probably work best on what problem. Without a glass box model you can only guess at what to try, based on what did and did not work before. This is how evolution works, by trial and error. As evolution has shown, it eventually leads to amazingly powerful solutions. But as evolution also shows, this approach takes a very long time. We do not have that long to solve the sustainability problem.

Here’s an example of how slow macro social experiments are:

“The New Jersey Income Maintenance Experiment is generally regarded as the first large-scale social experiment. During 1968 and 1969, 1,300 low income families in five cities were randomly assigned to treatment or control groups, and the treatment group received negative income tax payments for the next 3 years. The effects of the experimental program on family members’ employment and earnings, educational attainment, marital stability, and other behavioral outcomes were measured by the difference in subsequent outcomes between the two groups.”

This experiment took five years from start to finish. Now suppose there over 100 factors to test to solve the sustainability problem. Without a model, how many experiments is it going to take to stumble on the right combination of controllable factors that works? Remember now, each experiment will take an average of about five years. Because a trial and error solution space search technique is being used, the experiments must be fairly sequential. Suppose we get very lucky and find the solution in only ten experiments. That will take 50 years. That is so long that by the time the experiments are finishing up, the problem will have changed so much that the experimental results will apply to the old problem, but not the new problem. The problem will never be solved.

But it will be if a faster approach is used. If a model based approach is used and micro experiments are used to test the model as it grows, progress can be
very rapid. A micro social experiment is a social experiment performed on a small group of people to test a particular direct (non-emergent) cause and effect relationship. The First Experiment is a typical example.

Micro social experiments can be performed in hours or days, unless retention is under consideration, which would change this to months. Thus micro experiments will average several weeks, instead of the several years of macro experiments. This is a fifty-fold difference, and shows why problem solvers must take a model driven approach.

Sadly, conventional wisdom is to guess and test the guess. Better would be to model and test the model, because solutions are an emergent property of the model.

The Incredible Power of Emergent Solutions

A key point to understand in this chapter is the incredible power of emergent solutions.

An emergent property of a system is a behavior that cannot be predicted from logical inspection of the parts. For example, no amount of inspection of the human system in 1928 predicted the Great Depression of 1929. Nor can how well an entirely new product will sell be reliably predicted from inspection of the product, consumers, and the rest of the system. The reason is that once a system passes a certain level of complexity, its behavior becomes greater than the sum of its parts, due to the many interactions between the parts.

An emergent solution is one whose success cannot be predicted by inspection of the problem. It is the success (or failure) of the solution that is the emergent property.

Sustainability is an emergent property of the human system. No amount of inspection will predict whether a growing society will be able to solve its sustainability problem before it reaches its limits. Likewise, no amount of inspection will lead to the exact solution that will work on the first try once a society has entered into unsustainability. Thus sustainability is an emergent solution.

This leaves problem solvers in a quandary. If inspection won’t lead to solution, then what will?

Whenever you need to be able to predict emergent behavior, you need to build a model of the system involved and use the model for prediction. There is no other way.

This is exactly what system dynamics models do for complex social systems. Once you have defined the structure of the problem, calibrated the model with measurements from the real world, and verified that key assumptions in the model are true by the use of micro experiments, all you have to do to predict the future is run the model. Each simulation run is a cheap and quick model experiment. You can run thousands of them as you first find the root cause of the problem, then the high leverage points that need to be pushed on to solve it, and then how to best push on those points. Every model experiment tests how system structure and process factors affect the emergent behavior of the system.

The emergent solutions a model recommends must still undergo final testing and refinement. But the probability of them working the first time or needing very little refinement to work is very high. In fact, once the model is mature, it will churn out solutions to new problems with high confidence every time, just as the models of physics, chemistry, and the rest of the hard sciences have been doing for a long time.

Emergent solutions derive their incredible power from the fact that usually only a small number of factors need to be changed to solve difficult problems. For example, humans and chimpanzees share about 95% of their DNA. Another example is the way economic recessions and inflation can be tamed by pushing mostly on two points in the human system: control of the money supply and the federal funds discount rate. That this take very little effort shows these are very high leverage points.

The best emergent solutions push on a very small number of ultra high leverage points. Because of such elegant simplicity, they are easily managed and maintained over a long period of time.

The Ultimate Scenario: Using Micro Experiments to Build the Model Until the Emergent Solution Appears

The role of micro experiments and the power of emergent solutions explain why the long term strategy to solve the sustainability problem must center on using micro experiments to build the model until the solution emerges. We cannot predict how long this will take. But we can predict it will not take too long, because once a group of problem solvers deeply understands this strategy and the tools involved, and they have the financial means to support their efforts, their work can go as fast (or faster) as the project that put the first man on the moon in ten breathtaking years. Here is a scenario of how their work might go:

Suppose we have a guiding coalition and several dozen well managed non-governmental and governmental organizations around the world committed to solving the sustainability problem using the equivalent of Analytical Activism, the System Improvement Process, system dynamics, and ultra high efficiency experi-
mentation. This will happen once the transformation problem is solved.

Some members of the coalition will focus on managing the overall project. The rest will play a multitude of specialist roles, just as NASA’s many contractors developed and built the many elements required to put a man on the moon. Mega projects take grand visions. They also take one central growing thing to hold the entire project together. For NASA this was the glamour and excitement of space flight. For the sustainability coalition it will be a collection of computer simulation models whose explanatory and predictive power will stun the world, not with their ability to reach another planet, but to save this one.

The first of these models was born on June 29, 1970, when Jay Forrester,

“...attended a meeting of the Club of Rome in Bern, Switzerland. [Their] orientation is activist—that is, they wish to do more than study and understand. They wish to clarify the course of human events in a way that can be transmitted to governments and peoples to influence the trends of rising population, increasing pollution, greater crowding, and growing social strife.”

Out of this meeting came World1, the first model to ever simulate “The Predicament of Mankind.” It was created in a burst of insight and enthusiasm by Forrester. World1 soon became World2, as published by Forrester in World Dynamics in 1971. World2 was the starting point for World3, which was the basis for The Limits to Growth, which appeared in 1972. This book, and the model in it, went on to become the best selling environmental book of all time, with about 30 million copies sold to date. (The next closest book is Silent Spring with ten million copies.)

But World3 only identified the problem. It convincingly showed that if business as usual continues, environmental, economic, and population collapse is inevitable.

Some time before 2010 the Sustainability Coalition formed and launched its first project. The goal was to first find a conclusive diagnosis for why, despite enormous effort by millions of environmentalists for decades, the sustainability problem was as unsolved as ever. Why was the human system exhibiting such strong change resistance?

Sponsored by a number of sustainability oriented transnational corporations, the coalition contracted with eight organizations. Two of them (Let’s call them team A and B) worked on competing models to see who could arrive at the most satisfying diagnosis. The rest launched a long series of micro experiments to test the fundamental assumptions of the models.

Team A had the great foresight to start by going all the way back to the Limits to Growth (LTG) project to determine why it was so successful. They quickly concluded that about 80% of the value of the project came from the World2 model, 10% from the World3 model, and 10% from the book. All the LTG team had basically done was to refine Jay Forrester’s model into a bigger, more detailed, more accurate model that allowed more plausible projections, and communicate the model to the world in a well written book.

The team designed their strategy as “taking up where Limits to Growth left off.” LTG had identified the sustainability problem. The next step, as the coalition had mandated, was to diagnose why the human system was unable to self-correct itself.

Buried in the back of the second edition of Forrester’s World Dynamics, published in 1973, was a new chapter on Postscript—Physical Versus Social Limits. In it Forrester pointed out that:

“The Limits to Growth veered away from social and political factors to stress the more tangible physical aspects of the world environment. The debate about growth has centered on resources, pollution, and agriculture. But the most important issue is not the ability of technology to continue pushing back the physical limits. The question can be better stated, ‘Assuming technology can continue to push back the physical limits of the earth, should society want to do so?’ Relying on technology to solve the problems created by growth is to evade the question of how to slow growth.’

The chapter also included a small model showing how social limits could be added to a model with only physical limits. From the model and the chapter the organization concluded they should, if possible, get Forrester to perform a second miracle: to sketch some foundational structures for the diagnosis and looking ahead, the cure.

By then Forrester was 90 some years old, but still mentally spry. He relished the idea of finally doing a serious job on the social side of the problem. In an intense weeklong workshop, Forrester and five modelers pounced out several models that looked very promising. The group was elated. The models made gigantic leaps forward, leaps so large that the modelers admitted this would have taken them five or ten years. Some of the insights they would have never seen.

Meanwhile the other modeling team, team B, found an obscure paper on The Dueling Loops of the Political
Powerplace, first published on December 7, 2005 and later issued as a small book. It never caught on. The team wondered why, because it explained so much and offered an entirely new promising direction. One member pointed out the model’s extreme novelty was precisely why it had failed to catch on—it was such a radically new paradigm that established environmental organizations could not see its potential, because they were so enamored by their own paradigms.

Working closely with the six experimental organizations, team B proceeded to subject the Dueling Loops model to a battery of grueling, high speed micro experiments. At first the model fared poorly in some areas. But a quick series of model evolution and experimentation cycles fixed the model’s shortcomings. In a few months the team surprised itself. The model was starting to hold up quite well. It showed the root cause of systemic change resistance to be not just the basic Dueling Loops structure, and the Battle for Niche Succession between Homo sapiens and the modern corporation, but also the inability of cultural fabric to evolve fast enough to react correctly to a phenomenon they called social stress.

Getting a little excited now, the team presented their diagnostic results to the guiding coalition. The coalition faulted them for straying slightly from the process, but the team fired back that what they had done was improve the process by using a lower level of confidence to confirm initial hypotheses. This allowed them to explore a broader range of the solution space more quickly. The coalition was impressed, and the process was amended and improved on the spot.

The coalition then astonished the team by revealing that the other modeling team, team A, had come to one of the same conclusions that team B had. Social stress was a term Jay Forrester had used 40 years earlier! Team A had several promising models bubbling along that, while not as advanced and final as team B’s model, were pursuing an entirely different line of analysis. The coalition would not say what they were, so that the two teams would continue their independent lines of inquiry.

It was now only six months into the project. The coalition put together a status report for the sponsors. It highlighted the rapid progress being made by the modelers and experimenters, the breakthrough insights gleaned from the week with Forrester, and the emerging model structures. Sponsor representatives requested and then sat patiently through an hour long presentation of the actual models and key experiments. They then peppered the coalition with questions and frank remarks that, in the words of one observer, “made it clear who really knew what was going on. The corporate sponsors had sent their best researchers, who had studied the status report beforehand. These were some of the sharpest scientists in the world. In a matter of minutes they pinpointed a number of flaws in the design of several experiments, and a notable omission in one of the models. I looked over and saw the eyes of one the presenters pop right open. He just about had a heart attack! But he also had the great presence of mind to thank them and ask if they would like to personally meet with the organizations involved.”

They met. The corporate researchers explained the problems they had spotted to each of the eight contract organizations. This worked so well they arranged for frequent reviews at the team level instead of the coalition level. This process improvement effectively doubled team productivity, because now the teams had a new defect prevention loop that nipped bad ideas in the bud and shined a light on the ones that might have otherwise received little attention.

At 14 months into the project the diagnosis reached the clear and proven milestone. The two modeling teams had reached fairly identical conclusions, using what were mostly entirely different models. This was seen as very strong proof of a correct diagnosis. It was like having two different doctors examine a patient and agree on the same diagnosis.

The biggest surprise was that “more of the truth” was not the only low leverage point. Forrester’s concept of social stress and the use of memetic infection had led to a much more subtle and powerful insight: Due to the way activists were framing the issue, it was seen as only “scientifically critical.” But it was not seen as “practically critical” by the public. It was by the activists, especially those who understood the Limits to Growth model. But the sense of the sustainability problem being clearly critical enough to make it everyone’s top priority was not present in the public, and therefore not in the media, and thus not in the minds of the world’s politicians. All this was clearly shown in the models and proven by the experiments.

It was a flurry of micro experiments that had led to this amazing conclusion, one nobody had expected. Guided by a model structure with a loop called Rationalize Now to Make Doom Later Appear Irrelevant, the experimenters had started with a concept linguistics professor George Lakoff called the improper metaphor. Employing Lakoff for his linguistic expertise, Dawkins for his memetic skill, and a few other luminaries, the experimenters had cracked open one of the greatest mysteries of social science: Why do so many societies end up marching to their collective doom, even when they are full of Cassandras pointing out that disaster is certain unless the course in changed...
in time? The question and its related high leverage point were labeled the Cassandra Mystery.

The micro experiments allowed the model’s memetic nodes to be calibrated with remarkable precision. The model scenarios became fascinating excursions into high speed, controlled cultural evolution. The key run, affectionately labeled “the engineer’s dream,” showed how seemingly small structural changes caused new loops to become dominant in a multi-stage phase transition chain. One little group of memes grew and spread, and caused other groups to grow and spread, and so on. The memetic cascade, as the experimenters liked to call it, gently transformed the dominant memplexes controlling the course of human civilization from a cacophony of destructively competing ones into a luxuriant, uplifting symphony of constructively competing ones. The emergent effect was the human system now wanted to aggressively optimize itself for the common good of all, instead of those with the highest current competitive advantage. The system didn’t know how to do it at first, since it had never been done. But that didn’t matter. The system always figured out a way. The effect was so dazzling to watch the experimenters ran the model over and over, in an insightful hypnotic trance.

The next step on the project plan was the Solution Convergence step. Because the high leverage points were so easy to understand, and because experimentation had already shown how the system would respond when the points were pushed on, this step took only a few months. Next came the Implementation step.

Like all great mysteries once they are solved, the answer to the Cassandra Mystery was so simple and desirable that even a ten year old could understand it and wanted to do it. Thus it was extremely easy to convince educators to revise curriculums to inject the memetic solution into society’s meme stream at a young age. Injection into the adult meme stream was even easier. A few hurried press conferences arranged by the coalition were all it took to take the sustainability problem from “this is important” to “this is the only important problem we have” in the public’s eye. This and parallel work on raising the public’s ability to detect political deception quickly overcame the mountain of change resistance that had plagued environmentalists for decades. After that, the coalition hardly had to do a thing, because the human system had entered the Age of Transition to Sustainability.

One year later the coalition disbanded. Their own project post mortem showed that, just as predicted, the solution was an emergent property of the models they had been building. Everyone had thought that the solution convergence and implementation phases would take years or decades. But as soon as they had found the ultra high leverage point that the Rationalize Now to Make Doom Later Appear Irrelevant loop had led them to, the problem solved itself so fast they barely had time to blink.

Announced at a small press conference attended mostly by a tired but happy bunch of modelers, experimenters and their friends and families, the post mortem report attracted little attention. It was a quiet footnote to a quiet revolution.

Summary and Conclusions

This scenario ties together the essential elements it will take to solve the sustainability problem as fast as is humanly possible. These elements appear to be:

1. A guiding coalition to manage the large project.
2. An appropriate formal process driving the entire work effort. This is the Analytical Method, its domain specific subprocess, the System Improvement Process, and the many smaller processes, such as the Building the Knowledge Pyramid loop.
3. A formal model whose growth reflects the project’s progress and whose growth builds the Knowledge Pyramid.
4. An unusually large amount of experimentation to turn Model Conjectures into Model Facts. Most of this is micro experiments.
5. Shifting gears into the new mode of ultra high experimental efficiency.
6. Reliance on the power of emergent solutions.

The last element is the end game masterstroke. A solution to a new problem can never be proven to work until after it has actually worked. But a modeled solution can be proven to have a high probability of working if the key assumptions in the model can individually be proven to have a high probability of being true. This proof is attainable only by experimentation.

Suppose there were ten key assumptions of equal importance. For the solution to have a 95% chance of working, the assumptions must each have a 99.5% probability of being true. Achieving this very high level of confidence, 99.5%, is why it takes so much experimentation to build the model.

The sustainability problem will be solved only after a long series of ingenious, highly efficient experiments are used to build a model whose emergent behavior solves the problem.

All this begins with The First Experiment.
Chapter 14

The Dueling Loops of the Political Powerplace

A Model for Breaking the Thirty Year Deadlock of Systemic Change Resistance

MOST EFFORT ON SOLVING THE SUSTAINABILITY PROBLEM focuses on its technical side: the proper practices that must be followed to be sustainable. But surprisingly little effort addresses why most of society is so strenuously resisting adopting those practices, which is the change resistance or social side. Until that side of the problem is addressed, environmentalists will remain paralyzed and unable to break the deadlock of systemic change resistance.

This chapter presents a simple, easy to understand analysis of the social side of the problem using a simulation model. The model shows the main source of change resistance is a fundamental structure called the dueling loops of the political powerplace. This consists of a race to the bottom among politicians battling against a race to the top. Due to the inherent structural advantage of the race to the bottom it is the dominant loop most of the time, as it is now. As long as it remains dominant, resistance to living sustainably will remain high.

The analysis has, however, uncovered a tantalizing nugget of good news. There is a promising high leverage point in this structure that has never been tried. If problem solvers could unite and push there with the proper solution elements, it appears the social side of the problem would be solved in short order, and civilization could at last enter the Age of Transition to Sustainability.

To allow this chapter to stand on its own as a conceptual whole, a small amount of the same material from chapters 2 and 3 is presented here again. The difference is instead of building a pseudo stock and flow model that lacked many important details, this time we build a real one so we can simulate the dynamic behavior of the system.

The Social Side of the Problem Is the Crux

The transformation of society to environmental sustainability requires three steps: The first is the profound realization we must make the change, because if we don’t our descendants are doomed. The second is finding the proper practices that will allow living sustainably. The third step is adopting those practices.

Society has faltered on the third step. By now the world is aware it must live sustainably, which is the first step. There are countless practical, proven ways to do this, which is the technical side of the problem and the second step. But for strange and mysterious reasons society doesn’t want to take the final step and adopt these practices, which is the change resistance or social side of the problem. Therefore the social side of the problem is the crux.

Here is what the third edition of Limits to Growth had to say about the social side of the problem: (Bolding added)

“[The second edition of] Beyond the Limits was published in 1992, the year of the global summit on environment and development in Rio de Janeiro. The advent of the summit seemed to prove that global society had decided to deal seriously with the important environmental problems. But we now know that humanity failed to achieve the goals of Rio. The Rio plus 10 conference in Johannesburg in 2002 produced even less; it was almost paralyzed by a variety of ideological and economic disputes, by the efforts of those pursuing their narrow national, corporate, or individual self-interests.

“It is a sad fact that humanity has largely squandered the past 30 years in futile debates and well-intentioned, but halfhearted, responses to the global ecological challenge. We do not have another 30 years to dither. Much will have to change if the ongoing overshoot is not to be followed by collapse during the twenty-first century.”
What is the underlying cause of such stiff, prolonged global change resistance? Whatever it is, it must be incredibly strong to cause such a powerful effect.

We might begin to find that elusive underlying cause if we drilled down and tried to determine why change resistance occurs at the national level. For example, looking at the world’s sole remaining economic and military superpower, why did the US Senate vote 95 to zero in 1999 to reject the Kyoto Protocol, despite a democratic President and a strongly pro-environmental Vice President, Al Gore? Why, since the ascendancy of the George W. Bush administration in the United States in 2001, has opposition grown to the point that progress in solving the environmental sustainability problem is moving backwards? Why do US environmental NGOs face “the most hostile environment in which we have ever struggled to advance our goals,” as the Union of Concerned Scientists describes it? "

If we could understand why the political system works the way it does, we could answer these questions and go further than we’ve ever gone before. We could find the high leverage points in the system that would allow changing that “hostile environment” into one that actively welcomed solving the problem, and thus solve the social side of the problem.

This chapter attempts to do this by performing a structural analysis of the fundamental causes of the social side of the problem, using a simulation model. Because the structure of the model so clearly exposes the causes of systemic change resistance, the key high leverage point where problem solvers should “push” to solve the problem becomes conspicuously obvious. Three solution elements are then presented to illustrate how feasible pushing on this point could be.

The Race to the Bottom

There are two feedback loops in the human system that, in the large, affect citizen’s lives more than anything else. They are the loops that politicians use to gain supporters.

Over time, social evolution has pared the many strategies available for gaining political support into just two main types: the use of truth (virtue) and the use of falsehood and favoritism (corruption). For example, a virtuous politician may gain supporters by stating, “I know we can’t balance the budget any time soon, but I will form a panel of experts to determine what the best we can do is.” Meanwhile, a corrupt politician is garnering supporters by saying, “Economics is easy. You just put a firm hand on the tiller and go where you want to go. I can balance the budget in four years, despite what the experts are saying. They are just pundits. Don’t listen to them. A vote for me is a vote for a better future.”

The corrupt politician is also saying to numerous special interest groups, “Yes, I can do that for you. No problem.” Guess who will usually win?

Falsehood and favoritism has long dominated political strategy. Most politicians use rhetoric, half truths, glittering generalities, the sin of omission, biased framing, and other types of deception to appeal to the greatest number of people possible for election or reelection. Once in office nearly all politicians engage in acts of favoritism, also known as patronage.

For example most politicians use the **ad hominem** (Latin for against the man) fallacy to attack and demonize their opponents, particularly as an election draws near. A prominent recent instance was the use of the Swift boat ads in the 2004 US presidential campaign to attack John Kerry’s character. The ads were an **ad hominem** fallacy, because they had nothing to do with Kerry’s political reasoning or positions. Other terms for the **ad hominem** fallacy are demagoguery, shooting the messenger, negative campaigning, smear tactics, and sliming your opponent.

Politicians are forced to use corruption to gain supporters, because if they do not they will lose out to those who do. This causes the **Race to the Bottom among Politicians** to appear, as shown on the next page.

To understand how the loop works, let’s start at false memes. A **meme** is a mental belief that is transmitted (replicated) from one mind to another. Memes are a very useful abstraction for understanding human behavior because memes replicate, mutate, and follow the law of survival of the fittest, just as genes do. Rather than show falsehood and favoritism, the model is simplified. It shows only falsehood.

The more **false memes** transmitted, the greater the **degenerates infectivity rate**. The model treats arrival of a meme the same way the body treats the arrival of a virus: it causes infection. After the “mind virus” incubates for a period of time, the infection becomes so strong that maturation occurs. This increases the **degenerates maturation rate**, which causes supporters to move from the stock of **Not Infected Neutralists** to the stock of **Supporters Due to Degeneration** as they become committed to the false memes they are now infected with. **Supporters Due to Degeneration** times influence per degenerate equals degenerates influence. The more influence a degenerate politician has, the more **false memes** they can transmit, and the loop starts over again. As it goes around and around, each node increases in quantity, often to astonishing levels. The loop stops growing when most supporters are committed.

Please see this endnote for a discussion of the definitions of degenerates and rationalists.
The dynamic behavior of the loop is shown below in Figure 2. The behavior is quite simple because the model has only a single main loop.

Corrupt politicians exploit the power of the race to the bottom by broadcasting as much falsehood and favoritism as possible to potential supporters. This is done with speeches, interviews, articles, books, jobs, lucrative contracts, special considerations in legislation, etc. The lies and favors are a cunning blend of whatever it takes to gain supporters. The end justifies the means. Note that the more influence a politician has, the more falsehood they can afford to broadcast, and the greater the amount of favoritism they can plausibly promise and deliver.

The race to the bottom employs a dazzling array of deception strategies. These are usually combined, which increases their power. Here are some of the most popular:

**False promise** – A false promise is a promise that is made but never delivered, or never delivered fully. False promises are widely used to win the support of segments of the population, such as organized special interest groups, industries, and demographic groups like seniors or immigrants. False promises flow like wine during election season.

**False enemy** – Creating a false enemy works because it evokes the instinctual fight or flight syndrome. The brain simply cannot resist becoming aroused when confronted with a possible enemy.

The two main types of false enemies are false internal opponents, such as negative campaigning, the Salem witch trials, and McCarthyism, and false external opponents, such as communism and the second Iraq “war.” While communism and Iraq were true problems, both were trumped up enormously to serve the role of a false enemy. False enemies are also known as scapegoats. They can also be used to divert the public’s attention from more important issues. Name-calling is one technique used to create a false enemy, but the biggest is fallacious arguments, better known as lies.

**Pushing the fear hot button** – When a politician talks about almost everything in terms of terrorism, or communism, or crime, or threats to “national security” or “our way of life,” and so on, that politician is pushing the fear hot button. It is very easy to push. Just use a few of the right trigger words, throw in a dash of plausibility, and the subconsciousness is automatically hoodwinked into a state of fear, or at least into wondering if there is something out there to fear. Whether or not an enemy actually is out there doesn’t matter—what matters is that we think there might be one.

Fear clouds the judgment, making it all the harder to discern whether there really is an enemy out there. Because we cannot be sure, we play it safe and assume there is at least some risk. Since people are risk averse, the ploy works and we become believers. We have been influenced by statements of what might be lurking out.
there. Our fear hot button has been pushed and it worked.

How effective fear can be is echoed in this quote from George Gerbner, past dean emeritus of the University of Pennsylvania’s Annenberg School for Communications:

“Fearful people are more dependent, more easily manipulated and controlled, more susceptible to deceptively simple, strong, tough measures and hard-line postures,” [Gerbner] testified before a congressional subcommittee on communications in 1981. “They may accept and even welcome repression if it promises to relieve their insecurities. That is the deeper problem of violence-laden television.”

**Wrong priority** – Wrong priorities stem from hidden agendas. A hidden agenda is a plan or goal a politician must conceal from the public, due to an ulterior motive.

There are many ways a hidden agenda can come about. A politician may support a certain ideology, and so bends everything to support the goals of that ideology. Or he may have accepted donations and/or voter support from special interests, such as corporations, and therefore must promote their agenda. Or perhaps he had to cut a deal.

A politician with a hidden agenda must make the wrong priorities seem like the right ones in order to achieve what’s on the hidden agenda. How can he do this? For a corrupt politician such matters are child’s play—manipulate the public through false promises, create a false enemy, push the fear hot button hard and often, repeat the same lie over and over until it becomes “the truth,” and so forth.

The low priority that environmental sustainability receives from most governments today is rapidly becoming the textbook example of how devastating wrong priorities can be.

**Secrecy** – Hiding or withholding the truth is a powerful form of deception, because it creates a false impression without actually having to openly lie about anything. Secrecy makes it impossible to tell if a politician is lying, because key premises cannot be tested. Secrecy is also known as the sin of omission. When you see a politician, administration, or party using much more secrecy than normal, and there is no reasonable justification, you can be certain that its purpose is deception.

**Clever Rationalizations** – The previous types of deception were strategic. Now we move into tactical types. Of these, the most common is clever rationalizations. A rationalization is a falsehood that supports a pre-conceived decision. Clever rationalizations are usually the result of extensive testing and competition with other rationalizations, such as by testing on focus groups. All rationalizations employ well known fallacies to trick the receiver into believing a statement is true, when in fact it is false.

For example, the widely circulated argument that the Kyoto Protocol would not solve the climate change problem, and therefore is not worth supporting, is a clever rationalization. Of course it won’t solve it, because the first round of greenhouse gas emission reductions (averaging 5.2% below 1990 levels) are only a first step. Another popular rationale is that mandatory emission limits would harm the US economy. It is true that GDP will probably fall as lower amounts of fossil fuels, cars, trucks, and so on are consumed. But the harm would be much bigger if nothing was done. Yet another rationale is why should the US support the treaty if China and India are exempted? The false answer is the US should not. But the true answer is the less developed countries will be included in later phases of the treaty. It makes little sense to include them in the early phases, because they are not a major source of emissions per capita.

**Other Types** – There are many other tactical types of deception, such as biased framing, spin, false grassroots organizations, biased public relations blitzes, false advertising, false news stories, the fallacy of “balanced news,” and casting doubt on the severity or urgency of a problem.

The right steady drumbeat of false promises, false enemies, pushing the fear hot button, wrong priorities, secrecy, and clever rationalizations creates the ultimate political weapon: lies that work on entire nations. This is why history has given us these gems of dark wisdom:

“Next the statesmen will invent cheap lies, putting the blame upon the nation that is attacked, and every man will be glad of those conscience-soothing falsities, and will diligently study them, and refuse to examine any refutations of them; and thus he will by and by convince himself that the war is just, and will thank God for the better sleep he enjoys after this process of grotesque self-deception.” – Mark Twain, *The Mysterious Stranger*, 1910.

“The whole aim of practical politics is to keep the populace alarmed (and hence clamorous to be led to safety) by menacing it with an endless series of hobgoblins, all of them imaginary.” – H. L. Mencken
“A lie repeated often enough becomes the truth.” – Vladimir Lenin.

“It does not matter how many lies we tell, because once we have won, no one will be able to do anything about it.” – Statement by Dr. Joseph Goebbels to Adolf Hitler, early 1930s, from The Rise and Fall of the Third Reich, by William L. Shirer.

More modern history has given us these:


“...false meme size to inflate the appeal of what they offer their supporters. But virtuous politicians cannot use falsehood to promise more than they can honestly expect to deliver. Nor can they use favoritism.”

Which makes it sound like Machiavelli is alive and well, and working as a consultant to any government who agrees that the end justifies the means. This leads to what Henry David Thoreau wrote in A Week on the Concord and Merrimack Rivers, in 1849:

“It takes two to speak the truth—one to speak, and another to hear.”

Which in turn leads to our own observation:

“It takes two to speak the lie—one to speak, and another to be deceived.”

The Basic Dueling Loops

Opposing the race to the bottom is the race to the top. The two loops are joined together as shown. Because each loop competes for the same Not Infected Neutralists, they are “Dueling Loops.”

In the race to the top virtuous politicians compete for supporters on the basis of the truth (on the model this is called true memes). No favoritism is used, because those who tell the truth treat everyone equitably. Virtuous politicians can help improve things so that society benefits as a whole, but they cannot promise or give anyone more than their fair share.

The race to the top works in a similar manner to the race to the bottom because the two loops are entirely symmetrical, with one crucial difference: in the race to the top, the size of the truth cannot be inflated. Corrupt politicians can use false meme size to inflate the appeal of what they offer their supporters. But virtuous politicians cannot use falsehood to promise more than they can honestly expect to deliver. Nor can they use favoritism.

The Basic Structure of the Dueling Loops

Figure 3. This is the basic structure of the dueling loops of the political powerplace. There are many variations. This structure, combined with agent selfishness, is the fundamental cause behind the behavior of all political systems, both ancient and modern. In particular this structure explains why corruption is what dominates politics, no matter how hard society tries to stamp it out. But once the structure is deeply understood it becomes possible to arrive at a way to eliminate corruption indefinitely. This is required to achieve sustainability of any kind, because sustainability is defined as the ability to continue a defined behavior indefinitely.
ism to inflate expectations of how well they can help particular supporters.

By examining how the basic dueling loops model behaves in a series of simulation runs, we can better understand why the political powerplace works the way it does. The table above lists the first six simulation runs we will examine. The first two variables are the changeable variables. By varying the changeable variables from run to run, we can try different scenarios. Each scenario is a logical experiment. The third variable is a result variable. It is the outcome of a simulation run, after equilibrium is reached.

**Run 1** – This was presented earlier in figure 2. By setting initial rationalist supporters to zero and false meme size to 1, we get the equivalent of the race to the bottom loop and graph that was presented earlier.

**Run 2** – In run 2 the number of initial rationalist supporters is increased to 1. Now both loops have the same number of initial supporters. Because neither loop has an advantage over the other loop, the result is both loops behave the same. Each attracts the same percentage of supporters, as shown below:

<table>
<thead>
<tr>
<th>Initial rationalist supporters</th>
<th>False meme size</th>
<th>Percent rationalists</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>83%</td>
</tr>
<tr>
<td>1</td>
<td>1.1</td>
<td>20%</td>
</tr>
<tr>
<td>1</td>
<td>1.3</td>
<td>5%</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>0%</td>
</tr>
</tbody>
</table>

Because this run exhibits the most basic behavior of the dueling loops, without the whistles and bells of giving one side an advantage, it is our reference mode. A reference mode is what modelers use to compare all other runs to, because it is the most fundamental run or represents the current system. In this run the percentage of degenerates and rationalists are always equal, so the degenerates and rationalists graph lines are identical. Percent rationalists is the number of rationalists divided by degenerates plus rationalists. Naturally the higher this percentage is the better. In this run percent rationalists is always 50%.

**Run 3** – This shows what happens if we give one side a head start on their number of supporters. Because we have not changed false meme size, neither size has an inherent advantage. But even a small head start, if all else is equal, can quickly become a large advantage, as the results show.

**Run 4** – Now things get interesting. The number of initial rationalist supporters is set back to 1 and false meme size is increased from 1 to 1.1. This is only a tiny bit bigger, by 10%. It would seem that itsy bitsy lies and favors wouldn’t make much difference, but no—they make a huge difference over a long period of time. As the run 4 graph below shows, the rationalists get wiped out. After 500 years they are down to about 20%. After 5,000 years (not shown) they are down to 0.345879 persons, which in the real world would be zero.

But notice how slowly the lines for degenerates and rationalists diverged for the first 50 years. What might happen if the degenerates decided to tell bigger lies and give out bigger favors?

**Run 5** – If false meme size is increased from 1.1 to 1.3, system behavior changes dramatically. It only takes about 30 years for the degenerates to pull away from the
rationalists. Now the degenerate and rationalist lines flatten out after only 500 years, instead of the 5,000 years it took in run 4. The end result is the same. The lesson is that the bigger the lie, the faster a corrupt politician can take over a political system. I wonder if that explains anything we might be seeing in politics today, such as in the United States?

Run 6 - Finally we see what happens if a corrupt politician decides to tell real whoppers. False meme size has increased to 2. In other words, every false promise, every false enemy, and so on is now twice as big as they really are.

The results are no surprise. Now the system responds so fast the rationalists never even make much of an impact on politics. They are smothered so fast by such big lies that the graph line for rationalists is starting to look like a pancake. Now, after only 500 years, there are 0% rationalists left in the system. They have been exterminated.

There is a limit to how big a lie can grow before it starts to make detection easy. In Figure 9 we will add the effect of size of lie on detection variable to the model, which will impose diminishing returns on the size of a lie.

This then is the basic structure of the dueling loops of the political powerplace. The two loops are locked in a perpetual duel for the same Not Infected Neutralists. In addition, each politician has his or her own loop, and battles against other politicians for the same supporters. It is these many loops and the basic dueling loops structure that forms the basic structure of the modern political powerplace. The outstanding feature of this structure is:

The Inherent Advantage of the Race to the Bottom

Because the size of falsehood and favoritism can be inflated, and the truth cannot, the race to the bottom has an inherent structural advantage over the race to the top. This advantage remains hidden from all but the most analytical eye.

A politician can tell a bigger lie, like budget deficits don’t matter. But they cannot tell a bigger truth, such as I can balance the budget twice as well as my opponent, because once a budget is balanced, it cannot be balanced any better. From a mathematical perspective, the size (and hence the appeal) of a falsehood can be inflated by saying that $2 + 2 = 5$, or $7$, or even $27$, but the size of the truth can never be inflated by saying anything more than $2 + 2 = 4$.

Because the size of falsehood and favoritism can be inflated and the truth cannot, corrupt politicians can attract more supporters for the same amount of effort. A corrupt politician can promise more, evoke false enemies more, push the fear hot bottom more, pursue wrong priorities more, and use more favoritism than a virtuous politician can. The result is the race to the bottom is normally the dominant loop. Thus the reason that “Power corrupts, and absolute power corrupts absolutely” is not so much that power itself corrupts, but that the surest means to power requires corruption.\[116\]

Due to lack of an in-depth analysis of the fundamental causes of the social side of the problem, problem solvers have long been intuitively attracted to the low leverage point of pushing on “more of the truth.” On the model this point is the true memes node. The truth is discovered by research on technical ways to live more sustainably, such as population control, alternatives to fossil fuels, and reduce, reuse, and recycle. The truth is then spread by scientific reports, popular articles, environmental magazines, lobbying, pilot projects, lawsuits to enforce the legal truth, demonstrations to shock the public into seeing the real truth, and so on. This works on problems with low adoption resistance, such as local pollution problems and conservation parks. But it fails on those with high adoption resistance, like climate change, because environmentalists simply do not have the force (wealth, numbers, and influence) necessary to make pushing on this point a viable solution.

Because of its overwhelming advantage, the race to the bottom is the surest way for a politician to rise to power, to increase his power, and to stay in power. But this is a Faustian bargain, because once a politician begins to use corruption to win, he joins an anything goes, the-end-justifies-the-means race to the bottom against other corrupt politicians. He can only run faster and keep winning the race by increasing his corruption. This
is why the race to the bottom almost invariably runs to
excess, and causes its own demise and collapse.

This collapse ends a cycle as old as the first two
politicians. A cycle ends when corruption becomes so
extreme and obvious that the people rise up, throw
the bums out, and become much harder to deceive for
awhile. But as good times return, people become lax,
and another cycle begins. These cycles never end, be-
cause presently there is no mechanism in the human
system to keep ability to detect deception permanently
high.

The dueling loops structure offers a clear explana-
tion of why environmentalists are facing such a hostile
political climate. This strong opposition occurs be-
cause a dominant race to the bottom causes corrupt politicians
to work mostly for the selfish good of degenerate sup-
porters, instead of working for the common good of the
people. In other words:

The Race to the Bottom Is Easily Exploited
by Special Interests

Exploitation is the use of others to increase your
own competitive advantage, at the cost of theirs. Be-
cause this is so obviously self-destructive to those being
exploited, deception is required to pull it off. (We are
considering only voluntary exploitation.)

The race to the bottom provides the perfect mecha-
nism for political exploitation. Each politician has his or
her own loop. There are also hierarchies of loops, since
a politician’s supporters can be other politicians. At the
top of each hierarchy is the top politician, such as a
president, political strategist, or party. Whoever is at the
top has tremendous leverage. Thus the race to the bot-
tom greatly amplifies the power of the exploiter.

In stark contrast, the race to the top cannot be ex-
plotted. Unseemly rewards cannot flow to a truth telling
politician without everyone knowing about it, because
part of telling the truth is keeping no secrets and not
committing the “sin of omission,” a type of lie. It also
cannot be exploited by supporters or outsiders with
bribes or favoritism, because truth telling politicians
would say no and if necessary report them. If they
didn’t, they would lose supporters because they would
be committing falsehood.

Basically the race to the top is not exploitable be-
cause exploitation requires unjustified support, which is
what the race to the bottom thrives on. But in the race to
the top, all support is justified because it is based on the
truth and the equitable distribution of the benefits of
social cooperation.

The incentive to exploit occurs when a special inter-
est group has interests that conflict with those of society
as a whole. Common examples are religious fundamen-
talists, the rich, the military, and large corporations. The
latter two make up the infamous military industrial com-
plex.

A corrupt politician, by accepting donations (legal
bribes) and votes in return for favoritism, becomes be-
holden to the special interest groups involved. If a spe-
cial interest is powerful enough, it can control and
exploit a political system by clever use of the race to the
bottom. This is exactly what is happening today. The
global political system is by and large being exploited by:

The New Dominant Life Form

Who the New Dominant Life Form is, why they are
inherently biased toward unsustainability, and why they
are so powerful was presented in chapter two on page
32.

This is the real enemy environmentalists are bat-
tling. The current Bush administration, as well as others
before it and around the world who oppose sustainabil-
ity, are mere proxies for the real opponent: the modern
corporation and its allies. Its allies include top corporate
management, stockholders, the rich, the military, and
politicians, plus various large special interest groups as
expediency requires, such as the religious right.

It is a paradox why Homo sapiens would create an
entity that is more powerful that itself and has a mutu-
ally exclusive goal. Such a creation is guaranteed to
cause its creator great harm, if not eventual extinction.
But it is really not a paradox at all— it is an experi-
gone awry. So awry, in fact, that it is time to end the
experiment by redesigning that mischievous creature….

We now have enough pieces of the puzzle to draw
an important conclusion: The dueling loops, their cyclic
nature, the inherent advantage of the race to the bottom,
the presence of the New Dominant Life Form, and its
successful exploitation of the race to the bottom are the
structural root cause of most of the stiff, prolonged resis-
tance to adopting a solution to the environmental sus-
tainability problem. Civilization is presently stuck in the
dominant race to the bottom part of the cycle. Our chal-
lenge is to cause this cycle to end as soon as possible,
and then to prevent it from ever starting again. If we can
do that civilization will not only enter the Age of Transi-
tion to Sustainability. It will also enter an entirely new
mode: a permanent race to the top among politicians,
along with all that has to offer, but has never been ac-

tained.

This may seem even more ambitious than the last
great political mode change, which was the rise of de-
mocratic forms of government in the 18th century. There
is, however, good cause for rational hope, because:
There Is a High Leverage Point that Has Not Yet Been Tried

We have extremely good news. There is a very promising high leverage point in the human system that has not yet been tried. It is general ability to detect political deception, as shown on the revised model on the next page. Pushing there appears to give problem solvers the greatest possible chance of solving the social side of the problem.

Actually the model identifies not one but two high leverage points. Both need their present values raised to solve the problem. But as we will show in another series of simulation runs, it is the key high leverage point of ability to detect deception that makes the biggest difference.

The central purpose of this chapter is to convey the importance of two propositions: that the dueling loops of the political powerplace explain why environmentalists are meeting such stiff resistance, and what the high leverage points of that structure appear to be. If we can do that, then it will not be long before readers explore these propositions for themselves, launch their own analyses, and begin to push on the correct high leverage points. Those points may or may not be the ones presented here, because this analysis is merely a first iteration.

Our deeper purpose is a third proposition: Environmental activists, academics, politicians, and agencies are failing to solve the global environmental sustainability problem because they are pushing on low leverage points instead of high leverage points. They are doing this because they are using an ad hoc, instinctual problem solving process instead of a formal analytical one, particularly on the problem as a global whole. If environmentalists would switch to a formal analytical process tailored to the problem, as science did 400 years ago in the 17th century when it adopted the Scientific Method, they would be able to correctly analyze even difficult problems and find the high leverage points necessary to solve them. Only then will the impossible become the possible.

A formal analysis tailored to the problem does not simply mean find good people, give them the budget they need, apply the Scientific Method, and expect the cows to come home tomorrow. It means design a custom process that fits the specific problem. An example of such a process is the System Improvement Process, which is summarized in the glossary entry at Thwink.org. This process was designed from scratch to solve complex social system problems. It works by breaking the total problem down into three subproblems, each of which is much easier to solve. Its key advantage is recognition of the social side of complex social system problems.

However nowhere in environmental activism, academia, political decision making, governmental agencies, or even international bodies have I been able find a group following a process specifically designed to solve the overall global environmental sustainability problem. This includes the United Nations Environmental Program, the European Union, the Organization for Economic Cooperation and Development, the US EPA, numerous books and papers, and countless environmental NGOs.

What might happen if there was such a group? What if they proved a formal, analytical process tailored to achieving their mission was a better way? Soon there would be a dozen such organizations. What if that in turn led to the majority of environmental organizations using an appropriate process, either for the complete problem or for the portion of it they were working on?

But we digress. Let’s return to the model at hand, which is shown on the next page.

On the model a solid arrow indicates a direct relationship. The two dashed arrows show an inverse relationship. A dotted arrow is a constant or a lookup table function.

Currently general ability to detect political deception is low. The lower it is the lower detected false memes are. The lower that is, the higher undetected false memes are and the lower repulsion memes are. This causes more degenerates and fewer rationalists, which is bad news.

Currently repulsion to corruption is also low. The lower it is, the lower the rationalists infectivity rate and the lower supporter desertion due to repulsion. This is because repulsion to corruption times detected false memes equals repulsion memes. This makes sense, because detected corruption is a good reason to decide to support virtuous politicians and to desert corrupt ones.

For an actual system reaction to deception detection to occur, two steps must take place. The deception must be detected, which is handled by general ability to detect political deception times false memes equals detected false memes. Then those detected false memes must cause people to be repulsed enough by the corruption to either defect from the degenerates, which is what the supporter desertion due to repulsion variable does, or to become rationalists, which is handled by adding repulsion memes to true memes to calculate the rationalists infectivity rate. In addition to this, false memes minus detected false memes equals undetected false memes, which reduces degenerate infectivity.
Let’s summarize how the You Can’t Fool All of the People All of the Time loop works, focusing on the higher leverage point. Currently the loop is weak, and thus might be more appropriately named You Can Fool Most of the People Most of the Time. Low ability to detect deception and the fact that the size of falsehood and corruption can be inflated but the truth cannot combine to cause more supporters to be attracted to the race to the bottom. Thus if ability to detect deception is low, corruption works like a charm, because most false memes flow through the system unimpeded. This causes undetected false memes to be high and detected false memes to be low, which strongly favors the race to the bottom.

But if problem solvers can raise ability to detect deception to a high level, most false memes flow to detected false memes. This greatly decreases undetected false memes, which destroys the power of the race to the bottom. At the same time this increases repulsion memes, which increases the rationalists infectivity rate and increases the degenerates recovery rate due to supporter desertion due to repulsion. The result is corrup-
tion doesn’t work anymore, which causes the race to the bottom to collapse as most people suddenly see the real truth and flee for their lives to the stock of Supporters Due to Rationality. This is precisely what happens when massive amounts of corruption are suddenly exposed.

It is the effect of influencing so much so strongly that makes general ability to detect political deception such a potent high leverage point.

Allow me to make a personal observation. The dueling loops structure is generic. It applies to any problem, not just environmental sustainability. The successful exploitation of the race to the bottom by the modern corporation and its allies is the fundamental reason progressive activists are encountering such strong resistance in achieving their objectives.

If progressive philosophy is defined as promotion of the objective truth for the good of all, then progressives (no matter what party they belong to) are rationalists at heart, and thus eschew falsehood and favoritism in its many forms. Progressives may not realize it, but their central strategy is the high road of winning the race to the top.

Next let’s familiarize ourselves with how pushing on the two high leverage points affects model behavior. The table above lists the simulation runs needed to do this. In all these runs, the number of initial degenerate and rationalist supporters is 1.

**Run 7** – This is the same as the reference mode (run 2) presented earlier. The purpose of this run is to test that the revised model has the same foundational behavior. It also serves as a good starting point for further scenarios.

**Run 8** – In the United States and many other countries, the general ability to detect political deception is low, somewhere around 20% or 30%. This is obvious because of the large amount of political corruption that goes undetected. (A caveat is that recently, in late 2005 in the US, this ability appears to be on the rise due to an excess of corruption that has become intolerable.) Let’s try raising this high leverage point from 0% to 20% and see what happens.

![Run 8. 1 FM size, 20% ability, 0% repulsion](image)

Wow! Great results! Finally it is the degenerates whose graph line is flattened like a pancake. Percent rationalists rises to 75% in 100 years and levels out at 100%. This is a dream scenario. All we’ve got to do is figure out how to make it happen.

Unfortunately that can’t be done, because this scenario is unrealistic. There is no way corrupt politicians are going to sit by and stick to a false meme size of 1, when they know full well, from at least 200,000 years of experience, that corruption works. So let’s fix that in the next run.

**Run 9** – In this run we change false meme size from 1 to 4.8, which is the optimum that effect of size of lie on detection and supporter desertion due to repulsion will let the degenerates get away with.

Corrupt politicians may be corrupt, but they are not stupid. They are usually expert at adjusting the size of lies and favoritism to be effective without overshoot, which would cause detection. Those unable to do this are quickly selected out by the iron hand of evolution’s most merciless law: survival of the fittest.
The graph tells the sad story. Now it is the rationalists who are as flat as a pancake after a Tyrannosaurus Conservatex stepped on it. In this scenario they have lost the game so soon and so badly it’s as if they had hardly any influence on the political system. But once again, is this a realistic simulation run? Not quite, because repulsion is still 0%, which is unrealistically low. Let’s do another run and see what happens when we increase it.

**Run 10** – Now we push on the second high leverage point, repulsion to corruption, raising it from 0% to 20%. Because both high leverage points are now being pushed, things should start looking more favorable. If they don’t, our understanding of the model is faulty.

The results do look better, but they are still not good enough. Percent rationalists tops out at 41%, which is well below what is needed for a political system to run itself well. We must do better.

**Run 11** – The smarter the agent, the faster and better it adapts to changing circumstances. We can only assume that corrupt politicians will adapt their strategy to the new circumstances of run 10. Experimentation with the model shows that the optimum false meme size for a 20% ability to detect deception and a 20% repulsion factor is 2.4. So in run 11 let’s change false meme size from 4.8 to 2.4.

As the run 11 graph shows, this strategy has a substantially better outcome. Percent rationalists levels off at 20% instead of the 41% of run 10. In other words, the degenerates have increased their percentage from 59% to 80%. Not bad for such a simple change. What’s interesting is they did it by decreasing the size of lies and favoritism, which means less corruption earned them more supporters.

The point is that false meme size is not fixed. It is fluid and, like so many agent strategies in complex social systems, changes as the situation demands.

**Run 12** – Next let’s see which of the two high leverage points gives problem solvers the most leverage. First let’s raise repulsion to corruption from low to high, which is from 20% to 80%. Then we experiment with the running model to determine the optimum false meme size for this competitive situation. It turns out to be 2. Will the result be good enough for the good guys to win or not?

Actually the model is now so complex I found it impossible to reliably predict the outcome of this run. But that’s one of the many benefits of simulation modeling: Once you have expressed your analysis as a dynamic structure, the software takes it from there and tells you how that structure will behave in any situation. And unlike my poor overworked cranial lobes, simulation software never makes a mistake.

The results show that even 80% is still not good enough. The forces of truth and corruption are still so evenly matched that they would be totally unable to deal cooperatively and proactively with difficult problems, because they would be too busy battling each other. The degenerates would also be engaging in promoting too many wrong priorities to even begin to get behind the right priority of environmental sustainability.

Time for a sanity check. Does this result make sense? Yes, because ability to detect deception is still low, at 20%. So let’s roll back repulsion to a more real-
licity and then see what would happen if we raised ability to detect deception.

**Run 13** – First we must estimate a reasonable value for repulsion to corruption. Later we hope to measure it in the field, but for now we must rely on an estimate.

There are five ballpark values repulsion to corruption could be: zero, low, medium, high, and 100%. Zero and 100% are so extreme as to be unrealistic, so we will rule them out.

I feel that presently repulsion to corruption is low. When the average citizen hears about detected corruption they do very little. They do not take action. Instead, the incident is written off as “politics as usual.” Only if corruption is extreme and prolonged do they take effective action. Even when Election Day comes, it is not corruption that voters consider the most. It is numerous other factors, like looks, charisma, sound bytes that stick in the mind, and most importantly, where the candidate stands on issues that are important to each voter. These issues rarely center on corruption, unless corruption has been prolonged and extreme.

Let’s not go too low, like 10%. A value of 20% seems reasonable. Much higher would slip into a medium level (40% to 60%), which does not make sense. People do not act on half the corruption they hear about. It is much less.

Also let’s start to raise ability to detect deception. In runs 8 to 12 it was 20%. Let’s raise it to 60%. Let’s continue to assume corrupt politicians will adapt to the new situation and change to the optimum strategy of 3.8 for false meme size. The results are shown below:

**Run 14** – To find out if we can achieve a high enough percent rationalists to solve the problem, let’s raise ability to detect deception from 60% to 80%. Again we assume adaptation and change false memes size to 4.7.

The results show that at last we have the behavior in the model we would like to see in the real world, because percent rationalists has risen to a blissful 100%. The opposition is eliminated and virtuous politicians can now focus on society’s proper priorities, at last. *If the model is correct,* then raising the general ability to detect political deception from low to high is all it will take to make the race to the top go dominant and solve the social side of the problem.

Notice how this run was able to raise percent rationalists from 41% to 100% (a 59% rise) by raising ability to detect deception from 20% to 80%, while run 12 only raised percent rationalists from 41% to 57% (a 16% rise) by raising repulsion from 20% to 80%. Calculating the leverage, 59% / 16% = 3.7. Thus in these fairly realistic scenarios ability to detect deception has 370% more leverage than repulsion to corruption.

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What about leaving ability to detect deception at 60% and raising repulsion to corruption? Would that solve the problem? No. Experimentation with the model shows that increasing repulsion to 80% increases percent rationalists to 94%, and increasing it to 100% only increases percent rationalists to 95%. It seems that increasing repulsion cannot eliminate the last few degenerates. However it does appear that the best overall solution is to raise both high leverage points: repulsion to corruption a little and ability to detect deception a lot.

Now for the important question: *Is the model correct?* No one knows, because it has not yet been subjected to the rigors of experimental proof and field calibration. However, I do believe that it contains the fundamental brushstrokes explaining why solution adoption resistance is so high. At the very least the model should serve as the starting point for a larger project that will go much further.
Next we take up the notion that the dueling loops are cyclic.

**The Cyclic Behavior of the Dueling Loops**

Up until now the model has ignored consideration of what causes a society to want to raise its general ability to detect political deception and/or repulsion to corruption. To raise the values for these two variables in our simulation runs, all we had to do was reach into the model and change them. That is not how it happens in the real world. How then do societies adjust these values?

My hypothesis is that societies reactively change these values when they see the clear and present need to change them. This need appears when a prolonged excess of corruption occurs. Because there is no formal reliable mechanism to keep the values of these two variables permanently high, they tend to fluctuate as the decades pass. Another way to say this is societies have a short organizational memory on what the values of these two variables should be.

Reactively changing these values causes an endless cycle. This cycle was briefly described earlier as: A cycle ends when corruption becomes so extreme and obvious that the people rise up, throw the bums out, and become much harder to deceive for awhile. But as good times return, people become lax, and another cycle begins. These cycles never end, because presently there is no mechanism in the human system to keep ability to detect deception permanently high.

The minimum conditions required for the dueling loops to be cyclic appear to be:

1. The natural tendency for general ability to detect political deception and repulsion to corruption to be low.
2. The existence of critical points that are automatically activated when corruption gets bad enough. Once a critical point is activated, society invests in raising general ability to detect political deception and/or repulsion to corruption.
3. The critical point is deactivated once corruption falls low enough. This is because there is no permanent mechanism to keep these variables high enough to prevent corruption.
4. The presence of delays in raising and lowering the two variables, and in changing supporters of one type into the other.

The previous model has been revised (see Figure 18 below) to incorporate these minimum conditions by renaming the key high leverage point to be Ability to Detect Deception and changing it to a stock instead of a variable. (It is traditional to capitalize the names of stocks, due to their central importance in stock and flow models.) The Critical Point Reaction Subsystem, as shown below, was then built around this stock to give it a realistic critical point and change delay.

The critical point reaction occurs when corruption, as measured by percent rationalists, falls below a certain arbitrary cultural corruption critical point.

A corruption cycle works like this: Once the critical point is reached a very common complex social system reaction occurs. The reaction to excessive corruption activated variable goes from false to true, after a reaction delay of 5 years. This causes additional investment to be added to the normal cultural investment rate, which increases a society’s investment in raising Ability to Detect Deception, such as by launching investigations, publishing information on who is corrupt, prosecuting corrupt officials, and changing the processes of its governmental institutions to be more corruption proof. This takes time, as represented by the investment

**The Critical Point Reaction Subsystem**

![Figure 18. This simple subsystem imitates how society reacts when corruption rises above an unwritten, culturally defined critical point. This reaction is part of a cycle that never ends, because presently there is no formal, enduring mechanism in governments to keep Ability to Detect Deception permanently high.](image-url)
delay of 5 years and by the way it takes many years to fill the stock up to the high level needed to detect most corruption.

As the stock of Ability to Detect Deception investments accumulates, more and more false memes are detected. Once the stock rises high enough, so much falsehood and favoritism is detected that percent rationalists rises so high that the corruption critical point is no longer exceeded. This causes reaction to excessive corruption activated to change back to false, which causes additional investment to change back to zero, which causes the stock of Ability to Detect Deception to start falling. It continues to fall until it goes so low that another critical point reaction is triggered, and the cycle starts over again.

Above is the table of simulation runs needed to illustrate the dynamic behavior of the critical point model. In all runs repulsion to corruption is 20%. In a real solution it probably needs to be increased a bit, but here we leave it alone for simplicity.

**Run 15** – This run has no critical point reaction since the corruption critical point equals 0%. Thus this run’s behavior is identical to run 11 because additional investment has not yet been triggered.

The subsystem has a normal cultural investment rate that keeps Ability to Detect Deception at 20% when additional investment is zero. Run 15 is the reference mode for the critical point model. In the graph percent rationalists has been replaced by Ability to Detect Deception, which in this run is a constant 20%.

It takes this run only a hundred years to reach steady state equilibrium. To show the cyclic nature of the dueling loops in later runs, the reaction start year is set to 1900. Starting the reaction then instead of in 2000 (which would be about now, and make the modeling experience a little more true to life) gives us more cyclic activity to look at, so that we can understand the model and its implications more clearly.

**Run 16** – In this run the critical point is changed from 0% to 35%, which means the critical point reaction will take place whenever percent rationalists dips below 35%. Since in the reaction start year of 1900 percent rationalists equals 20%, the critical point reaction starts then. The simulation results show such insightful social system behavior that we have enlarged the graph for this run, so the details may be more easily seen.

The graph shows the cycles are about 200 years long. This is much longer than the corruption cycles (really exploitation cycles) we see today. Thus it is more representative of the deeper cycles that occur, such as those due to changes in styles of government, which are a reaction to very deep social system drivers like class oppression by a landed aristocracy or a hereditary line of rulers. If the four delays in the model are reduced to low levels, cycle length falls to about 75 years, which is closer to what we see in cyclic political party dominance or exploitation by life forms or special interest groups like the modern corporation, due to corruption and other related factors that tend to obscure the fact that exploita-
tion of the race to the bottom is the central driver of these cycles. (75 years requires investment delay = 1 year instead of 5, reaction delay = 1 year instead of 5, incubation time = 1 year instead of 10, and infection lifetime = 5 years instead of 20.)

For example, the last time the modern corporation was ruthlessly dominant in the US was in the late 19th century. The cycle was ended with a backlash against the oppressive power of corporations that led to passage of legislation like the Sherman Anti-Trust Act of 1890. But now corporations are overly dominant again, due to successful exploitation of the race to the bottom.

The important thing to realize is that the natural tendency of the dueling loops is to be cyclic. The length of the cycles varies greatly, depending on a host of factors, only a few of which are incorporated in the model. Because there are many corrupt politicians and special interest groups trying to exploit the race to the bottom, there are many cycles underway at the same time. A political system will be most dominated by whichever cycle(s) are currently dominant and by how strong and clever the various exploiters are.

Let’s walk through a cycle and explain what’s happening, both in the model and the real world it attempts to represent.

A cycle begins when percent rationalists falls below the corruption critical point. Then, after a reaction delay of 5 years we see that Ability to Detect Deception suddenly spikes upward. These spikes are mass panic reactions to flagrant amounts of corruption. When a spike is underway a society will be wildly investing in all sorts of things to increase the public’s ability to spot political deception, like editorials and articles explaining how certain politicians are using lies and favoritism to achieve their nefarious goals, investigations to get to the bottom of various scandals and root out corrupt politicians, speeches extolling the importance of virtue and the ravaging effects of corruption, and so forth. Mechanisms to detect falsehood will start spontaneously appearing, such as the way factcheck.org appeared in the 2004 election in the US.

The incubation time of 10 years and other delays causes the percentage of degenerates to not fall as fast or as soon as Ability to Detect Deception spikes upward. Instead, there is a noticeable lag. While it takes only about 25 years for Ability to Detect Deception to reach its peak, it takes about 70 and 80 years for the percentage of degenerates to fall to its lowest level and for the rationalists to reach their peak. These excruciatingly long delays do occur, because it normally takes generations for fundamental cultural norms, like ideology allegiance or addiction to consumptive extravagance, to shift radically.

Once a critical point reaction occurs, eventually the degenerates fall out of power and the rationalists come into power, and a society enters good times. Those times are so good, and what is allowing them is so well hidden, that without realizing it society “forgets” that it should be investing in keeping the Ability to Detect Deception high. The result of this oversight is that very early in the cycle the level of detection ability starts to fall. In this run it starts to fall after only about 25 years, which is 1/8 of the cycle’s length. It continues to fall, though the rate of fall slows down as it approaches its normal level of 20%.

In the graph the good times begin when supporter type crossover occurs after about 35 years. After this the rationalists are dominant. This lasts for about half the cycle’s length, and then crossover occurs again as the degenerates become dominant. As the percentage of degenerates continues to increase, it eventually triggers another critical point reaction and the cycle starts all over again.

Notice that after 1900 the percentage of neutralists stays within a range of 17% to 29%. This corresponds to the roughly 10% to 30% of the population who are the so called “swing voters.” These voters are not strongly committed to either side. If the percentage of rationalists is close to the percentage of degenerates in a political system, as it so often is, then it is the neutralists who determine election outcomes. This fact has not escaped the attention of election strategists.

Run 17 – In the first draft of this model write up I completely missed the fact there is a very successful strategy the degenerates can employ to totally overcome what the rationalists did in run 16. It was only due to correcting a modeling error, which took two days, that I noticed that the wily degenerates have an ace up their sleeve.

Once the cyclic behavior of run 16 begins, the degenerates are dominant a little less than half the time. Thus they are losing. But as the graph below shows, they can win by “losing” even more! This is done by increasing false meme size from 2.4 to 4.7 so as to get caught red handed even more. This causes the pre 1900 portion of the run to level out at 40% percent rationalists.
instead of the 20% that we saw in run 15. The amazing result is the critical point of 35% percent rationalists is never triggered, the cyclic behavior never happens, and the degenerates, instead of being dominant less than half the time as in run 16, now stay at 60% dominance! How’s that for craftiness?

In other words, at a 35% critical point corrupt politicians can win big by telling whoppers they know are going to be detected and cause them to lose more supporters. This corresponds to the flagrant, braggadocio style of lie spinning and cash for favors we sometimes see corrupt politicians or political parties engaging in. There seems to be no logical reason they would try to get caught. But from the viewpoint of the model, there is a perfectly sane reason for such insane behavior: it is the winning strategy. Figuring out why baffling, counterintuitive social behaviors like this occur is impossible without building models like this one.

Another way to explain this is that by increasing the size and/or frequency of lies, the degenerates get “caught” more often. This results in fewer degenerates and hence more rationalists. The beauty of the strategy is it results in just enough rationalists, 40%, to avoid triggering the critical point reaction than would occur if percent rationalists dipped below 35%. If this occurred, after a 5 year delay Ability to Detect Deception would suddenly spike upward, due to a mass reaction to too much corruption, and we would see the cyclic behavior of run 16.

Run 18 – It looks like our friends, the virtuous politicians, have no choice but to try a higher critical point. Let’s hold false meme size at 4.7 and raise the critical point to 50%.

Once again we have cyclic behavior, though it is a little less so than in run 16. This time the degenerates are dominant only about 10% of the time.

This run begs the intuitive question, if Ability to Detect Deception is 50%, then why aren’t the rationalists and degenerates each dominant about 50% of the time?

The answer is they would be, if repulsion to corruption was 0% instead of 20%. But 0% is unrealistic, because some people do take effective action when they detect corruption, so we have used the value of 20%.

We must not forget for a moment the cleverness of those who believe the end justifies the means. Is there a winning strategy the degenerates can use to counter a critical point of 50%?

Run 19 – Yes there is. Telling even bigger whoppers works like a charm once again. A false meme size of 5.6 allows the degenerates to do much better than being dominant 10% of the time, as in run 18. The results show they don’t do quite as well as run 18, because now they are in the minority. But they have achieved a dominance of 45%, which is definitely enough to achieve many of their goals, not to mention the sizable impact such a large minority would have on political decision making.

Run 20 – The rationalists need to do much better. Let’s get serious and increase the critical point to 70%. Surely this will do the job. At least I hope it does, because raising Ability to Detect Deception that high is not going to be easy.

The results of this experiment are much better, as expected. For the first time the rationalists are safely in control of the political system all the time, by a very comfortable margin. There is still a little cyclic behavior, but now the forces of reason are never seriously challenged. The rationalists average about 60% of the population and the degenerates average about 20%.

Once again, is there a strategy the degenerates can use to do better? No. At least not the way this model is constructed. A false meme size of 6.7 does avoid trig-
Part 3. Now We Are Ready: Solving the Sustainability Problem

generating the critical point reaction, but the degenerates average only the same percent dominance. That strategy does not give a better outcome. In this run their best strategy is to maximize their cyclic dominance and use the chaos that causes to try for a lucky victory, which requires adapting to an optimal false meme size of about 4. Thus an important conclusion we can draw from this model is that a high level of Ability to Detect Deception is required to successfully counter the extraordinary power of the race to the bottom.

We are not yet finished. Looking at the graph closely, this run is still not good enough, because even a 20% minority, with occasional swings to over 25%, can still upset the applecart. In modern democracies, every sizable minority still has a voice that must be listened to and frequently accommodated. Thus if a society was trying to deal with a problem so large and difficult that it required all of that society’s or a planet’s attention to solve it, a 20% minority would prevent that.

So how high does the critical point have to go to solve the problem? That is, how strong does a society’s organizational memory have to be for it to always remember how to prevent excess corruption? Let’s continue experimenting to find out, by raising the critical point again, this time to 95%. The optimal false meme size of 4 remains the same.

Run 21 – The cyclic behavior is now almost completely gone. But some still exist and there are still a few degenerates to be reckoned with. Is a critical point of 95% good enough to solve problems as intractable as the global environmental sustainability problem?

I think not, for several reasons. One is that as long as some cyclic spikes exist in a social system, it is too easy for those signals to obscure other signals and thus add to the complexity of any problems a society may be trying to solve. Ability to Detect Deception spikes are not just another signal—they lay at the very heart of human systems, because they are attempts to adjust the perceptual acuity of self-governance. That acuity needs to be at least 20/20 to be able to see the true facts of the many complex, difficult problems governments are responsible for solving. Thus spike signals due to rising degeneration must be responded to in a serious manner, because they may indicate problems of great importance. In addition to the signal confusion problem, spikes in Ability to Detect Deception investment siphon investment away from other endeavors.

There is, however, an even greater reason that a corruption critical point of 95% is not good enough. I believe you can see for yourself what that reason is, from this article that appeared just yesterday as I was writing this. Only the first half of the article is quoted. The rest adds very little to the article’s basic argument. (Italics added)


“In December 1997, representatives of most of the world's nations met in Kyoto, Japan, to negotiate a binding agreement to cut emissions of greenhouse gases. They succeeded. The Kyoto Protocol was ultimately ratified by 156 countries. It was the first agreement of its kind. But it may also prove to be the last.

“Today, in the middle of new global warming talks in Montreal, there is a sense that the whole idea of global agreements to cut greenhouse gases won't work. A major reason the optimism over Kyoto has eroded so rapidly is that its major requirement - that 38 participating industrialized countries cut their greenhouse emissions below 1990 levels by the year 2012 - was seen as just a first step toward increasingly aggressive cuts.

“But in the years after the protocol was announced, developing countries, including the fast-growing giants China and India, have held firm on their insistence that they would accept no emissions cuts, even though they are likely to be the world's dominant source of greenhouse gases in coming years. Their refusal helped fuel strong opposition to the treaty in the United States Senate and its eventual rejection by President Bush.

“But the current stalemate is not just because of the inadequacies of the protocol. It is also a response to the world's ballooning energy appetite, which, largely because of economic growth in China, has exceeded almost everyone's expectations. And there are still no viable alternatives to fossil fuels, the main source of greenhouse gases.

“Then, too, there is a growing recognition of the economic costs incurred by signing on to the Kyoto Protocol. As Prime Minister Tony Blair of Britain, a proponent of emissions targets, said in a statement on Nov. 1: ‘The blunt truth about the politics of climate change is that no country will want to sacrifice its economy in order to meet this challenge.’ ”
Chapter 14. The Dueling Loops of the Political Powerplace

Why the International Stalemate Exists

Figure 26. What Tony Blair was really saying is no country can afford to “sacrifice its economy” to get out of the above race to the bottom. This is because the New Dominant Life Form has structured the international commerce game so that nations see the main loop before the side loop. The way out is to raise ability to detect deception at the level of nations, so that they can break free of the illusion that they are trapped in the main loop, and can see the truth: that the Pay the Piper Later side loop is the more important loop to their citizens.

The message I glean from this article is that the solution adoption resistance part of the problem has reached the stage where it is no longer just difficult—it may now be impossible to solve in time. This is because, as shown in Tony Blair’s statement, most of the world is trapped in an Economic Race to the Bottom among Nations (as shown in the diagram above) and doesn’t know how to get out. But guess what life form benefits most from that particular downward spiral and therefore has caused it to happen? And guess what high leverage point must be pushed extraordinarily well to stop that downward spiral in its tracks?

The problem is now so close to the threshold of insolvability (or past it, we really don’t know) that society no longer has the luxury of tolerating any corruption, because any corruption hinders solving the problem and could tip it over the threshold.

One solution alternative is to wait until the first “wake up call” environmental catastrophes start to occur, and then use the belated global realization that humanity must solve the problem to move forward on a solution. But if we wait that long, Humpty Dumpty will have already fallen off the wall, and it will not be possible to put all of the pieces back together again.

The case can even be made that as percent degenerates approaches zero, a multiplier effect is at work. These last few percent are the desperate, hard core degenerates, which usually includes the smartest of the lot due to the way degenerate leaders tend to hold out until the bitter end, like Hitler. As percent degenerates goes low, every special interest degenerate ties up two or more for-the-good-of-all rationalists, because (under present conditions) that’s how many people it takes to handle damage control and counter the insidious, endlessly disruptive stream of falsehood and favoritism.

Therefore a rule of zero tolerance to political corruption must be adopted, so that Homo sapiens is not distracted while it attempts to save itself from ecocide. Anything less is just asking for trouble when it comes to figuring out how to get the US, China, India, and the entire world on board a rapid and radical solution to the climate change problem, as well as to other global environmental problems such as topsoil loss, deforestation, and groundwater depletion.

Let’s take a look at what would happen if we tried the rule of zero tolerance in the final simulation run, by using a critical point of 100%.

Run 22 – As expected, zero tolerance to corruption completely ends the cyclic behavior of the dueling loops. Once the rationalists rise to dominance they stay there. Degenerates do not just drop to a low level—they are reduced to 0%. Their best strategy is to hold out as long as possible, by using a false meme size of 4.7. After about 50 years, society’s Ability to Detect Deception holds steady at 80%. A successful transition to solving the solution adoption resistance part of the problem has occurred.

But this transition takes a long time. It takes about 25 years for rationalists to begin to outnumber degenerates, and 40 years for percent rationalists to rise to 69% (barely over a 2 to 1 majority), which was mentioned in run 13 as probably the bare minimum it will take to
make a serious start on solving the problem, though it is still too low to be enough. As we argued in run 21, it will take somewhere near 100% to be enough.

Because the model is not calibrated (the numbers used in it are estimated, not measured), it cannot make accurate predictions. Nevertheless, it does look as if solving the solution adoption resistance part of the problem will take a long time. Will it take too long? That is one of the great questions facing problem solvers and civilization.

* * *

This completes the presentation of the dueling loops simulation model. This model is a simplified version of a larger one explaining more of the problem. The model presented here contains 4 stocks and 43 variables. The larger one has 11 stocks and 123 variables. This allows the larger model to clearly show how the New Dominant Life Form is exploiting the race to the bottom by the use of a subsystem that pits corporate proxies against humanists in a life or death battle for niche dominance. The larger model also goes into more detail on the high leverage points and even includes a third one: quality of political decision making. It is this third high leverage point that must be pushed if humanity is to correctly couple the human system to the environment system, in such a manner that the problem is solved as fast as possible and never occurs again. If you are interested in examining the simulation models presented here, the larger model, or the manuscript in progress this chapter is a partial summary of, please see thwink.org.

The Six Sample Solution Elements

It is one thing to point out where to push to solve a complex system problem, and quite another to say how to push. In addition, the high leverage points covered in this chapter are unconventional. It is probably not at all obvious how to push on them and to begin to implement the concepts in this chapter. Also, a little fresh thinking is needed.

For these reasons chapter three presented six sample solution elements, starting on page 42. These are:

1. Freedom from Falsehood
2. The Truth Test
3. Truth Ratings
4. Corruption Ratings
5. No Servant Secrets
6. The Sustainability Index

The first is a fundamental new right so the others have the foundation they need. The rest push on the high leverage point of general ability to detect political deception, either indirectly or directly.
Will these solution elements work? Only experimentation and further analysis will tell.

But that is not the most important issue here. The real issue, the one that’s going to make or break mission success, is whether or not we are following the right process. If we are, it is only a matter of time before we perform the right analysis, converge on the right solution, and implement it.

Summary and Key Findings

Simplifying enormously, most conventional wisdom says all we need to do to solve the sustainability problem is to find the proper practices needed to live sustainably and then aggressively promote those practices until they are adopted. This approach has tremendous logical and technical appeal. The inner talk runs about like this: "Solving this problem is basically a matter of finding out what's best for the good of all, and then spreading that knowledge. Once people and governments see what's in their own best interests, they will start doing things that way, because people are rational."

There is, however, a slight drawback to this approach. It doesn’t work.

This is because it completely misses the social side of the problem, and fails to see the hidden social structure that is the true cause of decades of solution failure. If problem solvers would focus their efforts on why so much change resistance is occurring they might find, as this analysis has, that all they’ve been doing is engaging in “more of the truth.” This is a low leverage point. Pushing on this point fails because it is no more than a heavy handed, naive attempt to make the race to the top dominant through the application of brute force. It does not consider that the race to the bottom is inherently stronger and has a more powerful special interest group behind it. Thus conventional approaches have no hope of succeeding, unless the laws of physics change or a “wakeup call catastrophe” occurs in time. Neither appears likely.

Fortunately there is at least one way out. It is the high leverage point of general ability to detect political deception. Currently this is low. If problem solvers can raise it to a high level the race to the bottom will collapse, leaving the race to the top dominant. Politicians will then respond correctly to the truth about the global environmental sustainability problem because it will now be in their best interests. If they come to the same conclusion that environmentalists have, that sustainability is civilization’s top priority and nothing else comes close, then civilization will at long last enter the Age of Transition to Sustainability.

The Next Subproblem

Pushing on the right high leverage points of the Dueling Loops only solves the first subproblem of change resistance. There is still the second subproblem of proper coupling.

Presently most efforts focus on just getting the second problem solved at all, because problem solvers have been growing increasingly desperate. As a result, popular solutions consist of a large, intuitively derived collection of elements that awkwardly attempt to solve the problem in any way possible. This leads to what our analysis shows to be shallow, symptomatic, inefficient solutions. But once change resistance is overcome we can move the focus to where it should be: proper coupling efficiency.

Inefficient coupling will result in a solution that cannot be maintained. It may cost too much, it may demand too much attention, it may breakdown because dominant agent incentives are not fully considered, it may cause undesirable side effects, and so forth. If one or more of these factors is not fully resolved, the solution will work at first. But over time it will fail, either slowly or suddenly.

The next chapter looks deep into the proper coupling problem, with the goal of finding a solution path that is inherently efficient. If this can be done, then we can solve the sustainability problem.

Otherwise we will only think we have.
Currently the human system is improperly coupled to the larger system it lies within: the environment. The result is the runaway environmental overshoot we see today. It appears possible to engineer a business model that is so ethically and financially attractive that its rapid adoption by the global business community would solve the sustainability problem as quickly as is realistically possible.

This chapter presents a theoretical foundation for how this can be done, using an analysis of why the two systems are presently improperly coupled, and a proposal based on that analysis that would result in a highly efficient, self-managing proper coupling of the two systems.

Strategic Overview

The goal of the Proper Coupling Package is to properly couple the human system to the environment, so that the human system acts in an environmentally sustainable manner. The package consists of three solution elements: Environmental Property Rights, Reflective Pricing, and Worldism. Based on the even more fundamental concept of common property rights, an environmental property right is the legal right to own and manage a common environmental “property,” such as the percentage of atmospheric CO2 or the health of a river, in much the same way that private property is owned and managed. Reflective Pricing is about the simplest possible implementation of how to manage environmental properties. Worldism is global cooperation on global problems and opportunities, which is necessary to make and enforce the decisions necessary for a uniform global implementation of Environmental Property Rights.

The chief benefit of the Proper Coupling Package is that it is a universal, self-managing approach to all sources of environmental degradation. Once the basic universal legal rights and regulatory bodies are established the solution pretty much runs itself, as opposed to the present day approach where every new environmental problem is solved on a custom basis that inevitably involves haggling, long delays, and imperfection due to compromise and change resistance.

The chief strategy of the package is to design a standard business model that corporations can use over and over to manage the millions of global environmental properties that must be properly controlled if civilization is to achieve global environmental sustainability. The business model is designed to be so ethically and financially attractive that the sustainability sector of the economy will quickly attract the large amounts of top managerial talent and effort needed to move civilization into the Age of Transition to Sustainability.

The Context of the Proper Coupling Package

The Proper Coupling Package is the fourth of five packages engineered in A Model in Crisis (a book in progress at Thwink.org) to solve the complete global environmental sustainability problem. It can only be implemented after the change resistance part of the problem is resolved, using the first three packages. However, it appears that if the business model can be designed to be attractive enough, and an incremental startup approach can be taken beginning with receptive regions of the globe, it may be possible to overcome this resistance without resorting to the first three packages. This would accelerate the solution by an estimated 10 to 20 years and would be a tremendous breakthrough.

The work at Thwink.org is driven by the System Improvement Process. This breaks complex social system problems down into three subproblems: how to overcome systemic change resistance, how to move the system from the present state to the goal state (also known as the technical side of the problem or proper coupling), and how to keep the system in the goal state indefinitely. The Proper Coupling Package solves the second of these subproblems.

The System Improvement Process has these steps:

1. Problem Definition – What is the problem? This is defined in terms of the goal state versus the present state of the system with the problem. In the goal state the system is environmentally sustainable.

2. System Understanding – Why are the three subproblems occurring?

2.1 Why is there such strong resistance to adopting the solution?

2.2 Why is the system not naturally in the goal state?

2.3 Why is the system not staying in the goal state?
3. **Solution Convergence** – How can the three sub-problems be solved?

3.1 How can adoption resistance to the solution be overcome?
3.2 How can we move the system to the goal state?
3.3 How can we keep the system in the goal state?

4. **Implementation** – Once a solution is found, this uses three sequential substeps to solve the three sub-problems:

4.1 Overcome resistance to solution adoption.
4.2 Move from the present state to the goal state.
4.3 Stay in the goal state indefinitely.

The first step defines the overall problem. The process then decomposes the overall problem into three sub-problems, and uses main steps 2, 3, and 4 to solve each of them. The Proper Coupling Package is the answer to the question in step 3.2: How can we move the system to the goal state?

It is crucial to understand why the Proper Coupling Package has a high probability of succeeding. It is the output of the process steps that precede step 3.2. Here is a short review of the most relevant steps:

**Step 1. Problem Definition** – This formally defines the problem using the standard format of “Move system A under constraints B to goal state C by deadline D with confidence level E.” The nutshell summary of the problem definition is:

> The global environmental sustainability problem will be solved when all critical environmental properties are being held in their safe zones indefinitely or are moving there within a predictably safe time span.

An environmental property is a measurable amount of a physical substance in a defined area. Examples are the amount of CO2 in the air, the level of mercury pollution in the Huangou River as it passes through Shanghai, the species extinction rate on the island of Madagascar, or the amount of chromium ore remaining in the earth’s crust. A property may be local, regional, or global. A critical environmental property is a property that requires active management to stay in its safe zone.

A safe zone is the range an environmental property must be in for society’s preferred quality of life. Each environmental property has a safe zone. Safe zones are a common concept, as shown on the voltmeter.

By defining the problem in this manner we have avoided the trap of improperly coupling the environmental sustainability problem with other problems, such as poverty or the plight of less developed nations. We have also defined the problem in a manner that will maximize focus of work and problem solving efficiency.

In particular, the introduction of the abstractions of environmental properties and safe zones almost magically opens a seldom explored path to solving the problem.

**Step 2.1 Why is there such strong resistance to adopting the solution?** – This step determined that the prime reason for such strong resistance is the Dueling Loops of the Political Powerplace. The Dueling Loops is an invisible social structure that offers corrupt politicians an inherent structural advantage over virtuous politicians. As a result, corruption, in the form of controlling election outcomes through donations (legal bribes) and in the form of favoritism to pay back those donations, is the norm in politics today, particularly in the United States.

This step also found that Homo sapiens is no longer the dominant life form on the planet. That honor now goes to what the analysis calls the New Dominant Life Form, which is the modern corporation and its allies. It appears that the New Dominant Life Form, through the use of massive amounts of lobbying, donations, aggressive think tanks like the Heritage Foundation, and clever manipulation of the media, has figured out how to exploit the power of the race to the bottom of the Dueling Loops. This is true in most industrialized nations, and even more so in the US where the New Dominant Life Form elected a strongly pro-corporate administration in 2000.

Please note this is not an indictment of all corporations and their managers. Most are doing the best they can, and are basically good. Each agent, from its own perspective, is behaving rationally. *It is the life form as a whole that has the emergent property of behaving unsustainably.* This is because the top strategy of for-profit corporations is to maximize the net present value of profits. This results in the New Dominant Life Form promoting behavior that improves short term profits, at the cost of reducing long term profits due to environmental degradation and natural resource depletion.
To summarize, the main reason there has been such strong resistance to solving the global environmental sustainability problem for the last 30 years is the presence of the Dueling Loops of the Political Powerplace, combined with the appearance of the New Dominant Life Form.

Step 2.2 Why is the system not naturally in the goal state? – This a little subtle. On the surface, the answer appears to be what was mentioned above: The system is not naturally in the goal state because the most powerful agent in the human system, the New Dominant Life Form, currently has a very strong incentive to push the system toward the present state, which is unsustainable. But there is a deeper reason, one that provides a powerful clue on where to begin to engineer a solution: The system lacks the proper incentives for the dominant system agent, corporations, to behave sustainably.

Step 1 of the System Improvement Process defined the problem as: The global environmental sustainability problem will be solved when all critical environmental properties are being held in their safe zones indefinitely or are moving there within a predictably safe time span. Seen from this point of view, there is a large flaw in the human system that, once corrected, will solve the problem. The flaw is that no fundamental incentive exists for dominant system agents to manage the critical environmental properties properly. In other words, the human system and the environment are presently improperly coupled. Thus the short answer to the question, Why is the system not naturally in the goal state? is the lack of a proper coupling mechanism.

Now that we have a clear diagnosis we can move on to designing a treatment that can cure the patient. This is what the next step does.

Step 3.2 How can we move the system to the goal state? – The system of interest is the human system plus the greater system it lies within: the biosphere. The goal state is global environmental sustainability, as measured by all critical environmental properties being in their safe zones or moving there in time. The key to moving to the goal state, once system change resistance is overcome, is resolving the flaw of no proper incentive for the dominant system agent, corporations, to behave sustainably. The Proper Coupling Package resolves this flaw by deep structural change to the human system, in the form of a new universal right just as fundamental as the right to equality, liberty, and fraternity. The new universal right is Environmental Property Rights. Upon this foundation the rest of the package, Reflective Pricing and Worldism, is built.

This explains how the Proper Coupling Package is the output of a formal process. Next let’s review the package’s foundational concept and its three solution elements. Then we will put them all together into the business model.

The Foundational Concept – Common Property Rights

Environmental Property Rights are a type of common property right. A property is some aspect of a system that can be measured. A property may or may not be valuable to people. A property’s value can vary over time due to a system’s state.

A common property is something that a society must hold and manage in common, because the property benefits the group. This differs from the concept of private property, which is not held in common, because private property mainly benefits only its owner or renter.

As a society evolves it gradually improves the rule set it uses to run itself. The more fundamental a particular rule is, the more benefits to society that can be built on that rule. Examples of fundamental rules are the concepts of law, democracy, individual freedom, and private property.

Common property rights are a logical evolutionary progression of private property rights. First a society discovers that private property rights would greatly reduce conflict and greatly increase citizen satisfaction. Then it discovers that there are some types of system properties that fall outside the bounds of private property into common property. Examples of common properties are enforcement of the law, the provision of public water and sewage systems, and the construction and maintenance of roads. These are system properties in the sense that each can be measured. For example, enforcement of the law is measured by the percent of laws being enforced. If this is low society suffers.

Once the generalization of common property rights exists, a society can codify it into law in the same manner as other rights. As far as I know no society has done this. Rather than be the first, which could get into scope creep, we will take the smaller and much simpler evolutionary step of starting with just one type of common property right, which becomes the first solution element. But as we do this we must remember that the first solution element’s foundation is the concept of common property rights.
Solution Element 1 – Environmental Property Rights

An environmental property right is the legal right to own and manage a common environmental “property,” such as the percentage of atmospheric CO2 or the health of a river, in return for the responsibility of keeping the property in its safe zone or moving it there in time. By “in time” we mean within a predictably safe time span, such as in 20 years. Note that a common property owner owns the health of the river, not the river itself.

Objective

Recall that the objective of the Proper Coupling Package is to properly couple the human system to the environment, so that the human system acts in an environmentally sustainable manner.

The objective of Environmental Property Rights is to create the new cultural norm necessary to attach the preferred coupling mechanism(s).

Environmental Property Rights are the next evolutionary step after private property rights. Imagine the world before the concept of private property rights ever existed. All property is communal or just there. If you have something in your hand or your hut, it is under your control, but there is no concept of ownership.

Next, imagine the concept of private property rights is invented. People can now “own” property. But there are many ways a society can define the ownership mechanism. In one region it might be on a purely verbal and memory basis. Another might use notched sticks at the chief’s lodge to keep track of who owns what. Another might set up a code of law to define the whole thing. And so on. The point is that a wide variety of mechanisms can be used to implement the concept of private property rights.

In a similar manner Environmental Property Rights introduces a new concept to the modern world. Exactly how it will be implemented can vary, and probably will as time goes by. One way to implement this new right is Reflective Pricing, which is covered later in this paper.

Rationale

Without Environmental Property Rights everybody’s business is nobody’s business, because there is no one with the incentive to wisely manage and protect the millions of “global commons” environmental properties.

Property rights have long applied to land, buildings, farm animals, and all sorts of objects. Property rights have proven to be a fundamental prerequisite to modern civilization. By extending the notion of property rights to environmental properties, a long standing flaw in the human system is finally corrected with a minimum amount of effort and complexity. It’s a simple, scalable, elegant solution to a very complex problem. Decades from now we may consider Environmental Property Rights just as historically fundamental as the right to vote and numerous other foundational human rights.

The elegance of Environmental Property Rights is that once the concept is added to the human system, it is much easier to activate new environmental properties as they become necessary. Contrast this to the present, where each newly discovered problem becomes a bruising battle handled on a case by case basis. The battle is too often lost. It is also too often handled differently from country to country, making it more difficult to resolve the problem globally.

Description

Environmental Property Rights would include these key aspects: (Please remember this is a very tentative first pass.)

1. Claims – Anyone may file a claim on an unclaimed environmental property. All they have to do is show that presently the property is unmanaged, that managing it will benefit humanity, and how they would manage it wisely. This is similar to the way settlers filed claims on a piece of public land they wished to own, or the way miners file mining claims. The notion of claims allows new environmental problems to be automatically solved by market forces, which will greatly accelerate solving the complete environmental sustainability problem. A self-managing free market approach is much more efficient than a regulatory approach or a command and control economy, because these two alternatives lack the proper feedback loops to be highly efficient.

2. Income – The owner of an environmental property may charge users of that property a fee for the privilege of “using up” that property. This would allow the owner to adjust the fees to the level needed for sustainable use of the property, in the same manner that Adam Smith’s invisible hand automatically regulates supply and demand by the setting of prices. Fee income may be used for any purpose desired, as long as it relates to solving the global environmental sustainability problem and gives priority to the property the fees came from. Fees must be charged in a uniform manner to all users.

3. Reward for wise stewardship – The regulatory body administering Environmental Property Rights will reward property owners for wise stewardship. The reward is the amount of the income a property owner may keep as net profit. The reward curve will
be calculated in such a manner as to greatly reward helping to move civilization to sustainability in time and keep it there. The reward curve will be published and predictably stable. The better a property is managed the higher the reward.

4. Accountability – All environmental property owners are responsible for moving their property to the safe zone as fast as is reasonably possible and keeping it there indefinitely. Those failing to do this will lose their claim, and the property will revert back to being an unclaimed environmental property.

Solution Element 2 – Reflective Pricing

Reflective Pricing is a free market mechanism causing the transaction price of everything to reflect the best interests of the buyer, the seller, and the environment. It requires Environmental Property Rights.

Objective

The objective of Reflective Pricing is to implement the concept of Environmental Property Rights in a reasonably efficient and effective manner. This is done by providing the actual coupling mechanism between the human system and the environment. In the jargon of economists, Reflective Pricing serves to internalize what are now externalized costs.

Overview

Reflective Pricing adds “fees” to the price of any unsustainable behavior. The more unsustainable it is, the higher the fee. This causes more sustainable practices to be substituted for unsustainable ones. Over time the human system gradually becomes more and more environmentally sustainable, until eventually it is 100% sustainable.

The fees must be large to have an effective impact, so they must be particularly large on practices that seem “necessary.” This will generate huge amounts of income. Rather than use that income for something else, such as income tax reduction or wealth redistribution, it is used for administrative expenses and “buys.” A buy is a payment from a property manager to buy a human activity that benefits the property or some other aspect of the sustainability problem. Examples are technology development, educational programs, assistance programs to adopt more sustainable practices, and transfer of knowledge to low income areas of the world.

Each environmental property has a safe zone the property must stay in or be moving towards in time. The further a property is from the safe zone, the higher the fees, and so the more money available for buys. Fees push properties towards the safe zone. Buys pull it there. These two forces create an extremely efficient set of feedback loops working together to cause the price of everything to now not only reflect the interests of the buyer and seller, but also the environment. Adam Smith’s invisible hand now reaches where it should.

Because the money available for buys will be so large, buys will have a sizable affect on the human system. If they are used on high leverage areas they can have much more of an impact than fees. Buys essentially amplify the power of fees.

For example, fees that raise the price of gasoline tend to have little effect on consumption until they grow quite large. But a modest fee of, say, .10 euros a gallon, would raise about 50 billion euros a year worldwide. If 20% of that (10 billion euros a year) was invested in just one type of buy, development of ways to reduce greenhouse gas emissions from the burning of fossil fuels, and the results were given free of charge to anyone to use, the effect on greenhouse gas emissions would be stunning. But we can do better than that. If another 20% of the buys went to research on ways to reduce deforestation, and the results of that were also given away, the results would be even more impressive. Finally, if 40% of the buys went to implementing the results of the research on ways to reduce greenhouse gas emissions and deforestation, the climate change problem would be well on the road to being solved. And all for a mere .10 euros a gallon.

It is essential to not use the income from fees for anything other than improving environmental sustainability, because that would introduce new feedback loops that would greatly distort system behavior. For example, using fees to reduce personal and corporate income tax would give people and corporations the perverse incentive to NOT solve the sustainability problem, because solving it would raise their income tax!

Next let’s examine the reasoning behind the design of Reflective Pricing.
Rationale

To fully understanding why Reflective Pricing is designed the way it is, let’s examine a series of causal flow diagrams. We will start with a small one and add more loops until we have the complete diagram.

The diagram above models the state of the environmental while *Homo sapiens* was still only a hunter/gatherer. This mode of existence was permanently environmentally sustainable.

Think of *Environmental Degradation* as a gigantic bathtub. The fuller it is, the worse the degradation. The bathtub fills up due to the *damage rate* and empties due to the *restoration rate*. The *natural damage rate* is equal to the *natural restoration rate*, causing the level of Environmental Degradation to stay at a low, normal level. If the natural damage rate increases, such as when a volcano erupts or a hurricane hits, the natural restoration rate goes up to accommodate it, until the level of Environmental Degradation returns to normal.

While the human system was still primarily one of living off the land without disturbing it, the human system had no significant effect on the damage rate. For example, the Australian aborigines established a hunter/gatherer society that was sustainable for 40,000 years on an entire continent.

But starting around 10,000 years ago, some groups of *Homo sapiens* broke that pattern with the invention of agriculture. Later the inventions leading up to the Industrial Revolution broke it still more, tipping the human system into a grossly unsustainable relationship with the biosphere, as shown on the next page.

That subsystem is the basic problem to be solved, in terms of symptoms and direct causes. Direct causes are also known as proximate, immediate, or superficial causes. The diagram aggregates all undesirable environmental symptoms into *Environmental Degradation*. This consists of three types of degradation: pollution, depletion of renewable natural resources, and depletion of non-renewable resources. Examples of each of these are global warming due to greenhouse gases pollution, the depletion of fish stocks and deforestation, and the depletion of concentrated minerals such as oil, chromium, and copper.

Before the environmental sustainability problem occurred, the *damage rate* and the *restoration rate* were equal, and the level of degradation was low. But today we have a different story. The *damage rate* exceeds the *restoration rate* by such a serious amount that the bathtub is filling up. When it starts to “overflow,” catastrophes such as local famines and local epidemics will begin. This will later be followed by global population and economic collapse. Thus we have a serious problem that must be solved proactively on a system wide basis.

The subsystem contains four feedback loops. The upper two are natural, while the lower two are man-made.

The *Natural Damage* loop is normally very minor. Suppose lightning causes a forest fire. This increases the *damage rate* and empties due to the *restoration rate*. The *natural damage rate* is equal to the *natural restoration rate*, causing the level of Environmental Degradation to stay at a low, normal level. If the natural damage rate increases, such as when a volcano erupts or a hurricane hits, the natural restoration rate goes up to accommodate it, until the level of Environmental Degradation returns to normal.

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The subsystem contains four feedback loops. The upper two are natural, while the lower two are man-made.

The *Natural Damage* loop is normally very minor. Suppose lightning causes a forest fire. This increases the *damage rate*, which increases *Environmental Degradation*. This in turn increases the *natural damage rate* the next time it rains, because the forest floor is more susceptible to erosion. As the natural damage rate goes up, so does the total *damage rate*, and the loop starts all over again.

Because growth in one node causes growth in the *Natural Damage* loop as it goes round and round, it is a reinforcing feedback loop. Reinforcing loops can grow indefinitely, until one or more balancing loops stop them. A balancing feedback loop exists when change in one node is balanced by forces in that loop that serve to reverse that change. All real world dynamic systems consist of at least one reinforcing loop and at least one balancing loop.

Opposing the reinforcing loop of *Natural Damage* is the balancing loop of *Natural Restoration*. This loop allows nature to restore the system to its normal state of very little degradation. As *Environmental Degradation* rises slightly, so does the *natural restoration rate*. After a short or long *delay* of the time it takes to restore degradation, such as the way a forest can recover
from a fire (a long delay) or the way plants can remove CO2 from the air as part of the carbon cycle (a short delay if there are enough plants), the total restoration rate increases. This serves to reduce the amount of Environmental degradation. This in turn decreases the natural restoration rate, which cause the loop to decrease in strength, so that the loop does not overshoot. Instead, it eases the system back to its normal state of very little degradation.

The Consume Less loop is a balancing loop. As the consumption rate increases, so does the total damage rate. This causes Environmental Degradation to increase, which causes suffering to increase due to more disease, less food, more conflict over fewer natural resources, and so forth. After a delay of how long it takes people to react to increased suffering that exceeds tolerance limits by dying or deciding to consume less so as to reduce their own suffering, the consumption rate decreases. (The dashed arrow indicates an inverse relationship.) In this manner the loop serves to balance the health of the system by reducing excess consumption. This is the loop that civilization is “up against” as it confronts the global environmental sustainability problem. If the problem is not solved proactively, this loop will force society to reduce its consumption rate by way of population and economic collapse.

One response from the human system has been the Clean Up loop. As intolerable suffering increases, once people figure out how to clean up the human restoration rate increases. This increases the total restoration rate, which decreases Environmental Degradation. For example, after an oil spill people clean it up, or after soil nutrient depletion due to poor agricultural practices, farmers may restore the nutrients by spreading compost over their fields or planting nitrogen fixing crops. But the drawback to relying on the Clean Up loop to solve the sustainability problem is that cleanup is prohibitively expensive for most types of large degradation, such as the 760 billion tons of excess CO2 currently in the atmosphere.

The damage rate equals the natural damage rate plus the human consumption rate times one minus consumption efficiency. Efficiency is how much an activity helps Homo sapiens without harming the environment. It varies from 0% to 100%. If it’s low then the damage rate will be high. For example, a low efficiency approach to topsoil retention in agriculture will cause consumption of food to cause a high damage rate on the system’s topsoil. On the right side of the diagram, the restoration rate equals the natural restoration rate plus human restoration efficiency times the human restoration rate.

Because Clean Up is prohibitively expensive on anything but small degradation problems, the solution to the sustainability problem can only come from improving two nodes on the diagram: consumption efficiency and the consumption rate. So let’s expand the diagram to see what is presently causing the consumption rate to be too high. The expanded diagram is shown on the next page. Later we will expand it still further to see what is causing consumption efficiency to be too low.
The lower portion of the diagram is intuitively understood by sharp managers. But unless we formalize it into a diagram, it will be impossible to later show how efficiently Reflective Pricing attaches to the human system.

The expanded diagram adds three loops. These are the loops that, more than anything else in the system, are driving the entire course of modern civilization. Most of the effects of these loops are beneficial, but some so-called side effects, such as an increase in the damage rate, are not. Let’s begin by taking a look at how the Consumption Growth loop operates, and then how it works with the other two added loops.

As the consumption rate goes up, so does sales. This increases gross profit. After a delay due to the time it takes to invest these profits, direct utility goes up. Utility, also known as quality or value, is the benefits a product gives a consumer. Direct utility is the direct benefits a product gives the consumer, such as the way modern antibiotics greatly extend the average lifespan. As direct utility increases so does consumer demand, which in turn causes the consumption rate to increase even more, and the loops start all over again.

Next let’s examine the Direct Utility Price Sensitivity loop. Direct utility (direct benefits) is not a free lunch. For example, the first generation of computers cost millions of dollars and took up a room the size of a football field, because they were based on vacuum tubes and generated huge amounts of heat. They were so expensive to produce that manufacturing costs were sky high. These costs are shown on the diagram as direct utility cost. Thus as direct utility increases, so does direct utility cost. This causes higher prices, which in turn decreases consumer demand. Thus this loop serves as a balancing loop to the Consumption Growth loop, and keeps it from growing to infinite amounts.

But gross profit can be invested in more than just increasing direct utility. It can also be invested in ways to cut manufacturing costs, which is called direct utility cost efficiency. An increase in this causes a decrease in direct utility cost, which reduces the price, which increases consumer demand. Thus the Direct Utility Cost Efficiency Growth loop can drive consumption to very high levels, causing the system to slip into overshoot mode. This is exactly what has occurred. Today civilization is overshooting its global environmental carrying capacity by about 25%.127

Once a society overshoots its environmental limits, the main limit to consumption growth is the Consume Less loop. In overshoot mode a society sees its consumption rate reduced due to an increase in suffering, which includes death and lower standards of living due to disease and natural resource shortages. Death reduces demand due to less population. A lower standard of living reduces demand due to less consumption per person. Thus in this simplified model suffering is due to health or economic causes. The above diagram explains the basic structure causing economic growth and how that in turn causes Environmental Degradation.
But why is a species as smart as *Homo sapiens* committing ecocide on such a colossal global scale? If we could find the answer to that question, we could begin to understand the system well enough to determine how to engineer a solution to the problem that would actually work. So let’s extend the diagram again by adding two more loops that should shed some light on this intriguing mystery. The revised diagram is shown to the right.

The two new loops model what economists call external costs. Long the bane of economics, an **external cost** is a cost that is so external to a transaction that it is not included in the producer’s costs, and so is not included in the price. For example, tomorrow’s cost of cleaning up all sorts of pollution is not included in today’s prices for the products causing that pollution. External costs are also called detrimental side effects.

The two new loops work in a similar manner to the two lower loops of the previous diagram. These loops deal with how efficiently society consumes environmental inputs. The lower the efficiency the greater environmental damage is, as shown by the far left dashed arrow. Dashed arrows are an inverse relationship, so as impact per unit of consumption goes up, the damage rate goes down.

Let’s study the lower left loop first. Once a producer or society sees suffering reach intolerable levels, it starts to make serious investments in lowering impact per unit of consumption (the *T* in the IPAT equation) in order to reduce the damage rate. But as the **Impact Price Sensitivity** loop shows, as *T* goes down indirect utility cost goes up, which increases the price, which reduces consumer demand because consumers are very sensitive to price. Producers do not like to see their sales fall, so they resist investing to lower impact per unit of consumption. This leads to environmentally unsustainable behavior.

The key insight in this diagram is the **Impact Price Sensitivity** loop introduces relationships A and B. These create a strong incentive to make the problem worse and cause large change resistance. As the **Impact Price Sensitivity** loop shows, as *T* goes down indirect utility cost goes up, which increases the price, which reduces consumer demand because consumers are very sensitive to price. Producers do not like to see their sales fall, so they resist investing to lower impact per unit of consumption. This leads to environmentally unsustainable behavior.

Why is *Homo Sapiens* Committing Global Ecocide?
ing in impact per unit of consumption. For producers to be more sustainable, their cost of production must go up, causing profits to go down. That’s the immediate cause of change resistance.

It’s true that some sustainability practices result in cost savings. But these are the low hanging fruit. Most of this was picked long ago. On the average being more sustainable drives up costs and thus prices.

To summarize, the lesson of the two lower loops is they clearly show why *Homo sapiens* is committing global ecocide. Relationships A and B combine to create a tremendous incentive for the dominant agents in the human system, large for-profit corporations, to behave unsustainably. Those that don’t play the game that way will be wiped out by those that do, due to the iron law of survival of the fittest. The result is the system becomes populated by dominant agents who strongly prefer unsustainable behavior. This is why change resistance is so strong.

Unless deep structural changes are made to the system that somehow overcome these two relationships by properly coupling the human system to the environment, the system will continue to drag civilization closer and closer to the abyss of environmental catastrophe. We now turn our attention to how this can be done, as shown in the complete diagram on the next page.

The proposed solution stands a high probability of working because if our analysis is correct the solution pushes on the right high leverage points in the simplest, most efficient manner possible. The high leverage points are impact per unit of consumption and impact cost efficiency.

Contrary to popular belief, indirect utility cost is not a high leverage point. It is an intuitively attractive low leverage point *if you only push there*. The conventional solutions of tradable permits, pollution taxes, and so forth that push there must be huge to have their intended effect. Anything that large is seen as an unnecessary cost by the dominant agent in the system, corporations, and so is resisted fiercely and successfully.
The completed diagram works its magic by adding a mere three nodes: environmental property rights, fees, and buys. First the concept of common property rights causes the legal creation of environmental property rights to occur. This in turn allows the fees node to be added. Then Reflective Pricing goes one step further by adding the buys node. This causes the human and environment system to become properly coupled. Starting at the top, here’s how the proper coupling mechanism works:

Claims may be filed on any unclaimed environmental properties causing Environmental Degradation. Once a claim is approved, the existence of environmental property rights and the presence of environmental degradation combine to allow an environmental property owner/manager to start charging fees. Following relationship E, fees increase indirect utility costs, and by way of relationship A, fees lead to increasing the price of products. This reduces consumer demand, and hence also the consumption rate and the damage rate, which solves the problem.

But there’s more to how fees affect system response. As we explained before, as soon as producers see the consumption rate start to fall, they take action, so as to minimize the drop in sales and gross profit. They redirect investment of gross profit to impact per unit of consumption and impact cost efficiency, such as by R&D on ways to more completely recycle their product...
or have its production produce less pollution. If they raise impact cost efficiency enough then indirect utility cost will drop, which ultimately causes their gross profit to go back up. Note that it will not go as high as it was before, due to diminishing returns. For most situations greater impact cost efficiency cannot reduce additional indirect utility cost to zero, especially once the low hanging fruit has been picked.

The great drawback to using fees alone is that for most products it will take a very large price increase to reduce consumer demand enough. For example, from 2000 to 2008 the price of gasoline in the US more than doubled. This had little effect on reducing demand, however. It would take at least another doubling to have a significant effect and probably an increase by a factor of 10 or more to reduce the consumption of gasoline to sustainable levels. But this would have a devastating impact on the economy, causing overall production to fall by 50% or more if introduced suddenly. But we must reduce fossil fuel burning to very low levels quickly if we are to solve the climate change problem in time. So what can we do?

This is where buys come in. About 90% of fees are used for buys. A buy is a payment from a property manager to buy a human activity that benefits the property, such as paying a firm to research ways to produce a product with less raw materials and pollution. Environmental property owners pool their buys to do this, which greats great economies of scale. The benefits of this go back to the very same producers who paid the fees. This circular path is why Reflective Pricing is so efficient.

Buys are purchases that directly increase impact cost efficiency or lower impact per unit of consumption, which are relationships C and D. Because buys do this directly, rather than the long tortuous route that fees alone must take through the system to increase them indirectly by much smaller amounts, fees and buys are much more efficient than fees alone in solving the problem. This is why the high leverage points are consumption efficiency and consumption efficiency cost, not indirect utility cost.

Buys can also be used to strengthen the Clean Up loop. The diagram shows how they can be used to buy cleanup work directly, which increases the human restoration rate through the Faster Clean Up loop. They can also be used to improve cleanup indirectly, by buying R&D that would increase human restoration efficiency, which is a Better Way to Clean Up. But we must not expect the Clean Up loop to help much at all, because restoration is so much more expensive than avoidance of damage in the first place. From a quality control perspective, we must engage in defect prevention instead of defect removal.

This completes the rationale behind the design of Reflective Pricing. Next let’s see how it would work.

Description
An environmental property is some characteristic of the environment that is of a global, regional, or local commons nature. Examples are percent of atmospheric CO2, river water quality, habitat quality, and percentage of remaining renewable and non-renewable resources. A safe zone is where the property must be for it to be in a healthy state. For example, the safe zone for CO2 might be between 280 and 320 parts per million (ppm). If CO2 and other greenhouse gases stayed in their safe zones then the effects of global warming would be acceptably small. Currently CO2 is at about 379 ppm and rising. Before the Industrial Revolution it had never gone above 300 ppm in the last 600,000 years.

Environmental property owners would have the right to charge fees to any agent causing their property to move out of the safe zone or not be moving there in time. This is the equivalent of property rent or mineral extraction fees.

Currently prices rarely reflect full environmental impact. This causes economic behavior to have the unwanted side effect of environmental unsustainability. Although this behavior is irrational in the long term, in the short term it is entirely rational. All solutions that do not make environmentally unsustainable behavior economically irrational in the short term are doomed to failure, because modern civilization is totally driven by short term economic self-interest.

Reflective Pricing implements the concept of Environmental Property Rights. It is not meant to be the solution, just an example of a reasonable one. Reflective pricing only solves the technical side of the problem. The much more difficult social aspects of solution adoption resistance, solution circumvention, quality of solution management, and so forth must still be solved. Very briefly, here’s how Reflective Pricing works to make human behavior environmentally sustainable:
1. Establish environmental property rights
   – Each environmental property of concern, such as atmospheric CO2, tropical forest coverage, nickel reserves, New England codfish, and ocean mercury pollution, is identified by a regulatory body or through claims. The right to manage each property or group of properties is contracted to a property manager, who may be public or private. Sovereign state and enforcement issues are resolved, probably through an international organization. This forms the legal and international foundation for reflective pricing.

2. Set safe zones
   – A safe zone is defined for each property, such as atmospheric CO2 should stay between 280 and 320 ppm and get there by 2050. Danger zones are also set to serve as buffers. The property manager’s goal is to keep a property in the safe zone or bring it there in time.

3. Charge fees
   – A fee is a payment to a property owner for the privilege of engaging in activity harmful to the property. Fees are charged for human actions that move a property away from the safe zone. The further a property’s level is from the safe zone the higher the fee.

   In the old way of thinking a fee is a type of eco tax. In the new way of thinking fees are payments to property owners for use of an environmental service or purchase of an environmental product. Psychologically and legally, fees are a price rather than a tax.

   Fees are charged at the most efficient places in the market. For example, a property manager might have gas stations add a fee to the price of gasoline, based on the CO2 emission rate per gallon from the vehicle’s latest inspection. The manager would also charge electric power plants a fee per ton of CO2 emitted. Fees have the effect of gently pushing a property towards the safe zone by saying don’t do that. How fees work to keep properties in their safe zones is shown above.

4. Pay out buys
   – Funds raised from fees go to buys and management expenses. A buy is a payment from a property manager to buy a human activity that benefits the property. The biosphere is essentially buying her health by employing her tenants. Examples of buys to help reduce CO2 emissions are R&D funds for alternative energy research and pilot projects, investment credits for wind farms, transfer of alternative energy technology to less developed countries, reforestation, and most important of all, conservation through reduction of energy consumption. Buys rapidly pull a property towards the safe zone by saying “Let’s do this instead of that.”

   The further a property is from the safe zone, the more the fees and so the more funds available for buys. Fees and buys allow both push and pull to be used to keep properties in the safe zone, an extremely efficient form of feedback loops working together. The curve employed prevents shocks to the economic system.

   Buys are the key to making the solution work without large disagreeable economic shocks, which is what would happen if fees alone were used.
5. Fees = Buys + Management Expenses – Each property is self-managing and self-financing. Management expenses include research, a reasonable profit, data collection costs, enforcement costs, administrative expenses, etc. Because funds from fees are not used elsewhere, such as on income tax reduction, unwanted side effects are avoided. This results in a self-organizing system with sustainable behavior for each property.

6. Net Income = Sales – Expenses – Pending Fees – This equation is used by firms or anyone calculating income. Net income, also known as profit, now considers the liabilities of pending fees. The equation provides a new bottom line for corporations.

Pending fees puts an enormous economic incentive on previously difficult to manage behaviors like undisposed nuclear and other toxic wastes. Such liabilities will now have a true, up-to-date valuation.

Buys are a type of sale. Fees are one of a firm’s many expenses. Because sales include a firm’s buys and expenses include their fees, there is now a clear, tremendous incentive for firms to act sustainably. On top of that is the effect of the price of goods and services they have purchased that themselves have fees and buys. Finally, on top of that is added concern for the future via pending fees. It’s a sort of irresistible triple whammy. This results in a self-organizing system with sustainable behavior for each firm. This is critical because corporations are now the dominant agent in the human system.

The beauty of reflective pricing is it causes self-organized sustainable behavior for each property, transaction, and firm, in an entirely self-funded manner. This solves the technical side of the problem in what is probably the most efficient manner possible for free market democracies.

Solution Element 3 – Worldism

Worldism is global cooperation on global problems and opportunities, which is necessary to make and enforce the decisions necessary for a uniform global implementation of Environmental Property Rights. It is the next evolutionary step after nationalism, as nations begin recognizing one by one that many issues like global environmental sustainability supersede national self-interest.

Objective

The objective of worldism is to provide a sufficient amount of global cooperation so that difficult global problems may be proactively and reliably solved. A sub objective of worldism is to replace the nation with the world as the top common identity of most of the world’s population.

Rationale

Worldism is necessary to manage and enforce worldwide Environmental Property Rights, just as nationalism was necessary for many other basic rights. Without worldism there will be no routine ability to make and enforce global decisions, and thus no reliable way to solve global problems.

Description

Worldism works once the two reinforcing loops shown below are established. Substitute the word “national” for “global,” and these are the same loops that drive nationalism and cause it to thrive. Like nationalism, once these loops are established people will not want to turn back. And, like nationalism has since it was invented, the loops will grow stronger and stronger.

The System Forces Pushing Civilization Toward Worldism

Here’s how the lower loop works: As global cooperation increases, the negative consequences of global problems decrease. As this happens the average quality of life goes up. As that goes up, so does average benefits per agent, which is a strong incentive to increase global cooperation still more, and the loop starts all over again.

Once humanity gets its global problems under control, it can proceed to pursue global opportunities that it never could before. The only limit to these is our imagination.

Here’s how the upper loop works: As global cooperation increases due to the forced necessity of banding together to solve global problems, some of that cooperative force will be channeled toward increasing positive consequences of global opportunities. This will increase
average quality of life. After that, the upper loop works the same as the lower loop.

As the two loops imply, a pleasant "side effect" of Worldism will be the potential solution of many global problems such as conflict, falling or stagnating quality of life, and excessive disparity of wealth. Another is the way new global opportunities can now be pursued more efficiently. But all these have a low priority compared to what is far and away our top priority: the global environmental sustainability problem. This pressing problem is why Worldism is needed now.

Worldism is a beneficial philosophy that places the average quality of life of all people, including those yet to be born, as the top goal of global cooperation. There is now a new topmost omniplex (an omnipresent philosophy) that people feel they belong to and own their allegiance to. Just as nationalism has replaced tribalism and city/states in most of the world, worldism replaces nationalism with a higher and more proper priority—the health and welfare of humanity and the planet as a whole.

Next, let’s put all this together into an attractive business model.

**The Attractive Business Model**

Since I’m not an expert on designing business models, this section is necessarily short and in need of improvement.

It should not be difficult to take the above concepts and create an attractive business model, one so alluring that it attracts millions of entrepreneurs overnight. Once the first few Environmental Property Management (EPM) corporations are established, the rest will have a proven model to follow, and the whoosh of all those managers swooping in to file claims on unclaimed environmental properties will be a replay of the great land rushes in the US in the 19th century, during which millions of acres of land were opened up to settlers for homesteading.

The key elements of a highly attractive business model that I can think of are:

1. A large untapped source of income, which is the market.
2. A monopoly or near monopoly on that market for the long term.
3. Low startup investment requirements.
4. A short amount of time between startup and a large return on investment.
5. A high return on investment over a long period of time.

The EPM industry offers all of these. It is probably well over a trillion dollar total market. (Gross World Product was 59 trillion dollars in 2005.) There is, however, a barrier to entry that must be resolved: The first solution element, Environmental Property Rights, does not yet exist.

To resolve that the first few EPMs would need to get together and design a model piece of legislation defining Environmental Property Rights. Then they would need to approach a few agreeable municipalities (small political units such as towns, cities, or counties) and make a pilot program proposal. The proposal would say that the EPMs could manage a few test environmental properties if the new legislation was passed, and the results would greatly benefit the municipalities. Even better, the results would benefit the world, because those forward thinking politicians who were early supporters of these new concepts would be helping to pioneer a solution to the global environmental sustainability problem.

Now let’s try to translate this potential into the minimum framework for a business model offered by Chesbrough and Rosenbloom, who “list the following six components of the business model:

1. **Value proposition** - A description of the customer problem, the product that addresses the problem, and the value of the product from the customer's perspective.
2. **Market segment** - The group of customers to target, recognizing that different market segments have different needs. Sometimes the potential of an innovation is unlocked only when a different market segment is targeted.
3. **Value chain structure** - The firm's position and activities in the value chain and how the firm will capture part of the value that it creates in the chain.
4. **Revenue generation and margins** - How revenue is generated (sales, leasing, subscription, support, etc.), the cost structure, and target profit margins.
5. **Position in value network** - Identification of competitors, complementors, and any network effects that can be utilized to deliver more value to the customer.
6. **Competitive strategy** - How the company will attempt to develop a sustainable competitive advantage, for example, by means of a cost, differentiation, or niche strategy.

Fitting the Proper Coupling Package solution elements into this framework is relatively straightforward.
In fact it is easy, because Environmental Property Management companies (EPMs) are a type of public utility. Like most utilities, they can take very simple approaches to all of these components. This is because utilities have protected markets and thus have little need to fine tune their business model to be ultra competitive, as the above framework allows.

First we consider the first component. The key to a strong business model is a strong value proposition. The standard EPM value proposition would be something like the summary in the paragraph below, which is what is submitted when a new environmental property claim is filed:

We can solve the (name of environmental property) problem in about the fastest time possible, with a very low negative impact on the economy. Here is our property analysis and business plan of how we will manage this property. All we ask in return is the right to exclusive ownership of the property for a period of (x) years, and the right to charge fees as necessary to cover our buys, expenses, and the standard net profit per the published Reward for Wise Stewardship profit curve. Accordingly, we hereby file a claim for (name of environmental property).

The other five components fall into place easily, because this is a protected market. Thus there is no need to describe the others here, other than to mention that “target profit margins” will run higher than the utility industry, due to the Reward for Wise Stewardship profit curve.

Risk Management

There are a number of risks this chapter has not addressed. These include the inefficiency and corruption that some utility monopolies have exhibited, the use of a causal flow model instead of a system dynamics model to identify the key social structure, the possible problem of overly large EPMs on properties like atmospheric CO2, and more that readers of this chapter are certain to spot. But if the basic strategy is correct, then these are tactical issues that will work themselves out. This leaves the critical question: Is the basic strategy correct?

The process used is the best one I know of for this type of problem. But has the process been applied properly? If it has led to identification of the correct low and high leverage points, then it has, because these form the bedrock of the solution strategy. Solutions to complex social system problems should not attempt to push on low leverage points. Instead solution convergence should seek to find the most efficient, self-managing way possible to push on high leverage points.

No one knows if the correct low and high leverage points have been found. All we have so far is a logically appealing hypothesis of where they are and what will happen if they are pushed. Like all scientific hypotheses, this one can be tested by experimentation. That must be the next step.

The first round of experimentation can be done quickly and cheaply, through the use of artificial world social experiments. It should not be too hard to design a small series of simple experiments that can be run on groups of people that simulate running an actual EPM. This would show whether pushing on these high leverage points would work or not. If this showed the hypothesis to be false, then it’s back to the analysis step. But if it showed the hypothesis to be probably true, then the next step would be to perform some experiments on municipalities using model legislation as described earlier. If that looked promising, then this approach could gradually be scaled up until it reached the global level, while still treating every EPM as a tightly controlled experiment. This would allow the body of knowledge needed to address all the risks to be accumulated in a reliable, scientific manner.

Another top risk is that the solution may be insufficiently self-managing and self-funding. If it is, then regression back into unsustainability is unavoidable.

The route to proper coupling lightly sketched in this chapter is specifically designed to address this risk. The very essence of the idea of proper coupling at Thwink.org is that the relationship between two systems that are properly coupled must be self-managing and self-financing. Otherwise they are improperly coupled. This avoids the trap of requiring continual large amounts of effort and expense, which cannot be sustained. Proper coupling overcomes what Jay Forrester of MIT identified as:

"The tendency of a [social] system to resist and counteract an applied force... Compensating counteraction can be disastrous if the applied programs are expensive. Only applied programs of intrinsic low cost are feasible."

Another risk is buys depend on large-scale implementation to succeed if work like expensive centralized R&D is required. The high costs of R&D buys need to be spread over many sources of fees so there’s a big enough R&D budget to make progress quickly. The benefits, of course, can be spread over many sources of unsustainable behavior.
Summary and Conclusions

The analysis has shown that the reason conventional market driven solutions have failed to solve the sustainability problem is they have been pushing on an intuitively attractive low leverage point. This was identified as indirect utility costs. The analysis also showed that there are two high leverage points that, if pushed on correctly, would solve the problem in a very efficient manner. The two high leverage points are consumption efficiency and consumption cost efficiency.

The strategic key to pushing on these high leverage points correctly is to introduce a new fundamental right that causes the human system to now “want” to solve the sustainability problem. This is common property rights, which are the next evolutionary step after private property rights. Common property rights give the social agents involved very strong incentives to self-manage the system in the best interests of society as a greater whole. All we are doing here is accelerating the natural evolution of the human system in a desired direction, so that we can solve the sustainability problem proactively instead of reactively.

Once society can start building on the new foundation of common property rights, everything else follows naturally, with very little resistance. The introduction of the concept of common property rights would be the precipitating event that would initiate a chain of subsequent events. There are Environmental Property Rights, Reflective Pricing, and Worldism. This chain (or one like it) would appear very quickly, just as the Industrial Revolution did once its fundamental prerequisites were present.

Would this chain be called the Sustainability Revolution? It matters not, as long as it leads humanity into the Age of Transition to Sustainability, at last and in time.

This is an unconventional solution. It defies the popular solutions of quotas, regulations, tradable pollution permits, and the vague, intuitive call for “free market forces” because it takes a completely different approach. The reason the approach is so different is not the novel notions of common property rights, and fees and buys. It is something much deeper. It is the well hidden fact that popular solutions are command and control in disguise. This will not work because it is inherently inefficient. Why this is so is taken up in the next chapter.

Epilogue: The Flaw

This chapter was written in 2006, long before I realized how corrosive the effects of profit maximization can be. Revisiting the chapter in January 2010, it’s more solid than I remember except for one serious flaw.

The chapter paints the Proper Coupling Package as “a business model so ethically and financially attractive that its rapid adoption by the global business community would solve the sustainability problem as quickly as is realistically possible.” That would not happen because the same profit maximization motive that has driven large for-profit corporations to exploit, circumvent, weaken, deregulate and rollback so many other laws would cause the same thing to happen to the intent of Environmental Property Rights. Why I didn’t see this before I don’t know. Perhaps I was subconsciously still infected by the profit is good meme.

No law can be written to prescribe exact behavior. Laws combine with cultural norms and fundamental social agent goals to steer a social system’s behavior. All three, laws, culture, and agent goals, must be right for the emergent outcome to be satisfactory. Of these, agent goals are by far the major determinant of long-term outcome, particularly the goals of a system’s dominant agents.

Therefore Environmental Property Management should be limited to non-profit corporations. One benefit of this approach is that many environmental NGOs will at last have a viable business model. Another is that as common property rights extend to other aspects of civilization, altruists of all stripes will at last have a viable livelihood.

The non-profit life form has proven to be far more benign than for-profit corporations. When business managers are no longer motivated by maximizing profits for their shareholders, they will instead be motivated by the original purpose of corporations. They were artificial creations designed to provide specific benefits for people as prescribed in their charter, with profits as a distant secondary goal. But over the centuries the life form step by little step changed that to where profits became the primary goal. Today entrepreneurs roam the globe, looking for ever more clever niches where profits can be squeezed out, with little regard for anything else. Stock markets and GDP growth curves have become the accepted barometers of the health of nations—when in reality, once the veil of deception is lifted, they measure the health of the New Dominant Life Form by measuring profits and sales.

As long as corporatis profitis remains the dominant life form, Homo sapiens will find it impossible to proactively solve the global environmental sustainability problem, as well as any other difficult social problem whose solution would benefit the common good.
Chapter 16

Goodbye to Command and Control

And hello to policy mechanisms that focus on inherent efficiency

Conventional wisdom on environmental sustainability solutions tends to embody what is in fact a command and control approach. This will not work, due to the inherent inefficiency of command and control. Better is to find policy mechanisms that accomplish the goal of environmental sustainability in a manner based on inherent system efficiency. This chapter explores this proposition.

The Stages of Policy Evolution

Environmental policy is evolving. First it was conservation oriented. The idea was that if we set aside enough areas of the world as protected parks or managed renewable natural resources, such as forests, then that would keep enough of the earth in pristine condition for the average condition of the earth to be acceptable. But this did not work.

Then environmental policy moved into end-of-pipe solutions. This approach attempted to clean up after the fact and to penalize producers of pollution. It failed to work for two principle reasons. The first is that defect removal (reactive cleanup) is several orders of magnitude more expensive than defect prevention (proactive avoidance of the need to cleanup). The second is that pollution producers did not find it hard to circumvent the penalties and still pollute, such as by polluting illegally, by simply going out of business after a large amount of pollution was produced, or by putting pressure on politicians to take approaches favorable to polluters.

Today environmental policy has moved to degradation source management. The idea is to prevent environmental degradation in the first place by proactively managing the many sources of degradation. A current survey of this approach is presented in A Framework for Sustainable Materials Management, by Joseph Fiksel, Journal of Mining, August 2006. (This is the SMM paper, which we will quote from frequently.) This source is representative of conventional wisdom. “Sustainable Materials Management (SMM) is an integrated approach toward managing material life cycles to achieve both economic efficiency and environmental viability.” The paper summarizes conventional environmental policy on page 20: (Bolding added)

“Viewed from a systems perspective, as shown in Figure 1, policy frameworks generally can be distinguished in terms of their positioning with regard to material flow cycles. Natural resource policies (e.g., the Minerals and Metals Policy of Canada) address material flow cycles that link natural and industrial systems, including extraction, harvest, and transport of raw materials to processing facilities; and direct utilization of natural resources for purposes of fulfillment of human needs, including food, space, and recreation.

“Product life-cycle policies (e.g., the E.U. Integrated Product Policy) address material flow cycles that link industrial systems and societal systems, including manufacturing, distribution, and consumption of products and energy to fulfill societal demands; and the recovery of waste materials for purposes of recycling or re-use in industrial systems.

“Waste management policies (e.g., the Japanese Fundamental Law for Establishing a Sound Material-Cycle Society) address the flows of waste materials into natural systems, including disposition of industrial wastes, such as airborne emissions, aquatic discharges, and industrial waste disposal; and disposition of societal wastes, such as municipal wastes, non-point-source pollution, and other anthropogenic waste streams.

“Within each of these policy areas, depending on the national circumstances, SMM policy-makers have a variety of options for placing economic, physical, or operational constraints upon the industrial activities that drive material flow patterns. Such interventions may include emission regulations, economic instruments, (e.g., taxes on energy and end-use), land use restrictions, and waste management requirements. Explicit regulations can be effective for directly restricting the flows of specific types of materials; examples include bans on harmful substances and emission limits for by-products such as heavy metals. However, flexible policies that
influence the causes of material flows may be more cost-effective.”

All three of these policies are forms of degradation source management. They use a large variety of “economic, physical, or operational constraints” to drive the system toward sustainability. The paper mentions a myriad of techniques that are being used to provide these constraints. They vary widely, from distinctions on “dematerialization” and “detoxification,” to “economic value creation,” to the European Commission’s “comprehensive 25-year strategy in 2003 to develop an integrated overall policy,” to Japan’s “comprehensive… legislative framework,” to the use of “material flow accounting” in the United States, Canada, Australia, and Korea.

There is, however, a problem with this approach. It is command and control in disguise.

Degradation Source Management Is Command and Control

A command and control economy is one that is centrally planned, directed, and enforced. The central mechanism is the collection of constraints under which the system’s agents must behave. The theoretical result is the system abides by the constraints.

A free market economy is one that has no need for this because it is self-organizing. Its fundamental mechanism is that buyers and sellers are free to set the price they will pay and charge, and to decide what to consume and produce. The theoretical result is the system comes to an equilibrium that maximizes quantity and quality of goods and services to consumers, while maximizing profits to producers.

There is theory and there is practice. In practice, the command and control approach became thoroughly discredited when, after a 72 year experiment to see whether command and control would work, the Soviet Union collapsed. Today nearly all countries in the world either embrace the alternative, a free market approach, or are moving there as fast as is realistically possible. The exceptions are those under dictatorships, and even these are rapidly succumbing to the siren call of free market economics, because of one outstanding feature: it works.

The telltale signs of a command and control (centrally managed) approach are:

1. Material flow quotas for production and/or consumption.
2. Lots of regulations on how to do something or what not to do.
3. The need to break a system down into many subsystems so each can be properly analyzed and controlled.
4. Penalties for non-compliance with quotas and regulations.
5. Measurement to determine compliance.
7. The presence of a large bureaucracy to do all of the above.

Compare the above to the traits of a free market approach (self-organizing):

1. The legal creation of an efficient agent, corporations, who may serve as a producer for consumers and other producers.
2. A fairly light framework of laws on how producers and consumers must behave, so that the flow of goods and services is unimpeded and respects the rights of producers and consumers. Chief among these laws is that producers are free to set prices at what consumers will pay.
4. Penalties for non-compliance with these laws.
5. Measurement to determine compliance.
7. The presence of a relatively small bureaucracy to do all of the above.

Both models need the infrastructure of features 4, 5, 6 and 7. Where they differ is in features 1, 2 and 3. The foundation of the command and control approach is central decisions. The foundation of the free market approach is the creation of the right artificial social agent and the right core set of incentives for agent behavior. The reason the free market approach works much better is it is a self-organizing system. This causes lots of local decisions to be reasonably optimal, as opposed to central decisions that cannot be nearly as optimal.

These two different models on how to run an economy are points on a higher level spectrum. This is centrally managed versus self-organized. The closer a complex system can be to the self-organized end of this spectrum, the more efficiently it will run.

Degradation Source Management Will Not Work

Degradation source management will not work, because it sits too close to the centrally managed end of the spectrum. Here are some examples to prove this point:
Above is figure 1 from the SMM paper. Essentially the hypothesis is that we must understand the details of material flows so we can optimally manage them. They will be managed with something like the three policy frameworks shown. These are the three described earlier: natural resources, product life cycle, and waste management policies.

Already we see plenty of trait number 3 of command and control: The need to break a system down into many subsystems so each can be properly controlled. We will see many more as the system is further broken down, for example, for different energy sectors, and regions, and countries, etc. To do this properly will require a simulation model of how the material flow cycles work and how the policy frameworks will (or will not) manage the system effectively. To derive the quotas and regulations required by these policy frameworks, the model will eventually grow to be quite large and complex. It will not be long before it is unable to accurately provide correctly calculated quotas or to accurately predict how sustainable the system will be when certain polices are followed, just as present day economic models are unable to grow past a certain fairly small and simple size.

Thus to set the quotas and write the regulations the politicians will have to fall back on intuition. They will also be subject to intense pressure from those affected. While some areas of the world will have less pressure, such as the European Union, they must all perform the same amount of guesswork to set the quotas and regulations.

And then we will see a replay of what happened in the Soviet Union while under command and control: the system will react in an undesirable manner. Intelligent agents will try to circumvent the quotas, regulations, enforcement of penalties, and measurement of results. It will not be long before the system is in a perpetual state of “we pretend to be sustainable, and they pretend we are sustainable.” This is a mock reference to the old Soviet Union witticism that “We pretend to work, and they pretend to pay us,” a quip that contained more truth than fiction.

Here’s another proof that degradation source management will not work, because it is too close to the end of the centrally managed end of the spectrum. The box on page 16 of the SMM paper contains this mind-numbing example of how difficult it will be to be to analyze the system to calculate the material flow quotas and design the regulations:

“A recent MFA study indicates that the E.U. economy has become more eco-efficient in terms of material intensity, since the ratio of DMC to gross domestic product (GDP), or resource efficiency, has slowly declined from about 1.2 kg/€ in 1992 to about 1 kg/€ in 2000. However, the absolute DMC has slightly increased, so that actual decoupling of material use from economic growth has not been achieved; that is, DMC continues to grow with GDP. The study concluded that the average DMC per capita for the EU-25 in the year 2000 was approximately 16.5 t, although individual countries ranged from less than 10 t to more than 30 t per capita. Similarly, another study showed that between 1980 and 2000 EU-15 DMC per capita declined from 16.2 t to 15.6 t, while overall material efficiency increased by 52% and GDP grew by about 70%. Thus, it can be asserted that to support the lifestyle of the average European resident requires a direct material consumption of about 44 kg/day. The majority of these materials are construction minerals, fossil fuels, and biomass from agriculture. (The TMR, including the material rucksack, is estimated to be about five times greater or about 220 kg/day.)"

The above quote is accompanied by figure A, as shown on the next page. Does anyone seriously believe that an accurate, complete “national material flow accounting model” can be constructed? How about a global one? It hasn’t been done for economics. When a government’s top economic policy is set, decision makers do pay attention to a number of competing economic models, but their judgment and political pressure plays the bigger role. The same will happen for a centrally managed approach to sustainability. The results will be the same for that approach as they were for communism: initial success, a long period of increasing inefficiency, and finally, collapse.
Let’s look at another paper for evidence that degradation source management will not work. This is *Material Flows Accounts: A Tool for Making Environmental Policy*, by Wernick and Irwin of the World Resources Institute, 2005. That material flow accounting (MFA) is a form of command and control can be seen in this quote from page 7: (Bolding added) “MFA data offer government leaders a sound basis for setting strategic targets and tracking the effectiveness of environmental policies.”

These are system throughput targets, not environmental quality targets. MFA does not track environmental quality. To do that, environmental accounting must be added to MFA models. The calculation link between the two is made using arbitrary weights, so that a given amount of throughput causes a given amount of environmental impact.

The idea is that if throughput targets are achieved, then environmental impact will fall to acceptable levels. System throughput targets are identical to the production targets long used by the Soviet Union. These worked well at first but failed in the long run. The same will happen for degradation source management, because degradation source management and communism are both forms of central managed systems.

Here’s another proof using the same paper. On page 6 the Executive Summary says: (Bolding added) “National Income Accounts, initiated in the 1930s and formalized in the federal government in the 1940s, still provide a foundation for U.S. fiscal and monetary policy. The need to provide these numbers is now taken for granted. Government leaders and managers would not think of making fiscal or monetary policy without them. Members of the public look to indicators based on these accounts to make their decisions. Similarly, companies and investors cannot do business without the numbers from financial accounting. Yet policymakers, firms, and the public lack any similar set of numbers for the material flows that are at the center of environmental issues.

“This policy brief explains why material flows are critical to environmental quality and proposes next steps for monitoring them by establishing a material flow accounting framework for the United States. It describes a pilot database and the material flow data sheets (MFDSs) that would be used for organizing data to be entered into the database. Such a database would supply sufficient detail for supporting national policies intended to stimulate more productive use of resources and reduce environmental releases of materials that harm human and ecological health.”

This passage argues that “such a database would supply sufficient detail” for making the decisions that would drive the system to sustainability. The argument is that if this works for “fiscal and monetary policy” decisions, then it will work for environmental sustainability decisions.

But the passage ignores the fact that no economic model has ever produced the number that economic decision makers have automatically used in making the most important decision of them all: setting a nation’s federal funds rate. Instead, this is set by the judgment of the financial system’s managers. The passage also ignores the fact that nations have been unable to use economic models to avoid recessions and excessive bouts of inflation. It also ignores the fact that the use of economic models to make key decisions on how developing countries should grow has met with dismal failure. Yet the passage blithely argues that a material flow model would work so well it would solve the sustainability problem.

Here’s another reason degradation source management will not work. There are thousands of environmental health indicators, such as the percent of atmospheric CO2, that must be controlled to successfully manage the health of the environment. But there are only two main economic factors that must be controlled for a healthy economy: GDP growth and inflation. How are environmental management models going to do much better than economic models, when they have several orders of magnitude more targets to manage? This suggests a very different conclusion from what the *Material Flows Accounts* paper arrived at: because they have so much more to manage, environmental management models are going to do much worse than economic models.

To summarize, sustainable materials management and material flows accounting are command and control...
mechanisms. It follows that degradation source management, which is based on these mechanisms, is also command and control. Historically, approaches to human system management using this approach have worked well at first and failed in the long term. The best example of this was communism in Soviet Russia, which clung to the dogma of command and control too long. There initial success was followed by marginal success, which was followed by a long decline, which culminated in collapse of the system and the frantic search for a new and better model. China has fared much better. Once they recognized the folly of a centrally managed economy, they switched to a self-organized one (free markets) as fast as possible.

Perhaps the day will come when sustainability problem solvers will take the route that China did, and say goodbye to the one Soviet Russia took. For them to do that they need to understand why one end of the human system management spectrum works so much better than the other end. The two ends are centrally managed and self-organizing. Let’s look at the centrally managed end first.

**Why Centrally Managed Systems Are Inherently Inefficient**

In theory central management should work. In practice it does not. The reason is we have a complex social system to manage. The behavior of such systems is dominated by the feedback loop structure of the system and the resultant behavior of the system’s social agents. System structure is nodes and their relationships, such as the way the percentage of CO2 in the air (a node) causes climate change in many other places in the system (other nodes). In the human system, currently the dominant social agents are for-profit corporations, governments, non-profit corporations, and people, in that order.

From this point of view, central management is the continual changing of the values of specific system nodes so that they contain the preferred value. For example, one node may be the quota for CO2 emissions for a nation. Another node is the quota for nitrous oxide emissions for that nation. Another node is needed for methane emissions. This gives us three nodes. Then, for the 190 other nations, 3 x 190 = 570 nodes are needed. Let’s assume that each nation has 100 principle types of sources of these gases. This gives us 57,000 nodes to centrally manage, just for the three main greenhouse gases.

Next, there is chemical pollution. The US EPA has over 75,000 chemicals in its inventory of existing chemicals. The US EPA receives notices of about 2,300 new chemicals per year. Every one of these must be given a quota, and if necessary, regulations on its production, use, and disposal. Assuming other countries are about the same, if you multiple 75,000 by 191 countries, you have added 14,325,000 nodes that need to be centrally managed. Most will be minor. But even if just 10% need active management, that is still 1,432,500 nodes.

Now can you see why centrally managed systems are inherently inefficient? It’s like a team of superhuman managers standing on the earth. They can magically reach anywhere. Their responsibility is to perfectly set the flow rates of every business, farmer, and organization on the planet. They do this by reaching in and turning the flow valves to be more open or closed, as needed. They must do this at least once a day for the system to stay current. Can’t be done, you say? Well, neither can a centrally managed solution to the sustainability problem.

However, there is a much bigger reason that centrally planned approaches fail. They do not consider that human systems are composed of humans, and that humans are independent, very intelligent social agents. It did not take these agents very long to start acting contrary to expectations under communism. Why should workers work any harder if that makes no difference in their pay? Why should factory managers try to run factories more efficiently if they are not allowed to make a profit based on efficiency?

Now let’s examine the role agents play in the other end of the spectrum.

**Why Self-organized Systems Are So Inherently Efficient**

This subject requires the introduction of a key abstraction: the role of independent intelligent agents in living systems. For example, consider the role of fish, turtles, and water birds in lakes.

A lake is a healthy ecosystem when the independent agents within it are free to make their own major decisions, and the information they have available to do that is what they need to make reasonably optimal decisions, ones that drive the lake to ecological health. What these agents are concerned with most is questions like: Where can I get my next meal? What predators might be lurking ahead? Where is a safe place for me to sleep? If the agents are free to ask and answer questions like these, then the system is self-organized. Its agents will naturally, without any central management, seek the most efficient route to the natural equilibrium of the system. For a lake this is ecological health.

At the deepest level there is no fundamental difference between a lake and the biosphere. Both are complex systems whose internal behavior is driven by the actions of their agents. Both have environmental limits.
Both run best when they are not centrally managed, but are instead self-managed by the actions of their many agents.

An agent is a goal seeking entity with one or more goals and the ability to control its own behavior in pursuit of those goals. If the goals a system’s agents follow are stable and relatively coherent and small in number, then the system is self-organizing, because the agents will adapt their behavior to optimize achievement of their goals.

But on the other hand, if the goals are constantly changed by central management and are great in number and are not coherent, then the system is centrally managed. This introduces inefficiency because the agents cannot evolve mature, stable strategies that work best at the local level. Instead, they turn to centering their strategies on the unstable goals. They will compete on who can influence the setting of the goals the most, so as to gain the maximum competitive advantage. Some will choose to ignore the goals and focus their attentions on escaping detection. Still others will meet some goals and miss the rest, since that optimizes their competitive advantage. And so on. All these strategies are very common.

A classic example of a self-organizing mechanism is free market democracy. This is why it was used earlier as the comparison to command and control economies.

One proof that self-organized systems work more efficiently than centrally planned ones has already been given. This is the results of free market democracy versus socialism.

Another proof is growing by leaps and bounds, as approaches to corporate management move away from classic top down hierarchical management to ones that are as decentralized as possible. The latter is so much more efficient that it has become the new norm.

According to Wikipedia, the reason central planning fails is that “planners cannot detect consumer preferences, shortages, and surpluses with sufficient accuracy and therefore can not efficiently coordinate production (in a market economy, a free price system is intended to serve this purpose).” But independent agents can detect consumer preferences with ease. They can spot shortages and surpluses long before central planners can. And they can spot them more accurately. Speed, accuracy, and correctness of decision making is what makes a system efficient.

To summarize, a complex social system is self-organized when the agents who get the real work done have goals that are stable, relatively coherent, and small in number, and the agents are free to choose how to achieve those goals. Only a self-organized social system can achieve relatively high levels of efficiency.

Or as they say at one of the most uncentrally managed, successful companies of them all, “Google's philosophy is that choice is always better than control. Tightly centralized control gets in the way of innovation.”

It is innovation, and lots of it, that will be required to solve the sustainability problem.

**Why Europe’s Greenhouse Gas Emissions Control Program Is Doomed to Failure**

Only sustainability mechanisms that are inherently efficient will work. Let’s apply this principle to an actual case.

On November 16, 2006 The Economist published an article titled Soot, Smoke and Mirrors: Europe’s Flagship Environmental Program Is Foundering. Here are the key parts of the article: (Italics added)

1) “…at a time when policies on climate change are coming under scrutiny, the European Union’s flagship programme, the emission-trading scheme, is in serious trouble. It was set up last year amid high hopes: it is the first international arrangement that uses markets to reduce soot and smoke. But unless reformed, it will go down as a good idea, badly executed.

2) “The system works as follows. National governments decide how much carbon the five dirtiest heavy industries in their countries may spew forth (the industries are things like power generation, pulp and paper, and metal hacking). They then allocate “permits to pollute” to each company in that line of business. If a firm wants to go over its limit, it must buy “pollution permits” from cleaner firms or credits from developing countries that have set up special projects to lower emissions.

3) “Moreover, as EU policies go, this one is fairly well designed, in principle anyway. It manages to set a carbon price and encourages trading in environmental assets (the pollution permits). That should be the most efficient way to control emissions. It is a welcome contrast to the command-and-control systems, such as the common agricultural policy, that the EU has preferred in the past. And although economists may argue forever about the relative merits of carbon trading versus a carbon tax, Europe's decision to go for the former at least has the merit of decisiveness. Britain's environment minister calls the scheme “the most innovative and efficient method yet invented for reducing carbon emissions”. Arnold Schwarzenegger, the governor of California, wants to set up a similar arrangement between his and other states. Indeed, Gordon Brown, the British chancellor of the exchequer, says the European and Californian schemes one day should be linked as part of a worldwide carbon-trading network.
(4) “Yet even while lauded as a model for others, the scheme is failing at home. It will lead to cuts in emissions only if the permits are strict enough, so the question of who allocates them is vital. For political reasons, the EU left the power of allocation to national governments. As a result, what should have been an exercise in setting rules for a new market became a matter of horsetrading about pollution limits, with powerful companies lobbying for the largest possible allowances.

(5) “Last year, governments gave away (ie, did not sell) pollution permits that amounted to more than the pollution companies were actually spewing forth.” That risks making the scheme pointless. The European Commission is now reviewing proposals for allocations in 2008-12. If approved, these would allow companies to increase emissions by a further 15%.

(6) “The European Commission could reject the proposed national allocations outright and insist that offending governments slash the allowances substantially. They could also push governments to sell the permits, rather than give them away (taxpayers would like that too). But in the long run, argues Michael Grubb of Cambridge University, countries need independent agencies to issue the permits, just as there are independent central banks to issue money.”

Let’s examine the flaws in the conventional wisdom this article represents. The first paragraph states that “it is the first international arrangement that uses markets to reduce soot and smoke.” This is false. It is the allocation of permits that does this. Price fluctuation of tradable permits does not affect the total amount of the permits, which is what determines total emissions.

Paragraph 2 describes the allocation method. Paragraph 3 then claims this method “should be the most efficient way to control emissions” and that “it is a welcome contrast to the command-and-control systems.” It is good to see recognition of the need for efficient mechanisms. But the allocation method described is command and control. At its core it is the same as the quotas allocated to farmers. The use of tradable permits does not magically make Europe’s emissions control scheme any better than its common agricultural policy. It only allows emission producers to more easily transfer the pain (the cost) of reducing their emissions.

Confusion reigns in conventional wisdom. Paragraph 4 states that “the scheme... will lead to cuts in emissions only if the permits are strict enough.” This agrees with our own opinion and contradicts the earlier assertion in paragraph 1 that “it is the first international arrangement that uses markets to reduce soot and smoke.”

Paragraphs 4 and 5 show how Europe’s emission-trading is failing because it does not rely on the dominant agents in the system to have the proper fundamental incentives to behave sustainably. The result is that “powerful companies [lobbied] for the largest possible allowances” and “Last year, governments gave away (ie, did not sell) pollution permits that amounted to more than the pollution companies were actually spewing forth.” The future looks even worse. Although the Kyoto Protocol calls for the European Union to collectively cut its greenhouse gas emissions by 8% below 1990 levels by 2012, “The European Commission is now reviewing proposals for allocations in 2008-12. If approved, these would allow companies to increase emissions by a further 15%.” The dominant agents have resisted change very successfully, and are causing the program to founder.

Paragraph 6 makes a valiant attempt to rectify the problem when it says “The European Commission could reject the proposed national allocations outright and insist that offending governments slash the allowances substantially.” This argues that if the permit total equals the EU’s target, the program will work. This ignores the fact that when command and control economies tried the same thing, they ultimately failed. The world seems to be enamored with the siren promise that tradable permits are the answer, while missing the cold hard fact that, under the covers, permits are still quotas, no matter what you call them.

Paragraph 6 then offers two fixes. The first is “[The European Commission] could also push governments to sell the permits, rather than give them away (taxpayers would like that too).” This says that selling the permits would raise funds that would allow taxes to be cut elsewhere. However, this introduces the perverse incentive that if firms and people cut their emissions, then their taxes go up. It also fails to amplify the power of fees (the cost of the permits) by using them as buys, as described in the chapter on The Proper Coupling Package.

The second fix is “countries need independent agencies to issue the permits, just as there are independent central banks to issue money.” This would be an improvement, but it still does not eliminate the flaws of tradable permits. Would the use of independent agencies to set quotas have saved communist Russia from imploding? Has communist China turned to independent agencies to set quotas as the way to radically improve its economic efficiency, or has it turned to free markets and no production quotas?

Conventional wisdom, as exemplified in the above article, is violating the principle that only sustainability mechanisms that are inherently efficient will work. Until this principle is adopted and used as the driving strategy for solution design, sustainability solutions will continue to be soot, smoke, and mirrors.
When Sustainable Materials Management (SMM) Can Be Useful

We don’t want to throw the baby out with the bath water. SMM or material flows accounting is a useful tool. But it’s more of a tactical tool that should be applied at the level of a firm or industry. It should not be the prime tool at the national or global level, because at these levels unsustainable material flows are a symptom of the problem, not the cause.

A similar distinction applies to economic analysis tools. Different ones are used for micro and macro analysis. At the micro level of individual agents or sectors, microeconomics uses price theory. But at the macroeconomic level an aggregate viewpoint is necessary. Tools like fiscal and monetary policy, and aggregate demand and supply are more productive.

When deciding what theories and models to use at the macro level of the sustainability problem, problem solvers should be aware of the fallacy of composition. According to Wikipedia, this “arises when one infers that something is true of the whole from the fact that it is true of some (or every) part of the whole.” An example is given:

“In Keynesian macroeconomics, the ‘paradox of thrift’ is an example of this fallacy: increasing saving (or ‘thrift’) is obviously good for an individual, since it provides for retirement or a ‘rainy day,’ but if everyone saves more, it may cause a recession by reducing consumer demand.”

SMM is good for the part but not the whole. It is an excellent analysis tool for determining how to improve the sustainability of a firm, or even a group of firms or an entire sector. But the hypothesis that SMM is the tool of choice for macro-sustainability analysis is unsound, because at that level other factors become more influential and aggregate material flow becomes merely the macro performance readout of the system. Material flow is a measure of how the system is performing. Attempting to improve material flow directly at the macro level, by opening and closing flow valves with precise quotas and regulations, is a naive method that will fail. A more indirect approach is needed.

Moving to the Fourth Stage with Social System Engineering

Earlier we spoke of the first three stages of sustainability policy evolution. The stages were conservation oriented, end-of-pipe solutions, and degradation source management. The next stage will be something like social system engineering, because the human system must rapidly move to the self-organized end of the spectrum if it is to solve the sustainability problem in time.

The system is already inching its way there. When we hear of solution elements like “policy instruments that provide the appropriate economic signals” or “policies that reward business innovation,” or especially “Establishing an efficient level of decoupling ideally would require that all external environmental costs are reflected in material and product prices,” as mentioned in the SMM paper, what is really happening is the system is bumping and grinding its evolutionary way to self-management. But it needs to move there at a gallop and not a stroll. That is what social system engineering can do when performed properly.

Social system engineering is the deliberate engineering of large scale social systems, so as to achieve overall system goals. Because the system is a complex social system, tools that can handle this type of system are required. The chief tools are structural thinking and system dynamics. The key strategy of social system engineering practitioners is to analyze the system so correctly, at the high level, that the bare minimum number of structural changes needed to solve the problem are identified. After that, the rest is straightforward.

Structural thinking is the intuitive use of mental models that see the world as a complex system whose behavior is controlled by its dynamic structure, which is the way its feedback loops interact to drive the system's behavior. The term is preferred to holistic or whole systems, which have looser and more intuitive meanings, and emphasize understanding the whole rather than the dynamic structure of the system. It is also preferred to systems thinking, which too often only implies thinking of the system as a whole. This is not enough.

The fundamental tenant of system dynamics is that system behavior cannot be understood without understanding the system’s structure. Holistic and whole system thinking can work on easy problems. But they cannot solve more difficult problems whose intractability is caused by the presence of feedback loops whose existence is anything but obvious.

Structural thinking is not stepping back to look at the whole, the big picture, or a higher level. This helps, but does not lead to the major insights that emerge when the feedback loop structure of the system becomes visible. When this happens, night becomes day. Structural thinking is the first step to an even higher level: system dynamics, where instead of just thinking in terms of system structure you model it.

Structural thinking on complex social system problems is not easy to achieve. For example, the conventional wisdom conveyed in the SMM paper does not achieve it, despite the use of terms “systems perspec-
tive” and “systems view,” and the repeated use of the word “system.” The paper has left out the dominant social agent, corporations, from its analysis. It has also ignored the crux of the problem, which is change resistance. Nor has it built its analysis around discovering why the system’s dominant feedback loops are causing the problem and where the leverage points are. Instead, the models shown are of symptoms. They are not the real problem to solve.

*Material flows that are unsustainable are symptoms of the problem.* What is the underlying cause? Until this question is answered, the patient’s illness has not been diagnosed. Without a correct diagnosis, attempts at treatment can only be based on guesswork. This is why in modern medicine the first thing physicians do is collect the data needed for a diagnosis. Then they make the diagnosis. Only then do they proceed to develop a treatment plan.

Unsustainable material flows are what Jay Forrester, the inventor of the field of system dynamics, calls *coincident occurrences.* Here is what he has to say about them: (Italics and bolding added)

“Social systems are inherently insensitive to most policy changes that people select in an effort to alter behavior. In fact, a social system draws attention to the very points at which an attempt to intervene will fail. Human experience, which has been developed from contact with simple systems, leads us to look close to the symptoms of trouble for a cause. But when we look, we are misled because the social system presents us with an apparent cause that is plausible according to the lessons we have learned from simple systems, although this apparent cause is usually a *coincident occurrence* that, like the trouble symptom itself, is being produced by the feedback loop dynamics of a larger system.” 130

Why are the system’s material flows unsustainable? Isn’t it due to the behavior of the system’s dominant social agents? What can we do to change the fundamental incentives of those agents so that system flows become sustainable? Why aren’t we treating the cause by changing the system, rather than treating the symptoms by fixing the same things over and over again?

The moment you begin to ask questions like these, you have entered into the realm of social system engineering, and said goodbye to command and control.

### The Proper Coupling Package as an Example of Self-organization and Social System Engineering

One way the human system could say goodbye to command and control and hello to inherent efficiency is the Proper Coupling Package. This package illustrates the potential power of self-organization and social system engineering.

The Proper Coupling Package taps the power of self-organization by saying to the system’s dominant agent, “Hey, want to make a pile of money and do the ultimate good deed at the same time? Well let me tell you about Environmental Property Rights. They’re the biggest thing to come along since private property….“

Self-organization in an incredibly powerful force, as the results of three to four billion years of evolution has shown. But that power depends on the right application point. Finding that point in an intelligent manner, without endless false leads, requires the right tool. As far as we know there is only one tool that can do the job. It lies at the heart of the field of social system engineering. The tool is *system dynamics.*

This is the tool that allowed such clear identification of first the coupling structure, and then the low and high leverage points. Once the points of application were found, it was easy to generate a number of high quality hypotheses for pushing on them. After that it was just as easy to weed out the bad hypotheses by seeing which ones could be worked into the model to logically solve the problem. The hypotheses that remained were then combined into a single hypothesis that had the greatest chance of maximizing the self-organizational power of the system.

### Summary and Conclusions

Notice what we’ve done. *Completely gone is the concept of material flow as the central analysis viewpoint.* It has been replaced by finding what was causing the problem from the social system point of view, identifying the low and high leverage points involved, and then designing solution elements to push on the high leverage points.

Especially interesting is that the Proper Coupling Package uses the concept of safe zones instead of quotas and regulations. A *safe zone* is where all environmental properties of interest must stay or be moving to in time. If all properties are doing this then sustainability has been achieved. It is almost infinitely easier to set safe zones than material flow quotas and regulations, because safe zones are direct stable goals, while quotas and regulations are so indirect, unstable, contentious, and expensive they are impossible to set optimally. Better is to allow agents to make resource allocations decisions
themselves. They can do it much more efficiently than central planners, as the success of free market versus centrally planned economies has shown.

Social system engineering and the Proper Coupling Package were presented as an example of a whole new way of thinking. An approach like this is possible only if structural thinking is used. This goes beyond what too often passes for systems thinking, into a correct analysis of the complete system, and hence the complete problem and a correct diagnosis. Without a correct diagnosis, what you are probably treating is coincident symptoms and not the true underlying cause.

An approach like this is also possible only if a process that fits the problem is used. Too many studies and too many organizations are driven by a process (or no process) that does not fit the sustainability problem. This is a difficult complex social system problem. It thus requires a process that recognizes the change resistance part of the problem, which most problem solvers ignore. It requires a model of what is causing the strong change resistance encountered in all difficult complex social system problems. The model must go deep and find the fundamental cause of the problem, and not stop at shallow levels. Such models require system dynamics simulation or at least a feedback loop structural analysis by hand. The problem also requires recognition of the role the system’s dominant agents play in the problem and the role they must play in the solution.

If a problem solving approach is missing any of these features, then it is doomed to take a long time to solve the problem. If it is missing most or all, then it will never solve it, except with guesswork and a very large supply of luck.

The Proper Coupling Package is an example of how solution options exist that are inherently efficient. Once you have seen one such option, then by comparison the conventional solution path of command and control starts to look woefully inefficient. The old paradigm begins to crumble away, because there is now an attractive alternative.

Welcome to the new paradigm.

* * *

Next we move from solving subproblems to solving entire problems in the quickest, most efficient manner possible with an idea whose time may have come: solution factories.
Chapter 17

Solution Factories

Tomorrow’s leading activist organizations will no longer be activist organizations. They will be solution factories.

An ordinary factory produces physical products. A solution factory produces mental products. The output of a solution factory is the memes and meme carriers needed to solve a social problem and keep it solved indefinitely. These are created by using a formal process that works so well it’s almost like using an assembly line. But, unlike an assembly line, solution factories do not produce physical products. They produce mental products which in turn cause new emergent properties to appear in the social system with the problem. It is these emergent properties that solve the problem.

This chapter explores why solution factories are needed, what they are, and how they can be optimized, in order to serve as the leading wedge of the institutions that actually solve the sustainability problem. We start with the question of why solution factories are needed, by asking:

What Can Radically Increase Total Investment in Environmentalism?

Examination of the Transformation Simulation Model shows that if we can find something that could triple total investment, time to solution would fall by 29%. These are not exact figures, because the model is not calibrated. But they do seem to say that if we can radically increase total investment in environmentalism, time to solution would drop substantially. Looking at our various models, what is it that increases total investment? The answer can be seen in the model to the right from page 217.

This model shows that it is higher certification scores that attract additional investment. But what is it that causes higher scores? It is environmental industry results. And what improves that? Quality of effort. And what affects that? This quickly leads to the realization that we have endless loops involved. So what is it that really causes increased investment?

Surprisingly enough, there is a clear and ready answer. First we must differentiate between result variables and value added variables. A result variable is an outcome that resulted from process activity somewhere else. A value added variable is an activity that adds value to a process. Looking at the model, all eight variables are result variables. The question then becomes which of these result variables is fronting for the largest value added variable? Study of the model leads to the conclusion that by far the largest value added variable is the activity it takes to increase fitness of problem solving strategies. We know this to be true from the Solution Evolution simulation model presented earlier on page 182, as well as the evolutionary algorithm itself. This is because the chief emergent property of the Solution Evolution model and the evolutionary algorithm is maximization of the fitness of replicators, whether they be memes, genes, robots, or something else we have not yet conceived of.

Thus the problem is not what can radically increase total investment in environmentalism. It is:

What Can Radically Increase the Effect of Effort on Solution Fitness?

The higher the fitness of a solution, the more likely it is to solve the problem. Because we are working on memetic problems here, their solutions are also memetic. Each solution is competing against other solutions to solve the problem by replicating so fast and so well that the solution comes to dominate the system enough to solve the problem. This is identical to the way a species with high fitness can invade a new ecological niche in the blink of an eye.
There is no need to look very far for the answer to the question of what can radically increase solution fitness, because we addressed it earlier in the Solution Evolution model. That model demonstrated that the best way to maximize the solution fitness of a collection of solution components (each of which is a meme) was to follow a formal process based on the Scientific Method. There is no other way to solve difficult problems, because the Scientific Method is the only known method of creating new cause and effect knowledge that is sound. Thus the Scientific Method is the only known method for solving difficult problems, unless you can afford to wait long enough for guess number 1,000,001 to finally find the solution.

It follows that we need a new type of organization whose role is to implement the Solution Evolution model. What should we call them? Solution Evolvers? Solution Fitness Maximizers?

I don’t think Thomas Edison, the most prolific inventor of all time, would mind at all if we borrowed from a 19th century term that described how he methodically went about his work. It was he who in 1876 opened the world’s first invention factory in Menlo Park, New Jersey, with the astounding pronouncement that he would “invent some minor thing every ten days and some big thing every six months.” And he did it. Out of his invention factory came the first practical incandescent light bulb and the entire electric lighting industry, the carbon button telephone microphone which together with Alexander Graham Bell’s work caused the birth of the telephone industry, the phonograph and the recording and music industry, and the first celluloid film strip, camera, and projector, which led to the motion picture industry. By the time he retired, “the wizard of Menlo Park” had accumulated 1,093 patents, more than any other single individual in the world.

Thomas Edison’s invention factories produced inventions. We need factories that produce solutions, so why not call them solution factories? Instead of inventions, which are solutions to technological problems, a solution factory produces solutions to social problems. Instead of trying to maximize the profit that can be made from inventions, the goal of solution factories is to maximize solution fitness.

The Solution Factories
Solution Element

A solution factory creates solution components to an important social problem or subproblem, using a well defined manufacturing process. The end product of a solution factory is an interrelated collection of memes that, working as an emergent whole, solve the problem(s) the solution factory is working on.

What we have discovered is another solution element. All others were discovered during the long tedious engineering and construction of the Strategy Map. They were then incorporated into the design of the Transformation Simulation Model. But this element was totally unexpected. Then again, such surprises are to be expected in an iterative process, where each iteration brings significant improvement, and often the last iterations take the longest strides.

A solution factory is not an ordinary environmental organization. Solution factories manufacture solution components in the form of memes, using a disciplined team of engineering specialists, at a speed and quality that will cause today’s typical environmentalists to drop their jaws in amazement. They are the most visible part of the solution. In the eyes of the public they will probably be seen as the leading thrust of the entire solution. In a sense they really are, because they are the armies of problem solvers that, once united and driven by the proper process, will achieve success over the enemy. This enemy, which was previously invisible, has been identified as the New Dominant Life Form, its successful exploitation of the race to the bottom via a torrent of cunning false memes, and the many corrupt politicians that have become incognizant proxies to that life form. What solution factories do is manufacture the memes necessary to turn the tide of the battle in favor of humanists. If we can win that battle the sustainability problem is solved.

Now let’s take the concept of solution factories and revisit the certification structure model. For ease of reference it is shown again on the next page.

Solution factories increase the fitness of problem solving strategies. Once they are created, solution factories will allow the environmental industry to vastly increase the funding it receives today, because the industry can now offer funders the one thing they desire the most: proof their money will be spent wisely. That proof is certification. Higher certifications will attract more funding to those organizations producing the highest fitness solutions. This will decrease funding to other organizations, which will lead to a swift and harsh shakeout of the industry. Those that remain will spend all that funding much more wisely, because it is not the increased funding that will make the critical difference—it is the increased fitness of solutions.

The goal of the solution factory solution element is to maximize the fitness of problem solving strategies in the Redirection of Investment to High Fitness Strategies loop. This loop was presented earlier with the Certification Solution Element on page 216. Let’s
take another look at it, now that its importance has grown considerably.

The redirection loop arrows are bolded. The top talent loop is the upper loop. The driver for both loops is the new constant called high reliability of measure of problem solving ability. The new measure is certification scores.

The loops demonstrate how high certification scores cause the two attractors to increase. More of the best and brightest are attracted, along with more funding. This causes a solution factory to become more efficient in manufacturing solution components, which raises its certification even more, which attracts even more funding and top talent, and so on. This creates two entirely new and very strong reinforcing feedback loops. The result is a new social structure driving the environmental industry to increasingly higher levels of excellence. Without certification and dedicated solution factories there is no such structure, which is where environmentalism finds itself today.

Solution factories serve as funding and top talent attractors, which causes the two loops to grow rapidly. But nowhere in these loops do we see solution factories. This is because solution factories are an emergent property of the many structural changes this book has presented. Emergent properties, such as solution factories, cannot be managed directly because they are emergent. They can only be managed indirectly, by designing and managing the necessary structures.

Improving the Transformation Simulation Model, with a New Effect of Funding on Fitness Curve

Let’s return to run 14 in the Transformation Simulation Model on page 257, which discovered that tripling total investment in year 2015 reduces time to success from 72 to 51 years. How can the simulation model realistically accomplish this?

Inspection shows that in the factors subsystem, the certification solution element is represented by a chain of variables running from problem solving measurement reliability to the fitness of strategies multiplier and the top pay multiplier. This agrees with The Dynamic Structure of Certification causal flow model. So in the simulation model, certification does not affect total investment directly. To make such a change would destroy the conceptual integrity of the model. It would also disagree with what can be done in the real world, where you cannot stand on the beach as the tide is coming in and proclaim that “Certification shall increase total investment” and expect to see it happen.

Let’s preserve the conceptual integrity of the simulation model by working with it as cautiously as possible, starting with a look at the two lookup tables used to calculate the two multipliers mentioned. Can either of the curves in these tables be realistically changed to reflect the much greater fitness of problem solving strategies that solution factories cause?

Shown below is the lookup table used in the simulation model’s effect of top pay on multiplier variable. The model uses this to calculate the top pay multiplier using the percent top pay to top talent, which is the same as problem solving measurement reliability if the funding attraction delay is ignored. Before the Top Talent Package is activated, measurement reliability is 20%. The curve translates this into a top pay multiplier of 1%. After the Top Talent Package is activated, reliability rises to 80% due to the introduction of certification. The curve translates this 80% into a top pay multiplier of 74%.
This curve cannot realistically be changed significantly, because it is already increasing the top pay multiplier from 1% to 74%. That is extravagant enough. Let’s turn to the other lookup table.

Below is the lookup table used for calculating the effect of funding direction on fitness strategies. Like the other table, its input is problem solving measurement reliability. But its output is the fitness of strategies multiplier. When measurement reliability is 20% the fitness multiplier is 75%. When measurement reliability rises to 80% the fitness multiplier rises to 100%.

This curve was designed so conservatively that it has plenty of room for change. The fitness multiplier rises only 1/3 when measurement reliability rises from 20% to 80%. Therefore it seems entirely realistic to change this curve to reflect the greater efficiency of solution factories. So let’s modify this curve to the one shown below:

Starting from the left, the first two points remain unchanged. The next three embody the proposition that solution factories and certification will cause the fitness multiplier to rise from 75% to 250% instead of from 75% to 100%. I think this is very realistic, because when you examine The Dynamic Structure of Certification, you can see that the structure clearly has the amplification power to allow the introduction of solution factories and certification to radically increase the fitness of problem solving strategies. This is because the Redirection of Investment to High Fitness Strategies is such a powerful loop. Why? Because it’s the same loop the invisible hand of evolution has used to create all biological life. The loop harnesses this power by causing certification scores to rapidly cause solution factories to evolve to be much more efficient than they are today. In fact, a fitness increase of 75% to 250% is probably a conservative estimate for what the loop can do for memetic life (the solution components), judging by what it’s done for genetic life.

Running the Transformation Simulation Model with the revised curve gives these results:

The revised curve causes time to success to drop from 72 to 58 years. While not as large a drop as the 51 years of run 14, it is realistic, so let’s call it a keeper.

Run 15 is the first refinement to run 12, which was the best that full Analytical Activism could do without solution factories. Next let’s turn our attention to how we can design solution factories so that the new curve of run 15 can realistically happen. We start by learning from the past.

The World’s First Invention Factory

Thomas Edison opened the world’s first invention factory in 1876, in the very small town of Menlo Park, New Jersey. Francis Jehl, one of Edison’s assistants at Menlo Park and later one of his managers, described its birth this way: (Italics added)

“By the spring of 1876 he was firmly settled [in Menlo Park] and ready for his experiments. Before leaving Newark he told his friend, Dr. George Beard, the electrician, that he proposed to invent some minor thing every ten days and some big thing every six months. Beard recalled this conversation several years afterward and confessed that the prediction had seemed a ‘wild one’ at the time. Strange to say, Edison more than fulfilled it.” 132
How did Edison fulfill that outlandish promise, one that no one person before or since has done? By deciding beforehand that his factory was not going to produce Adam Smith’s pins or Henry Ford’s cars. It was going to produce inventions as its primary product. Edison could do exactly that because he had something no one else in the world had: a process that churned out invention after invention.

W. Bernard Carlson and Michael E. Gorman describe Edison’s process in their essay on *Thinking and Doing at Menlo Park: Edison’s Development of the Telephone 1876 to 1878.*

“This essay recounts the process by which Edison developed the telephone, focusing on his efforts to perfect a powerful and reliable carbon transmitter in 1877. As Edison succinctly characterized this process in 1878, ‘I had to create new things and [overcome] many obscure defects in applying my principle.’ As this quote suggests, invention may be seen as involving two elements similar to what Edison called his ‘principle’ and ‘new things.’ First, an inventor has a principle or mental model of how he or she thinks his or her creation should work. Second, an inventor uses ‘things’ or devices to express his or her mental model in physical terms, and these devices will be called building blocks. As this essay will reveal, Edison had a distinctive set of building blocks and often borrowed from established inventions to create a new invention.

“In this way, the act of invention may be seen as the interplay of mental models and building blocks. In developing something new, an inventor may begin with a mental model. This model incorporates a general idea of how a device might work and an awareness of its potential significance. By manipulating and experimenting with a selection of building blocks, an inventor explores variations and changes. Eventually, insights from the building blocks may lead an inventor to modify his or her mental model. An invention may be said to be complete when an inventor feels the fit between the mental model and the building blocks device is close, and when he or she is able to convince others that the device matches their mental model and expectations.”

The authors of the essay then describe how Edison went about inventing the telephone. The crux of the problem was the carbon transmitter. Racing against Alexander Graham Bell, Edison wrestled the problem to the ground by revising his mental models until they converged upon the first workable, commercially viable carbon transmitter. But Edison did not stop there:

“Although the development of the carbon transmitter was the predominant line of investigation in his telephone project of 1877, Edison also experimented with a wide range of transmitters. Some of these were modifications of his carbon transmitter, while others varied the resistance by using switches, capacitators, or batteries. Underlying all of these designs was Edison’s ability to generate a variety of alternative representations of his central idea.

“Yet these telephone inventions failed to exhaust the potency either of variable resistance as a mental model or of carbon and diaphragms as building blocks. Throughout 1878, Edison used this model and these building blocks to create a remarkable series of spinoff inventions.”

These passages demonstrate not only that invention factories are possible, but also the core of how it can be done. *All it takes is a process that works, and the people who believe in the process and know how to make it tick.* Today invention factories exist in the form of hundreds of thousands of R&D departments, university research departments, corporations specializing in invention itself, and, just as in Edison’s day, scores of madcap inventors working alone in crowded garages and dingy basements.

What can we learn from the world’s first invention factory?

Several things: Edison’s mental model is our Transformation Simulation Model. His building blocks are our solution components. Invention factories produce physical inventions, which are solutions to technological problems. Solution factories produce memetic solutions, which are solutions to social problems. Lots of experimentation, as Edison did, is crucial. The right process is mandatory.

But while these insights may be helpful, there is no feeling they will be tremendously so and help us to make breakthroughs. They are an unorganized hodgepodge of insightful rules. Something much more is needed. It is time to apply our tools and go deep once again. We need a model of understanding that can help us to structure our analysis of why the world’s first invention factory worked so well.
The Dynamic Behavior of Solution Factories

How solution factories work is shown above. The work flow process has five main steps, as numbered. Step 1, Problem Identification, corresponds to the first step of the System Improvement Process (SIP). Step 2, Structural Analysis, corresponds to the second step of SIP, which is System Understanding. Steps 3 and 4 correspond to the third step of SIP, which is Solution Convergence. The actual solution is the Solution Memes. But they cannot be transmitted unless they have carriers, such as books, articles, people, or physical inventions. When the Meme Carriers leave the factory and cross over into the system they are designed to affect, implementation occurs, which is step 4 of SIP.

Notice how there is no separate implementation step in the work flow. This is because the solution memes and meme carriers are designed to be self-implementing. For example, if a new meme and its carriers are well designed and released at the appropriate time, the meme will infect enough new minds and be well received by the system. Conversely, if it is not well designed, it will fail, and no amount of tactical brilliance by implementers will make a significant long term difference. Successful implementation is thus an emergent property of the process. The absence of an explicit implementation step in the work flow is one of many large differences between solution factories and present environmental organizations.

A self-implementing solution approach will move environmental organizations of all kinds away from their present preference for command and control solutions, and toward solutions with inherent high ability to self-adapt and solve the many tricky aspects of the sustainability problem.135

Meme release causes new emergent properties to appear in the system with the problem, such as tendencies toward less corruption and more sustainable practices. This happens after the delay of how long it takes the system to respond to the solution. After system behavior changes, Measurement of Results is used to improve all of the four main work flow steps, and the Evolution of the Actual Solution loop starts all over again.

Supplementing the main work flow loop is the Hypothetical Evolution of High Fitness Solution Components loop. Here the first step is hypothesis generation, such as an idea Edison wanted tested, key assumptions in a simulation model, or a potential solution to an environmental problem. In all but the smallest solution factories, division of labor allows the hypotheses to be handed off to experimenters, who perform experimentation to test the hypotheses. Then interpretation of results occurs. A hypothesis may be accepted, rejected, or sent back to hypothesis generation to be modified. If accepted it becomes a sound solution component and enters the solution factory’s knowledgebase.

The sounder the knowledgebase, the more efficiently it can be used to build new knowledge from old knowledge. As more and more solution components
accumulate, they become a warehouse of knowledge a solution factory can use to build solutions from. Knowledgebases may be shared with other solution factories. The work in this loop is hypothetical because it consists of logical and artificial world experiments, as well as some small scale real world experiments.

**Understanding How Solution Factory Process Efficiency Can Be Raised to a High Enough Level to Solve the Problem**

Process Efficiency \( \times \) Effort = Results. The greater the efficiency the less effort required to solve the problem. If an organization or movement has a limited amount of effort and faces a difficult problem, then high process efficiency is the only way to solve the problem. This is the case for the global environmental sustainability problem.

Currently the process efficiency of the environmental movement is low, causing the movement to thrash around violently in a desperate, educated guesswork driven search for solutions that will work. But if process efficiency was high, as it is for example in science and business, the movement would be united and driven by a formal, continuously improved organizational process that would lead the movement down the right road to the right solutions. On that road guesswork would be replaced by experimentation. Desperation would be replaced by a calm confidence that the problem can and will be solved, because we are now using the best known tools for the job. The massive failure of the last 30 years would be replaced by small successes, and then bigger ones, and eventually the stupendous breakthroughs necessary to solve the problem at the global level.

Let’s take a close look at how the environmental movement can begin this process as soon as possible. Our strategy is to first perform a careful analysis of how the process efficiency of solution factories can be raised to a high enough level to solve the problem, and then apply the results of that analysis to an implementation model and plan.

In short, this book is trying to accelerate the solution by maximizing the process efficiency of the environmental movement.

**Solution Factory Key Practices**

The work flow model, or something close to it, is the basic process behind all organizations attempting to create solutions of any kind. Depending on the factory type, some process steps are done well, poorly, or not at all. Thomas Edison’s invention factory was a type of solution factory. What might happen if we could analyze the world’s first invention factory from the standpoint of its underlying process, and find the specific factors that made it so extraordinarily productive?

This can be done by extracting the key practices in the work flow model that determine how efficient the process is. A key practice is a work practice that contributes to overall process efficiency, such as how well a problem is identified. A list of key practices can then be used to measure how well a particular factory is following the process. If the process model is correct and the list contains the right key practices, we now have a powerful analysis tool. We can explain why some factories are more productive than others, and we can predict what would happen if a factory follows certain practices. This allows us to design factories that have a very high probability of solving their mission level problems.

The Solution Factory Process Rating Questionnaire on the next page measures how well a factory is following 12 key practices. The practices were extracted from the Solution Factory Work Flow process. The answers are on a scale of 0 to 5. If the answers are reasonably accurate and unbiased, they will give us a good idea of why a factory runs so well, or in some cases, why it doesn’t.

The questionnaire is followed by a table for using the results of the questionnaire to come to some rather interesting conclusions.

Before you read what follows the questionnaire, be sure you have studied the questionnaire and considered how it might apply to your organization and others you are familiar with. Each question is designed for education as well as measurement.
Solution Factory Process Rating Questionnaire

Rate your organization’s practices using a 0 to 5 point scale, where:

0 means the practice is not done at all.
1 means the practice is done so poorly there are negligible benefits.
2 means the practice is done poorly, with some benefits.
3 means the practice is done reasonably well, with substantial benefits.
4 means the practice is done extremely well, with terrific benefits.
5 means the practice is done in the best possible manner, with optimum benefits.

Overall Process
1. ___ The organization uses a formal process for solving its mission level problems. The process fits the problem, is written, everyone is trained in it, and the process is continually improved. The process drives the entire organization.

2. ___ After all major work projects are completed a post mortem is performed to see what went wrong, what went right, and how the process can be improved from that experience.

The Main Work Flow
3. ___ Problems are clearly and correctly defined, so that no effort is wasted on other pursuits.

4. ___ An analysis model of the problem domain is constructed. The model explains why the system with the problem behaves the way it does.

5. ___ Only after the analysis model is constructed do problem solvers begin to narrow solution alternatives down to the final selection.

6. ___ The solution is packaged in a manner that makes it self-implementing. That is, it takes no further significant effort from the organization to make the solution succeed, because the solution is designed to manage and cause its own successful implementation or acceptance by the customer.

7. ___ The results of released solutions are accurately measured as quickly as possible, and the results are used to improve the next version or phase of the solution, or when necessary the present solution. This is also known as measuring organization effectiveness, such as the way a for-profit corporation tracks its profits. This practice creates a formal solution results feedback loop.

Experimentation
8. ___ All key problem solving assumptions are declared to be hypotheses in need of testing. This includes all key strategies, including the organization’s process itself.

9. ___ All hypotheses undergo rigorous experimentation to see if they are true, false, or need to be modified to become useful.

10. ___ Only hypotheses that have passed multiple well designed experiments are added to the organization’s formal knowledgebase of sound solution components. The knowledgebase has a high quality gate.

Knowledgebase Management
11. ___ The knowledgebase is managed so well that what it contains enters into all decisions that would benefit from it, in a manner that optimizes the quality of those decisions.

12. ___ Knowledgebase additions, removals, and changes are used to improve previous decisions in all workflow steps.
The above table uses questionnaire results to compare two different types of solution factories.

Here’s how a process rating is calculated: Each factory, such as Before Edison, has two columns. The left column is the raw questionnaire scores. The right column is the weighted scores. These are the raw score times the weight for that practice. For example, the key practice number 7 has a weight of 4. The Before Edison factory has a raw score of 2 for that practice. 2 x 4 = 8, which is the weighted score.

The weighted score subtotals show how a factory is doing in four general areas. The grand total of the weighted scores is the process rating. Because the weights add up to 20 and the raw scores range from 0 to 5, the maximum possible rating is 100. This gives a rating scale of 0 to 100.

The process rating is then squared to get the approximate relative productivity. What this means is that productivity varies exponentially with process maturity. A good example is the way student ability varies exponentially as one goes from grades 1 to 12. A student who is several grades above another student can usually do dozens of things the other cannot. Thus a difference of about 3 grades corresponds to a productivity difference of an order of magnitude. Given that, the difference between grades 1 and 12 is several orders of magnitude. Thus is perfectly reasonable to assume that the difference between a process rating of 10 and 100 should be several orders of magnitude, not just one order of magnitude. Squaring 10 and 100 gives 100 and 10,000, which varies by two orders of magnitude. This is enough for the rough comparisons the rating system will be used for.

The 12 Key Practices

Next let’s use the table to analyze invention factories. Although we will speak in terms of exact numbers, please remember these are really only rough approximations, useful for comparison only.

Using one of his own inventions, I’ve had the great pleasure of traveling back into time to interview Mr. Edison, so as to collect an accurate questionnaire on his invention factory. Mr. Edison was also kind enough to fill in another questionnaire of what invention factories were like before. The results are listed in the table.

To be a wee bit more honest, the results are based on my own experience in business management, process consulting, general reading, and a reading of several books about Edison’s invention factories. These were: Menlo Park Reminiscences, by Francis Jehl, 1937; Working at Inventing: Thomas A. Edison and the Menlo Park Experience, edited by William Pretzer, 1989; and Thomas Alva Edison: Inventing the Electric Age, by Gene Adair, 1996.
Domain Specific Practices

**Key Practice 1** – The organization uses a formal process for solving its mission level problems. The process fits the problem, is written, everyone is trained in it, and the process is continually improved. The process drives the entire organization.

Starting at the top of the questionnaire, question 1 determines how well a good formal process was used. Because this is such an important key practice, it has a weight of 2. Before the world’s first invention factory the very concept of turning out a steady stream of inventions in a factory did not exist, so there was no formal process used. This explains the 0 raw score for Before Edison. But after Edison created the first invention factory, there was a formal process for producing inventions. However, like most first efforts, it was not mature compared to today’s invention factories, so it only gets a 2. But still, there is a huge difference between a 0 and a 2, and even more between the weighted scores, which are a 0 and a 4.

**Key Practice 2** – After all major work projects are completed a post mortem is performed to see what went wrong, what went right, and how the process can be improved from that experience.

Formal post mortems were impossible before Edison, so that gets a 0. But after Edison came along there was a formal process that could be improved, so post mortems were possible. Edison and his team thought deeply about what went wrong and right after major projects, so Edison’s invention factory gets a 3.

Main Work Flow Practices

**Key Practice 3** – Problems are clearly and correctly defined, so that no effort is wasted on other pursuits.

Now we consider the main work flow key practices. Before Edison problems were not clearly and correctly defined. There was only a general urge to create something. But after Edison it became routine to define needed inventions in terms of missing knowledge, which could be found by experimentation using qualified teams of experimenters. Thus this factor gets a 0 and a 2.

**Key Practice 4** – An analysis model of the problem domain is constructed. The model explains why the system with the problem behaves the way it does.

The earlier quotes about how Edison went about inventing things show that “mental models” and “building blocks” played central roles in his process. His mental models are a form of analysis models. Edison carried these models in his head and communicated them to others through drawings, so that a functioning invention could be built. His original sketch of how the first version of the phonograph should be built is shown on the next page. The extraordinary power of this sketch may be seen in the following passage from *Thomas Alva Edison: Inventing the Electric Age*, by Gene Adair, 1996, page 60:

“His experiments with the telephone had familiarized Edison with diaphragms—small, thin disks of metal of other material that vibrate in response to sound waves. One day he got the idea of attaching a pin to a diaphragm and placing a ribbon of wax paper beneath it. ‘I rigged up an instrument hastily and pulled a strip of paper through it, at the same time shouting ‘Halloo!’’ Edison recalled. ‘Then the paper was pulled through again so its marks actuated the point of another diaphragm. My friend Batchelor and I listened breathlessly.’

“They heard a distinct sound, which, Edison said a strong imagination might have translated into the original ‘Halloo.’ The experiment was hardly conclusive, but it inspired Edison to do further testing.

“For several months, Edison worked with possible recording substances such as wax, chalk, and tinfoil. Word began to leak out from Menlo Park about a new machine that would somehow preserve telephone conversations. In early December [of 1877] Edison presented John Kruesi with some sketches and instructed him to build the device they illustrated. Kruesi wanted to know what it was for. ‘The machine must talk,’ said Edison.

“With his usual craftsmanship (and some skepticism), Kruesi fashioned pieces of brass and iron into the machine Edison requested.

“It was tested on the night of December 4, 1877. With his workers looking on, Edison carefully wrapped a sheet of tinfoil around the cylinder and lowered the needle of one of the diaphragms onto it. Turning a crank at one end of the cylinder, he shouted some words into the disk.

“Edison returned the cylinder to its starting point and placed the needle of the second diaphragm in the groove that had been impressed into the tinfoil. He turned the crank again, and to everyone’s astonishment, the voice of Thomas Edison came forth. ‘I was never so taken aback in all my life,’ Edison later remembered.”

The sketch was more than a sketch. It was an abstract model of how the invention was to work. If Edison had been unable to express his mental model in written form, he would have been forced to build the
world’s first phonograph himself, as well as all his other experiments. This would have slowed his rate of invention to a crawl.

Was the sketch an analysis model? No. An analysis model explains why the system with the problem behaves the way it does. The sketch explained only how the solution was to work.

This was an obstacle that Edison and others of his time could never surmount, because most of science was still in its infancy. For example, there was no chemical theory yet that could explain and predict what chemical compounds would have what properties. Without such a theory, a true analysis of many subproblems was impossible. This forced Edison and those in his invention factory into relying on multitudes of experiments to find things like the best filament for light bulbs and the best substance for the pressure sensitive rheostat for the telephone microphone. But because they had a good experimental process, as well as a genius at the wheel, their searches were fruitful.

Because Edison’s models tended to analyze how the solution should work rather than the problems to be overcome, this key practice gets only a 2 for Edison’s invention factory, and even less, a 1, for before Edison. This practice carries a weight of 3 because in modern science, analysis models drive research more than anything else except experimentation and a solution feedback loop, which carry weights of 3 and 4.

An outstanding example of this practice was the detailed model that James Crick and Francis Watson built to crack the code of DNA. Without that model, they would have been unable to conceptualize the molecular structures involved.  

**Key Practice 5 – Only after the analysis model is constructed do problem solvers begin to narrow solution alternatives down to the final selection.**

Compare the analysis model that Crick and Watson did to Edison’s sketch of the phonograph. It is not hard to see that inventors of Edison’s time used relatively crude models. Furthermore, inventor’s before Edison, and even Edison himself, seldom used true analysis models. Instead they build solution models. Thus this factor gets only a 1 for before Edison and a 2 for Edison’s invention factory, because in both cases they were putting the cart before the horse.

The purpose of an analysis model is to understand the system with the problem so well that converging on a solution becomes a matter of choosing between well understood alternatives. Contrast that to the many guesses Edison was forced to make because he had no analysis models. A good analysis model allows problem solvers to spend their time studying a handful of final alternatives in depth, thus saving much time and expense. A good analysis model can also transform a problem from insolvable to solvable, because now you can see a way forward.
Key Practice 6 – The solution is packaged in a manner that makes it self-implementing. That is, it takes no further significant effort from the organization to make the solution succeed, because the solution is designed to manage and cause its own successful implementation or acceptance by the customer.

Inventions like the phonograph and light bulb are self-implementing, because they contain everything the customer needs to solve a problem. Thus before Edison and Edison’s invention factory both get a 5.

But if you glance ahead to other comparison tables in this chapter, you will see that solutions to social problems are mostly not self-implementing. This is because the output of social problem solution factories, such as think tanks and environmental NGOs, are memes. The memes, in the form of articles, books, conversations, and such, may or may not change the system and thus solve the problem. Solution memes and their carriers almost always require large amounts of companion memes for successful implementation. An interesting exception, which we will discuss later, is how think tanks after the Powell Memo achieved the near miraculous ability to produce self-implementing meme carriers. This is done by “graduating” think tank staff into governmental power structures. Once there, they can self-implement because they are now in power.

Key Practice 7 – The results of released solutions are accurately measured as quickly as possible, and the results are used to improve the next version or phase of the solution, or when necessary the present solution. This is also known as measuring organization effectiveness, such as the way a for-profit corporation tracks its profits. This practice creates a formal solution results feedback loop.

My impression of invention factories before Edison is they were very unorganized compared to today’s research and development. They had only a rough idea of solution results, because they could barely measure anything but the most obvious results. Measurement of temperature, weight, acidity, infectivity, and so on was, by today’s standards, primitive. Thus this practice gets a 2 for before Edison. But Edison’s invention factory measured solution results better than the average factory, due to their heavy emphasis on experimentation and recordkeeping of the results. Thus it gets a 4.

This practice has the highest weight of all the key practices. This is because it creates the most important feedback loop in the process: Evolution of the Actual Solution. Feedback about solution results allows problem solvers to improve the results of the first four main work flow steps. For example, if a solution element fails in the real world, a failure analysis can be performed. It might lead to the conclusion that the structural analysis was flawed. Or it might point to the wrong solution meme alternative was chosen.

The importance of accurate, timely feedback on results can be seen in the fact that one of the greatest inventions in the history of the modern corporation was the discovery of double entry accounting by the Italians in the 15th century. For the first time traders could accurately tell what was contributing to profits and how much their profits were. This was such a competitive advantage that the practice of accounting swept the world quickly. Today measurement of corporate financial performance is considered so vital that it is a top corporate priority. Public corporations are required by law to publish audited financial statements, a practice which closes the feedback loop to their stockholders.

But strangely enough, accurate and timely measurement of results is given little importance by environmental NGOs. It seems they have not yet discovered what the New Dominant Life Form discovered 500 years ago: that the most important practice of all is to measure your own results with the speed and precision of a diving hawk.

Experimentation Practices

Key Practice 8 – All key problem solving assumptions are declared to be hypotheses in need of testing. This includes all key strategies, including the organization’s process itself.

When I talk to environmentalists or read the literature of the field, I am continually amazed at how little they question key assumptions. It’s certainly not that way in the business world, where questions like “Is that really true? Can you prove that?” are the norm when new strategies are being developed.

The same appears to have been true before Edison, where so little was questioned that this practice gets a 0. But Edison’s invention factory made very few major false assumptions. Instead, Edison drove himself and everyone else to turn assumptions into hypotheses that needed testing. Thus Edison’s factory gets a perfect 5.

Key Practice 9 – All hypotheses undergo rigorous experimentation to see if they are true, false, or need to be modified to become useful.

The emphasis Edison placed on experimentation is clearly described in this passage about Edison’s second invention factory. This was built from scratch at West Orange, New Jersey. (Italics added)

“By early fall [of 1887], five new buildings had been erected….

“The main laboratory, three stories high and containing nearly 40,000 square feet of floor space, included a beautiful wood-paneled li-
library, offices, experiment rooms, a power house (containing dynamos, steam engines, and a boiler), machine shops, and storage space. The four smaller buildings housed laboratories devoted to electrical testing, chemical and metallurgical experiments, and woodworking.

“Just as he had done at Menlo Park, Edison spared nothing to equip the lab. He installed the best possible machines and instruments in the workshops and experiment rooms, filled the library with every book and scientific journal he could possibly need, and brought in supplies by the wagonload—tools, chemicals, mineral specimens, and just about every other kind of material. As Edison saw it, ‘The most important part of an experimental laboratory is a big scrap heap.’”

From this we can see that to Edison, an invention factory was a complex of buildings equipped with everything needed for massive amounts of experimentation. Very little space was needed for the actual creation of hypotheses. According to Edison this was the easy part, which is what he meant by “Genius is 1% inspiration and 99% perspiration.”

Now what did Edison’s staff do, once given such well equipped laboratories?

“The success of the invention factory idea depended on the skills of these craftsmen. Fast, flexible workers, accustomed to high standards of precision work, provided the foundation of the experimental teams that carried out the work of innovation. The fruitful cooperation between inventor and machinist, personified by the relationship of Edison and Batchelor, became the basis of the team approach to innovation that characterized work in Edison’s laboratory. Edison made it clear later in his career that ‘The way to do it is to organize a gang of one good experimenter and two or three assistants, appropriate a definite sum yearly to keep it going… have every patent sent to them and let them experiment continuously.’ As this quotation indicates, the chief experimenter ran the group with the minimum of interference from Edison. He would outline the task and give some pointers, but he normally relied on the initiative of the experimenter. When one man asked him what to try next, Edison replied: ‘Don’t ask me. If I knew I would try it myself.’”

Thus Edison’s invention factory gets a perfect 5 for this practice. Because rigorous experimentation drove very few invention factories before Edison, that gets a 1.

This passage gets to the core of Edison’s greatest invention, which was the concept of invention factories itself. An invention factory become possible when two critical factors become true: (1) The factory manager wants to create a large steady stream of inventions, and (2) Correct division of labor to make invention manufacture a repeatable, scaleable process is used. Edison was the top level problem identifier and hypothesis generator. Through the use of drawings, writing, and conversation he was able to delegate everything else, starting with analysis and experimentation, to others. He did the “1% inspiration” and they did the “99% perspiration,” which amplified Edison’s output a hundredfold. Other inventors before Edison did not get these two factors right. But after Edison, hundreds of thousands did.

**Key Practice 10** – Only hypotheses that have passed multiple well designed experiments are added to the organization’s formal knowledgebase of sound solution components. The knowledgebase has a high quality gate.

Edison knew that “garbage in, garbage out” held true for his invention factories. He thus enforced the strictest possible quality gate to the knowledgebase that he and all his workers shared. Only after key hypotheses had passed a battery of experiments was he satisfied they were true enough to build inventions with.

This practice gets another perfect 5 for Edison. Before the miracle of Menlo Park most budding inventors built their dreams on such a vast variety of unfounded, untested assumptions that before Edison gets a 1.

**Knowledgebase Management Practices**

**Key Practice 11** – The knowledgebase is managed so well that what it contains enters into all decisions that would benefit from it, in a manner that optimizes the quality of those decisions.

Notice the phrase “have every patent sent to them” in the previous passage. This is part of knowledgebase management. So is “filled the library with every book and scientific journal he could possibly need” in the passage before that. And then here is another description of Edison’s approach to knowledge management:

“[Edison] established formal procedures for record-keeping on all laboratory work; numbered laboratory notebooks would provide the laboratory with a complete record of its work, thereby facilitating that work and protecting it legally. These three steps—thorough literature searches, keeping up to date on the emerging science and technology, and careful documentation of work done in the laboratory—were among the central elements of [his] research efficiency.”

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Edison wanted his company’s knowledgebase, as well as that of science and industry, to enter into the decisions of his experimenters and their assistants. But it could have been even better if technology like video and the internet had been available. So we’ll give him only a 4 for this practice. Before Edison gets a 1, because in most other invention factories only the driving genius was highly educated and well qualified. The rest were not nearly as capable as Edison’s “chief experimenter’s” were.

**Key Practice 12 – Knowledgebase additions, removals, and changes are used to improve previous decisions in all workflow steps.**

If knowledge workers are not kept abreast of change in their field and their organization, they are working from stale knowledge and will produce behind-the-times results. This is a minor issue when the knowledgebase is small and stable. But it becomes critical when the knowledgebase is large and rapidly changing. The last century of the growth of science has seen exponential growth in the size of knowledgebases and the speed of change. Thus this practice is crucial to today’s solution factories.

It was also crucial to Edison’s invention factory, because it was at the forefront of hyperchange. The Menlo Park invention factory alone produced 400 patents and at least three major inventions (the phonograph, electric light, and telephone transmitter) and many minor inventions in six years, an astounding record even by today’s standards. I’d estimate that over 80% of these many innovations were based on reassembly of previous knowledge into a new form, rather than newly discovered knowledge.

Thus Edison’s invention factory was at the top when it came to keeping everyone up to date on the latest in the knowledgebase. This practice gets a perfect 5. But before Edison gets only a 1, because the way earlier invention factories were organized encouraged the use of stale knowledge. This was caused by the use of less than top talent experimenters, who were not usually considered experimenters, but lowly assistants. These other invention factories were not as well stocked with the latest books and journals. Nor was their staff reading much of the time, as the photograph shows Edison’s staff was.

The Relative Productivity of Two Types of Invention Factories

The weighted ratings for the two types of invention factories add up to 24 for before Edison and 73 for Edison’s invention factory. Squaring these gives 576 and 5,329 for relative productivity. While these are not exact numbers because we have not calibrated the process model, the questionnaire, the rating weights, or conversion to relative productivity, they can serve very well for rough ballpark comparison.

The most dramatic conclusion is that Edison’s invention factory worked because its relative productivity was an order of magnitude greater than anything that came before. Edison’s will to create an invention factory, combined with his keen sense of how to setup a manufacturing process that was repeatable and scaleable, allowed him to run circles around everyone else. This included Alexander Graham Bell, inventor of the telephone. Bell produced only one major invention and 30 patents because, unlike Edison, he never hired more than one assistant for work on inventing the telephone, did not focus on reusing his knowledgebase in similar inventions, and never devoted his life to creating as many inventions as he could.

The subtotals in the table of invention factories tell why Edison’s approach worked so well. He had a strong formal process, while others had none. He had all the elements in the proper main work flow. He had the very
best key practices for experimentation, which was pitifully weak at other invention factories. And finally he managed his knowledgebase seriously, to get the most out of it. The emergent result was Edison fully delivered on his promise to “invent some minor thing every ten days and some big thing every six months.”

**The Memetic Side of Think Tanks**

Invention factories produce *physical* solutions to problems. Think tanks produce *mental* solutions to problems, in the form of memes. While both are types of solution factories, invention factories and think tanks work very differently.

The purpose of think tanks is to produce memes that will affect the course of government decision making. This allows a rough definition: A think tank creates memetic solution components to important public problems, for the purpose of affecting government decisions. A shorter definition is a think tank is a memetic solution factory specializing in problems that require governmental intervention to solve.

Think tank employees produce new useful thoughts, each of which is a meme. These memes may be in the form of an appealing phrase, an article, a book, graphs, videos, an interview, a speech, etc. The actual article, book, person, lobbyist, etc is the *meme carrier*, which is necessary to carry the meme(s) to other minds where, if a mind is *infected* by the meme, the meme has *repli* cated. The memetic output of think tanks enters society’s *meme stream*, from where it flows to other minds. In pre-industrial societies, the meme stream is primarily conversational, augmented by the written word. In industrialized societies the meme stream is dominated by the media, and within that, television, and more recently the internet.

An indirect measure of success of a think tank is how many successful replications of memes that it created have occurred. A direct measure is how effective the resultant behavior is in solving the problem a think tank was working on. Thus usually the more minds a think tank’s memes infect the better.

Memetic infection is what think tanks are really all about. But this perspective is not widely shared. For example, wikipedia.org defines a *think tank* as “A research institute or other organization providing advice and ideas on problems of policy, commerce, and military interest.” The American Heritage dictionary defines *think tank* as “A group or an institution organized for intensive research and solving of problems, especially in the areas of technology, social or political strategy, or armament.” These both miss the memetic abstraction completely.

But far more insidious is the way both definitions hide the fact that many think tanks do not merely provide “advice and ideas.” They promote it as aggressively as possible, using whatever means it takes to get the job done. As you might expect, this includes the many conservative think tanks that were established in the United States as a result of the Powell Memo. Their goal is not to provide “advice and ideas.” It is to invent and propagate the memes necessary to win The Race to the Bottom among Politicians. This is done by first inventing persuasive rationales (memes) to convince people to support conservative politicians and policies. These are all fallacious, because the race to the bottom ultimately relies on falsehood and favoritism. There may be truth mixed in, but the only purpose of this is as a benign “carrier” for the rest of the message. The positive connotations of the term “think tank” serve as a very effective cover for the true mission of conservative think tanks.

**Learning from the Opposition: The Rise of Corporate Proxy Think Tanks in the US**

Think tanks are a murky type of organization to research because their product, memes, is so ethereal. It’s easy to determine the number, size, and general political orientation of think tanks. But it is very hard to determine their actual political effectiveness and innermost strategies and techniques. Thus this sketch of the rise of think tanks will necessarily fall short in these important areas.

Andrew Rich provides the graph below to show the growth of US think tanks by ideology. The curve shows The proliferation pattern of nationally focused think tanks, by ideology. The largest group has no identifiable ideology. Notice how the late arrival of liberal think tanks gave conservative think tanks a large learning curve and first to market advantage.
that all was relatively quiet until the 1970s, when the Powell Memo precipitated a phase transition in the US political system. This caused the curve to jump from slow to rapid growth. What were the major factors involved? What is that curve composed of, in terms of political influence? Where might this growth curve and other trends be going?

As we search for answers to these questions, we will develop a model of understanding for think tanks. The examination will focus on US think tanks, since they are the most influential in the world and set the trends that other countries follow. Our model of understanding will be expressed in three forms: (1) The Solution Factory Work Flow model, which we have already discussed, (2) A SOFAN diagram of The Rise of Think Tanks in the United States, and (3) A table of process ratings for three types of think tanks.

We begin our analysis of the rise of think tanks with the Social Force Analysis Notation (SOFAN) diagram above.

In SOFAN a “force” is the impact exerted by a feedback loop structure on a social system. All the sloped lines are social forces, with the name of the feedback loop causing the force below each line. The circled Rs show that all the loops are reinforcing, causing them to grow until something stops them. In SOFAN what stops or transforms such growth is a precipitating event, as represented by a vertical line.

The diagram shows two main types of forces. On top are the dominant think tank forces. These led to the four phases of the rise of think tanks in the US. On the bottom are the dominant social background forces. As far as I can tell, there is a single main background force: the long, slow, relentless rise of the modern corporation to dominance over Homo sapiens. Because it is the most important force on the diagram, let’s examine it first.

The Dominant Background Social Force

This force arises from the **Successful Exploitation of the Race to the Bottom among Politicians** structure. The exploiter is the New Dominant Life Form, more commonly known as the modern corporation and its allies.

This background force was briefly presented in chapter two, and then presented at length in the chapter on The Dueling Loops of the Political Powerplace. However, it is so important it is presented in even more detail in the A Model in Crisis manuscript as the Niche Succession Simulation Model. This model shows how the modern corporation and its allies have successfully exploited The Race to the Bottom among Politicians. It also shows how the modern corporation and Homo sapiens are engaging in a classic survival of the fittest struggle for niche dominance. The niche is control of the biosphere. According to the ecological **principle of competitive exclusion**, over time only one species (or life form) can exist in a niche. All others will be forced to adapt to a different niche, be driven out of the niche,
or be driven to extinction. While multiple life forms can exist in the biosphere, only one can control it.

There were two main precipitating events that caused the birth of the modern corporation. The first occurred in 1855 when the Limited Liability Act was passed in England. Similar acts had already been passed in France in 1807 and in most states in the US by 1830. But England, the dominant world power at the time, set the standard, which quickly spread worldwide.

Limited liability means that a corporation’s stockholders (and employees, with some exceptions) are not liable for the corporation’s debts and cannot be punished for its wrongdoings. Before the introduction of limited liability they were fully liable, which is called unlimited liability.

From the viewpoint of stockholders seeking to maximize profits, limited liability is a boon, because it means there is little incentive for stockholders to act responsibly. If a corporation causes large problems for society (such as catastrophes, pollution, or environmental destruction) that total far more than its net worth, it simply declares bankruptcy. Or if a corporation runs up losses much bigger than its net worth, such as by Enron style con games or just plain ole bonehead management, it declares bankruptcy. But in both cases, before bankruptcy occurs the company may pay out as much stockholder dividends and executive compensation as it wants, and these payouts cannot be retracted by those with claims on the company after bankruptcy.

From the viewpoint of society, however, limited liability is a shield of irresponsibility. Because stockholders and managers are shielded from behaving responsibly toward the needs of society in general, they behave irresponsibly and push their companies to engage in all sorts of risky and reckless behavior. Due to limited liability, stockholders and managers can essentially “gamble for free” at the expense of society, because they are not liable when they lose a gamble. But the corporate life form has been clever enough to hide this brutal fact behind a smokescreen of “benefits” that it brings to society. This has been done so well that the public has come to see the modern corporation, as it exists today, as essential to modern civilization. It is not, because there are superior alternatives.

How critical the precipitating event of limited liability was in retrospect may be seen in this quote from The Economist in 1926. It wrote that “[history will] assign to the nameless inventor of the principle of limited liability… a place of honor with Watt and Stephenson, and other pioneers of the Industrial Revolution.” Going even further than that, in 1911 Nicholas Murray Butler, President of Columbia University wrote that “… in my judgment the limited liability corporation is the greatest single discovery of modern times.” The end result is “limited liability encourages managers to take inappropriate risks.”

By 1855 the definition of the modern firm was almost complete: a separate legal entity, limited liability, stock ownership, and public reporting of a firm’s affairs. But there was one key feature still missing: firms were inferior to people in the eyes of the law, because they were “artificial entities” and not “natural persons.” But then, in 1886, came a legal thunderbolt. David Korten, writing in When Corporations Ruled the World, describes the final precipitating event that changed everything: “In 1886, in a stunning victory for the proponents of corporate sovereignty, the chief justice of the Supreme Court declared in Santa Clara County v. Southern Pacific Railroad that a private corporation is a natural person under the US Constitution—although as noted above, the Constitution makes no mention of corporations. Subsequent court decisions interpreted this to mean that corporations are entitled to the full protection of the Bill of Rights, including the right to free speech and other constitutional protections extended to individuals.

“Thus corporations came to claim the full rights enjoyed by individual citizens while being exempted from many of the responsibilities and liabilities of citizenship. In being guaranteed the same right to free speech as individual citizens, they achieved, in the words of Paul Hawken, ‘precisely what the Bill of Rights was intended to prevent: domination of public thought and discourse.’ The subsequent claim by corporations that they have the same rights as any individual to influence the government in their own interest pits the individual citizen against the vast financial and communications resources of the corporation and mocks the constitutional intent that all citizens have equal voice in the political debate surrounding political issues.”

Once the modern corporation had all the prerequisites to compete against the then dominant life form, Homo sapiens, a classic battle of niche succession began. The competitive advantage of the New Dominant Life Form began to grow and grow and grow. More laws in its favor were passed. Society grew ever more dependent on corporations instead of partnerships or individuals for production of its needs. People in industrialized countries became highly dependent on corporations for jobs. Politicians became dependent on corporate money for election. Acting through govern-
ment representatives, international corporations set up their own World Trade Organization (WTO) in 1995. The WTO has more power than even the World Court (Actually The International Court of Justice, the principle judicial organ of the UN), because WTO members are legally bound to follow WTO decisions, while the World Court only has jurisdiction if the parties involved give their consent and agree to be legally bound to follow the court’s decision. As a result of all these developments, some time in the late 20th century the competitive advantage of the New Dominant Life Form crossed over the only game in town threshold, in terms of political influence.

Once in this region, one precondition for a successful phase transition to Overt Corporatism was met. Corporate think tanks and other corporate sponsored organizations no longer had to hide their lack of “policy research” objectivity or their propensity toward ruthlessness, because they were now the only game in town. Any politician who did not play the corporate game was a dead politician, in the sense they would probably not get elected or reelected. The power of corporations was now so great that they could openly fix the so called “research” and the “facts” around the policies that would most benefit corporations. Or they could use direct force, such as:

“Consider the state of Montana, which for nearly a century was run as a virtual colony by the aptly named Anaconda Copper Company. The company had a tradition of corruption and hardball tactics. At one point, displeased with the decision of a state judge in favor of one of its rivals, Anaconda shut down all its mines and smelters in the state for three weeks, cutting off thousands of workers from their paychecks, until the governor called a special session of the legislature to pass a new bill that resolved the dispute in favor of the company.”

Or consider this example concerning the tax on wine in California: (Italics added)

“As late as 1989, the tax on wine remained a constant one cent a gallon.

“But California was changing. The California Highway Patrol pushed the state to see alcohol as a public safety issue. Mothers Against Drunk Driving (MADD) turned personal grief into political mobilization. In the late 1980s, a broad coalition of groups organized to pressure the state legislature to impose a nickel-a-drink tax on bars and restaurants, with revenues earmarked for trauma centers, law enforcement, alcoholism prevention and treatment. But despite polls showing that 73% of Californians supported such a tax, the measure went nowhere in the legislature.

“...the coalition...decided to take the matter directly to the citizens of California by means of an initiative on the 1990 state ballot. Soon thousands of volunteers across the state were setting up tables on sidewalks and in malls to qualify the initiative, Proposition 134.

“Responding immediately, liquor industry leaders held emergency meetings to plot a counter strategy. The president of the California Wine Association called Proposition 134 ‘the most serious threat to this country since Prohibition,’ and an industry newsletter reported that the industry would spend ‘whatever is necessary’ to defeat the tax. Led by donations from Seagram & Sons and Guinness Corporation, the industry committed an unprecedented $38 million to oppose the nickel-a-drink tax initiative. Attack ads were drafted, a one-penny-a-drink counter initiative was launched in order to muddy the waters, and an industry front group, Taxpayers for Common Sense, was created in the offices of the liquor executive.

“The combination of negative advertising, counter initiatives, front groups, and an overwhelming financial advantage proved effective. In the crucial area of broadcast advertising, the balance of resources was not even close. While the liquor industry spent $18 million on ads that slammed the nickel-a-drink initiative, proponents had only $40,000 with which to counter them. On election day, confused voters rejected both the citizen initiative and the industry alternative.”

Is there any question who is now the New Dominant Life Form on planet Earth?

The Rise of Think Tanks in the United States diagram argues that the dominant background social force since 1886 has been the steady increase in the competitive advantage of the New Dominant Life Form. This background force, which is not at all obvious to most analysts, affects foreground forces that are more apparent. In particular, this background force caused the co-option of think tank mechanism for corporate ends force to emerge and greatly strengthened the force of the Powell Memo precipitating event. Let’s turn our attention to the upper part of the diagram to see how this came about.
Phase 1 – Creation of Preconditions

In the 17th century the greatest invention since agriculture was discovered 10,000 years ago occurred: discovery of the Scientific Method. Scientists and others now had a repeatable process for producing reliable knowledge, using experimentation to prove hypotheses true or false. New knowledge could be built from old knowledge several orders of magnitude more reliably, because the old could be assumed to be correct. Suddenly science could build its castles of wisdom on rock solid foundations of knowledge instead of quicksand. As a result, their castles soared to greater and greater heights. This caused the advance of knowledge, and its many benefits when applied, to shoot through the roof and become exponential.

As a result of technological advances like control of infection, the harnessing of electricity, the appearance of a flood of cheap consumer goods, rising life spans, and a mushrooming middle class, confidence in the ability of science to solve problems began to grow. Once it began to grow significantly, it was just a matter of time until society came to the conclusion that science could also be applied to solving social problems. Once this point was reached the can make a difference in social problems threshold was crossed. Phase 1, Creation of Preconditions, was almost complete. All that was needed was the right precipitating event to cause a phase transition.

Phase 2 – Progressive Idealism

The right event came along in 1907, when the first two national think tanks were founded. This signaled the beginning of the age of Progressive Idealism. Andrew Rich, in Think Tanks, Public Policy, and the Politics of Expertise, describes how this occurred:

“The First Think Tanks: Reflections of a Progressive Ideal.

“The first national think tanks emerged just after the turn of the 20th century with missions reflecting a Progressive Era confidence that expertise from the burgeoning social sciences could solve public problems and inform government decision making. Progressive reformers looked to experts to generate the ‘scientific knowledge’ that would move policy making beyond rancorous log rolling and partisan patronage. They aimed to make government reflect more efficient and professional standards.

“The Russell Sage Foundation was founded in 1907…. It began with a mission to promote ‘the improvement of social and living conditions in the United States of America.’ The Foundation was intended to contribute to the turn-of-the-century charity movement, as an institution that could both define standards for the social work occupation and find systematic solutions for the broader social problems to which the movement was addressed. Knowledge and efficiency were the watchwords for the movement.

“The Bureau of Municipal Research, also incorporated in 1907, took as its mission the efficient reform of government, rather than the solution of social ills. The Bureau evolved from efforts by New York businessmen and intellectuals, who placed high value on the establishment of defensible—and enforceable—budget and accounting standards in the city of New York. … Its mission was to meet the ‘supreme need for an agency dependent neither upon politics nor upon an average public intelligence.’ Its leaders brought academic credentials from top universities, in both finance and law, and a zeal for making government a more efficient provider of public goods and services.”

The first two national think tanks had an immediate impact. More were quickly founded, including the fabled Brookings Institution in 1916. Fifty years later, President Lyndon B. Johnson acknowledged their immense beneficial influence, when he said:

“The men of [the] Brookings [Institution] did it by analysis, by painstaking research, by objective writing, by an imagination that questioned the ‘going’ way of doing things, and then they proposed alternatives…. After fifty years of telling the Government what to do, you are more than a private institution…. You are a national institution, so important… that if you did not exist we would have to ask someone to create you.”

The era of Progressive Idealism was marked by one overriding value: the search for the new objective truths that were needed to take society to even higher levels for the benefit of all. The central product of think tanks during this period was new objective truths, in the form of unbiased analyses and solution alternatives. These were then used by government decision makers to determine what areas needed their attention the most, where the biggest gains might lie, and what might be done to achieve these gains. During the Progressive Idealism phase the driving force was perfection of think tanks to find the objective truth.

As more think tanks were founded and those that existed became more mature, the value of their output rose so high it began to catch the attention of the New
Phase 3 – Covert Corporatism

In 1942 a little noticed phase transition occurred when the first corporate end think tank was founded. Andrew Rich describes the precipitating event this way:

“With the explicit backing of big business, the Committee for Economic Development (CED) emerged in 1942, representing a new variant on existing think tank models. Anticipating the end of the war, business leaders were concerned with generating high employment in a postwar economy. Marion B. Folsom, one of CED’s founders and treasurer of Eastman Kodak Company, observed: “The problem is to find jobs in the post-war period for eight to nine million more persons than were employed in 1940 and to increase the output of good and services by 35%... To bring about this increase... in two years time is a most difficult assignment. This is largely the task of private industry.

“A research organization like the CED was deemed necessary to provide ideas for this undertaking. Business support of CED was explicit, with collaborative links to the Chamber of Commerce and the National Association of Manufacturers.”

While this looked innocuous on the surface, it was not. Up to this point think tanks had virtuous ends. Their growth was driven by the Evolution of a New Virtuous Process loop. But once the first think tank designed to meet the ends of corporations (and not society) was established, a new loop appeared. This was the Evolution of a New Corrupt Process loop, which caused the co-option of think tank mechanism for corporate ends force to begin to grow. Bit by bit little, more corporate oriented think tanks were founded, as this new mechanism was perfected. One was the American Enterprise Association (AEA) in 1943, “with seed money from Louis Brown of the Johns Manville Corporation.” It was “More conservative and anti-government than the CED.”

Up to this point, think tanks had achieved success largely because they were perceived to be objective, reliable sources of critically needed information, problem analyses, and policy alternatives. But this began to change in 1961 and 1963, when the Hudson Institute and the Institute for Policy Studies (IPS) were founded. While they were not primarily motivated by corporations, they were motivated by a similar drive: to be more influential. According to Andrew Rich, to do that they:

“...broke with some of the institutional conventions associated with think tanks, particularly norms of neutrality and academic objectivity. Neither Kahn nor Barnet [leaders of the two institutions] had Ph.D.s, historically the degree of think tank scholars. And both institutions seemed as concerned with staffing their organizations with creative and aggressive intellectuals as with those who might have obtained a long list of academic credentials. Both organizations doggedly defended—and gained respect for—the quality and accuracy of their research products. But Hudson and IPS were more dogmatic and unrestrained than their think tank forebears.”

It did not take long for corporate masterminds to connect the dots. Once that happened, the can accomplish more through loss of objectivity threshold was crossed. Furthermore, the only game in town threshold had long been crossed. Now all that was needed was the right precipitating event.

Phase 4 – Overt Corporatism

It came in 1971 with the strength of a shot heard round the world. But because the shot was a confidential memo, the only people that heard it at the time were the recipients of the memo.

The astounding tale of the Powell Memo has already been told, back on page 149. But it is worth telling again in the context of the SOFAN diagram. The following material is from Gangs of America: The Rise of Corporate Power and the Disabling of Democracy, by Ted Nace, 2003. Ted devotes an entire chapter to The Revolt of the Bosses: The new mobilization of corporate political power (1971 to 2002). The chapter opens with:

“In August 1971, two neighbors in Richmond, Virginia, happened to have a little chat. One was Eugene B. Sydnor, Jr., a department store owner who had recently been appointed chairman of the U. S. Chamber of Commerce’s Education Committee. The other was Lewis Powell, Jr., one of the most well-connected corporate attorneys in the country and a director on eleven corporate boards. The two talked about politics, and Sydnor was so intrigued by Powell’s ideas that he asked Powell to put them in a memo to the Chamber of Commerce committee.

“The late 1960s and early 1970s weren’t the best of times for men like Sydnor and Powell. Public attitudes toward businessmen were in a free fall. From 1968 to 1977, the percentage of Americans who agreed that ‘business strikes a fair balance between profits and the interests of
the public’ dropped from 70% to 15%. The country was experiencing the biggest social upheaval since the Great Depression, and much of what was going on seemed aggravating if not downright frightening to big business. Wrote one political scientist, ‘Order seemed to be unraveling: massive antiwar protests on the mall; a half-million-troop war effort bogged down and hemorrhaging in the mud of Southeast Asia; economic stagnation and declining profit rates; and in the cities, skyrocketing crime coupled with some of the most violent riots since the Civil War.’

“At the center of the turbulence was President Richard Nixon, who had built his career as a Red-baiting politician but whose actual style of government, once in office, involved an eclectic mixture of conservative and liberal positions, flavored with a strong dose of old-fashioned corruption. Nixon supported a number of measure opposed by business: a repeal of the Kennedy-era investment tax credit, an increase in the capital gains tax, limits on the use of tax shelters, a strengthened occupational safety and health bill, and tough new regulations on air pollution.

“By 1971 it was clear that both the consumer and environmental movements, which had barely existed five years earlier, were forces to be reckoned with. Seven major environmental and consumer groups were established in 1969 and 1970 alone: Friends of the Earth, the Natural Resources Defense Council, Public Citizen, Common Cause, Environmental Action, the Center for Law and Social Policy, and the Consumer Federation of America. Caught flat footed by this grassroots mobilization, corporations were unable to mount enough opposition to stop such legislation as the National Environmental Protection Act (1969), the Clean Air Act Amendments (1970), a ban on all cigarette commercials from radio and television (1970), and the cancellation of funding for the Supersonic Transport Plane (1970).

“Perhaps it could have been foreseen that the successes of the environmental and consumer movements would trigger some sort of backlash by big business, but the scale of the corporate political mobilization proved to be unprecedented. Even more improbable was the man whom many credit with inspiring that mobilization, sixty-four-year-old Lewis Powell, Jr.

“A few days after his conversation with Sydnor, Powell called in his secretary to take dictation and composed a memorandum describing his view on the malaise afflicting corporate America and the steps he felt the U. S. Chamber of Commerce should take to reverse the slide in the political fortunes of big business. The memorandum was marked ‘Confidential’ and was distributed as a special issue of the Chamber of Commerce’s Washington Report to top business leaders. Titled ‘Attack on American Free Enterprise System,’ it is a remarkable document, forming the seminal plan for one of the most successful political counterattacks in American history.”

This then was the event itself. What was the response of the system?

That it would be a very strong and possibly sudden response can be seen from the two preconditions for a successful phase transition. One is that the can accomplish more through loss of objectivity threshold had been crossed some time in the 1960s, when the Hudson Institute and the Institute for Policy Studies had proved that being more dogmatic and less objective worked, and that it was the only way that would work for policies that were not in the best interests of the public. The other precondition was the passing of the only game in town threshold.

Ted Nace continues with a description of the system’s response:

“As though in direct answer to Powell’s rallying cry, an unprecedented wave of political organizing began among business executives soon after the publication of the memo. The most important development came in 1972, when Fredrick Borch of General Electric and John Harper of Alcoa spearheaded the formation of the Business Roundtable, an organization made up exclusively of CEOs from the top two hundred financial, industrial, and service corporations.

“Because of the composition of its membership, the Business Roundtable occupied a position of unique prestige and leverage. It functioned as a sort of senate for the corporate elite, allowing big business as a whole to set priorities and deploy its resources in a more effective way than ever before.

“Alongside and in the wake of the Roundtable, the 1970s saw the creation of a constellation of institutions to support the corporate agenda, including foundations, think tanks, litigation centers, publications, and increasingly sophisticated public relations and lobbying agencies.
According to Lee Edwards, official historian of the Heritage Foundation, wealthy brewer Joseph Coors was moved by Powell’s memo to donate $250,000 to the Analysis and Research Association, the original name of the Heritage Foundation. Other contributors followed his example.

“At the national level, the permanent organizations that made up the corporate political infrastructure would assemble short-term coalitions as needed to wage particular battles. These coalitions often combined the prestige, financial resources, and Washington clout of the Business Roundtable with the ability of industry-specific groups to mobilize large numbers of people.

“Typical of such coalitions were the Center for Tobacco Research, described by the Wall Street Journal in 1993 as ‘the longest running misinformation campaign in U. S. business history’; the Cooler Heads Coalition, which sought ‘to dispel the myths of global warming’; the Competitive Enterprise Institute, a research and advocacy group that advocated against safety and environmental regulation; and the Environmental Education Working Group, which sought to undermine environmental education programs in schools.

“Over time, the new political infrastructure honed a variety of techniques. Alongside traditional tactics such as lobbying and junkets, innovative new methods emerged such as ‘astroturfing.’ As defined by Campaign and Elections Magazine, an astroturf campaign is ‘a grassroots program that involves the instant manufacture of public support for a point of view in which either uninformed activists are recruited or means of deception are used to recruit them.’

“On the fringe of the new corporate politics was a grab bag of techniques used to smear or silence corporate opponents. ...common was the use of lawsuits to intimidate corporate critics. According to law professors George Pring and Penelope Canan, thousands of such suits were filed from the mid-1970s to the mid-1990s. Pring and Canan coined the term ‘strategic lawsuits against public participation,’ or SLAPP. Their research showed that the targets of such suits rarely lost in court but nevertheless were ‘frequently devastated and depoliticized’ and that the suits discouraged others from speaking out.”

These new corporate techniques are examples of how the aggressive marketing of preferred policies force was now growing rapidly. For think tanks, aggressive marketing means not merely publishing research results, but beating on the right doors and getting the right people to read those results. Sharon Beder describes how the leading US conservative think tank goes about doing this: (Italics added)

“The Heritage Foundation has often been credited with changing the face of think tanks with its aggressive marketing strategies; others are now following suit. The foundation spends only 46% of its budget on actual research: more than half goes on marketing and fund raising, including 36% on public relations and ‘educational programs.’ Foundation president Ed Feulner says: ‘We view production—that is, conducting research, analyzing the data, and publishing the finding—as only part of the total process. The other key part is marketing—the way in which we package our findings, our distribution network, and the various activities aimed at building support for our ideas.

“The Foundation produces hundreds of publications every year, including books and a quarterly journal, Policy Review. Its specialty is its ‘backgrounder’ or ‘bulletins’ which are short essays (between two and twenty pages) on current issues—‘brief enough to read in a limousine ride from National Airport to Capitol Hill.’ These are provided without charge to government officials, employee and journalists, and are usually personally delivered.

“The Heritage Foundation, like other think tanks, conducts public opinion polls as a means of—as a Foundation employee put it—‘influencing public opinion, not just reflecting it.’ This is done by selecting questions that will influence the results and then getting wide media attention for the supposedly objective poll findings.”

If, as you have been reading this, you have been feeling a growing sense of anger, frustration and despair because environmentalists cannot hope to match what corporatists are doing, that feeling is well founded. The environmental movement, even if it was 100% united, cannot hope to out influence governmental decision making if it uses the same strategies as the New Dominant Life Form. Their only recourse is another strategy.

As a result of the Powell Memo of 1971, a phase transition from Covert Corporatism to Overt Corporatism occurred. Before the Powell Memo, industry had been reticent about pushing its agenda as hard and openly as it could. But after the Powell Memo, all that
changed. For example, here is the stated mission of the conservative Heritage Foundation:

“The Heritage Foundation is a research and educational institute—a think tank—whose mission is to formulate and promote conservative public policies based on the principles of free enterprise, limited government, individual freedom, traditional American values, and a strong national defense.”

Compare that to the mission statement of the fairly centrist Brookings Institution:

“The Brookings Institution... is an independent, nonpartisan organization devoted to research, analysis, and public education with an emphasis on economics, foreign policy, governance, and metropolitan policy.”

The first mission statement essentially says “I am going to aggressively push the following policies as hard as I can, using any means necessary.” The second statement, by extreme contrast, describes an organization that intends to perform objective work in certain fields, with no preconceived policy goals to bend their research and findings around, and no tendency to “promote” their findings aggressively.

During the fourth phase, Overt Corporatism, the Evolution of Manufactured Rationales and Meme Carriers Effectiveness loop worked so well it was devastatingly effective. The aggressive marketing of preferred policies force grew so strong that think tanks and the other types of solution factories spawned by the Powell Memo caused a seismic shift in American politics. Conservatism roared in like a lion unleashed. Once the majority infected by preferred policies threshold was crossed, it was inevitable that corporatism would get its way. And it did, in spades, when in 2001 the corporate proxy movement (better known as conservatism) elected George W. Bush as the 43rd president of the United States.

Background forces do not disappear after a precipitating event occurs. Instead, they are transformed into new forces. Before the Powell Memo the dominant background social force was the growth of the competitive advantage of the New Dominant Life Form. After the Powell Memo that force became the growth of total global dominance of the New Dominant Life Form. This is because the modern corporation now had enough competitive advantage to move onto its next challenge: global domination. This is occurring through the spread of corporations to second and third world countries, the infiltration of corporate proxies into nation and international bodies, the continued weakening of governments by privatization, regulation rollback, and tax cuts, and so on.

What will happen once the total global dominance of the New Dominant Life Form force grows to a high level, and crosses an important social threshold? What is that threshold? What will the precipitating event be? Looking a little deeper, is this really going to be the dominant force, if its source is the Redesign of Niche to Suit the New Dominant Life Form loop? Or is that even the right loop?

I don’t know, but a detailed analysis could probably find out.

**The Real Result of the Forces Unleashed by the Powell Memo: An Explosion of Corporate Agenda Promotion Institutions**

The Rise of Think Tanks in the United States diagram makes it appear that the main result of the Powell Memo was the next major event: the election of a highly corrupt and compliant corporate proxy President in 2001. But that is only an obvious symptom of a deeper new trend: the appearance of a plethora of new kinds of New Dominant Life Form driven solution factories. This disturbing trend is not shown on the diagram because the diagram is only trying to explain the rise of think tanks.

Ted Nace wrote in a passage above that:

“Alongside and in the wake of the [Business] Roundtable, the 1970s saw the creation of a constellation of institutions to support the corporate agenda, including foundations, think tanks, litigation centers, publications, and increasingly sophisticated public relations and lobbying agencies.”

This “constellation of institutions” is the “big 80” that was described back in the first presentation of the Powell Memo on page 149, where Ron Hazen wrote that:

“Consider that the conservative political movement, which now has a hammerlock on every aspect of federal government, has a media message machine fed by more than 80 large non-profit organizations – let’s call them the Big 80 – funded by a gaggle of right-wing family foundations and wealthy individuals to the tune of $400 million a year.

“Starting with just a handful of groups, including the Heritage Foundation, in the early ’70s, the conservatives built a new generation of organizations – think tanks, media monitors, legal groups, networking organizations, all driven
by the same over-arching values of free enterprise, individual freedoms and limited government.

We need to pin a term on these New Dominant Life Form driven solution factories. Let’s call them Corporate Agenda Promotion Institutions, or CAPI for short. The mission of CAPIs is to promote the dominance of the New Dominant Life Form, mainly by insuring that The Race to the Bottom among Politicians loop remains dominant and well exploited by the New Dominant Life Form. The counterpart to CAPIs is HAPIs, or Humanist Agenda Promotion Institutions. Their mission is to make the race to the top go dominant and stay dominant. (To remember CAPI versus HAPI, think of the “H” as short for “happy.”)

The real result of the forces unleashed by the Powell Memo was the sudden appearance of CAPIs. The most important types of CAPIs are:

1. Alliances and networks
2. Think tanks
3. Lobbying agencies
4. Public relations agencies
5. Litigation centers
6. False front special interest groups
7. Foundations

The alliances are very important, because they steer and network the CAPIs so as to maximize their strategic impact. They are similar to the role of management in an organization. The leading CAPI alliance is the Business Roundtable.

The Most Powerful CAPI is Think Tanks

The most powerful CAPI, however, is think tanks. They are the only type of CAPI that does the hard, deep thinking and analysis on which strategies and offensives can be based. They also have the most credibility with the public, the media, and politicians. After corporations, they also provide the government with the most people who are fully indoctrinated and trained in promoting the corporate agenda. And, starting in the 1970s, a new breed of think tanks appeared that proved that aggressive “marketing” of a think tank’s product could lead to highly successful direct influence of political decisions.

There is the question of why conservative think tanks have been so much more effective than liberal think tanks. Andrew Rich addresses this question directly: (Italics added)

“My research suggests that while it is true that conservatives have been more effective than progressive funders, this is not because they spend more money. Nonconservative foundations – what might be labeled ‘middle of the road, mainline, or liberal foundations’ – have devoted far more resources than conservatives to influencing thinking about public policy. This spending simply has not been as deliberate or effective. Conservative think tanks have quite successfully provided political leaders, journalists, and the public with concrete ideas about shrinking the role of the federal government, deregulation, and privatization.

“They are succeeding by aggressively promoting their ideas. By contrast, liberal and mainstream foundations back policy research that is of interest to liberals. But these funders remain reluctant to make explicit financial commitment to the war of ideas, and they do relatively little to support the marketing of liberal ideas.” 148

Conservative think tanks aggressively promote their ideas, while liberal thinks do not, or do so to a much smaller degree. Rich does not say exactly why they do this. My theory is that these behaviors stem from the dueling loops of the political powerplace. Conservatives are essentially corporate proxies exploiting The Race to the Bottom among Politicians. Because their arguments are based on falsehoods, they have little inherent logical appeal. But if they are cunningly packaged and aggressively promoted, they can work wonders. In fact they require aggressive promotion to work well at all, because their inherent appeal is so low.

The race to the bottom promotes falsehood in order to win supporters, while the race to the top promotes the truth. Because the truth has high inherent appeal, it needs less promotion to work. In a well running society, all you have to do is truthfully inform people of their options, and they will choose what’s best. Attempting to hype the truth or aggressively push it will backfire, because people will start suspecting that if it needs to be hyped, then it’s probably not true.

Rich implies that if liberals aggressively marketed their ideas as much as conservatives did, they would be able to have as much influence. I think this is true to a small degree, because you do have to inform people about basic data and their options. But it is not true to a large degree. If liberals start aggressively promoting their ideas as much as conservatives have, that will NOT make liberal ideas as effective. This is because the race to the bottom has an inherent structural advantage over the race to the top, for two reasons: (1) The size (and
hence the appeal) of falsehoods can be inflated, but the size of the truth cannot. (2) Corrupt politicians can use favoritism, while virtuous ones cannot.

Seen in this light, the sudden appearance of aggressive marketing in conservative think tanks is no more than the sudden discovery that advantage number one can be institutionalized, and used to give conservative think tanks an insurmountable advantage over centrist and liberal think tanks.

There is one further reason that aggressive promotion of liberal ideas will not lead to success. Liberal organizations simply cannot match the tremendous firepower that corporate sponsored conservative organizations can bring to the war of ideas. One example was mentioned earlier in the passage on a citizen’s initiative to pass nickel-a-drink wine tax in California: “While the liquor industry spent $18 million on ads that slammed the nickel-a-drink initiative, proponents had only $40,000 with which to counter them.” While not all battles are as lopsided as this one, conservatives can easily outspend liberals on the battles that matter, because the New Dominant Life Form has deeper pockets than Homo sapiens. And those pockets are getting deeper and deeper.

**Why CAPI Think Tanks Are Winning the War of Words**

Andrew Rich, in his article on *War of Ideas: Why mainstream and liberal foundations and the think tanks they support are losing in the war of ideas*, states the main reasons why Corporate Agenda Promotion Institution (CAPI) think tanks are winning what is aptly called “the war of words.” The reasons are:

1. “They are succeeding by aggressively promoting their ideas.”
2. Liberal think tank funders are “reluctant to make explicit financial commitments to the war of ideas, and they do relatively little to support the marketing of liberal ideas.”
3. By contrast, “conservatives structure their financing much differently than liberal and centrist foundations. A look at the data from 2002 reveals that conservative foundations consistently make funding policy institutes [think tanks] one of their top three priorities, while the liberal and mainline foundations rarely treat it this way.”

4. “Think tanks on the left tend to be organized by issue area—around women’s issues, poverty, or the environment—rather than taking on the broad range of issues with which Congress and the president deal.” This a severe constraint, because “Whereas a multi-issue, conservative group can redirect portions of its resources and energy from promoting ideas for, say, environmental regulation to Social Security reform as the immediate priorities of Congress and the president change, more narrowly focused progressive think tanks cannot.” This allows CAPI think tanks to work on what will influence the government the most at any particular time.

5. Conservative think tanks are perfectly willing to tell lies to promote their goals. Rich more delicately phrases this as “Concern for neutral, unbiased research is not a preoccupation of the foundations on the right.”

Sharon Beder, in her book *Global Spin: The Corporate Assault on Environmentalism*, adds another reasons why CAPI think tanks are winning: (Italics added)

6. “These conservative think tanks aim to influence the government and set the agenda in a variety of policy arenas, including that of the environment. *To be effective, they insinuate themselves into the networks of people who are influential in particular areas of policy by organizing conferences, seminars and workshops and by publishing books, briefing papers, journals and media releases for policy makers, journalists and people able to sway those policy makers. … Ultimately, think tank employees become policy makers themselves, having established their credentials as a vital part of the relevant issue network.”
Rating the Think Tank Types

The race to see which side could produce the best think tanks began when the starting shot of the Powell Memo was fired in 1971. Conservative think tanks have easily won the race, as the above table shows.

Think tanks are a type of solution factory, so they follow the same key practices of the same process that Thomas Edison’s invention factories followed in the table on page 339. A small difference is the domain specific practices are slightly different. These are the first two practices, which are very important hallmarks of CAPI think tanks. Because think tanks seek to solve a different type of problem from invention factories, the key practice weights in the above table differ from the invention factories table.

Conservative think tanks are winning because they are more intelligently exploiting every step in the process that gives them an advantage. These are the key practices with the higher weights and thus the higher leverage. Starting at the top of the table, notice how the aggressive conservative think tanks have trounced the non-aggressive centrist or liberal think tanks in key practices 1 and 2. While the non-aggressives are starting to catch up in key practice 1, they will never be able to score more than a zero on key practice 2.

This is because centrist and liberal think tanks are ardently committed to telling the truth. If they changed that commitment, so that they could start telling lies to achieve their ends, they would be joining a headlong race to the bottom. This they have wisely decided not to do, because it is an insidious trap to be avoided at all costs. Why is it a trap? Because if the end justifies the means, then soon the means become ends in themselves, and the original ends are forgotten. Each side competes on who can employ the dirtiest, trickiest, meanest methods that will work the fastest. Whoever can invoke the most fearsome false enemy, push the fear hot button the hardest, pursue the most expedient wrong priorities, make the greatest number of false promises, and successfully pass off the greatest number of lies will come out on top and stay on top. It is not a desirable world to live in.

In the main work flow key practices, the non-aggressive centrist or liberal think tanks do a little better. But still, they are missing some easy big gains. For example, in key practice 3 they are not clearly and correctly defining their problems in terms of the correct goals. The goal must include all the steps necessary to create and inject the true memes into the political system, such that they will have maximum impact. That is how the “war of words” will be won. Missing from the goal is the actual transmission of the true memes that research has created. The non-aggressive think tanks naively assume that all they have to do is produce
books, papers, and articles, and the job it done. It is not. It takes aggressive transmission of those ideas.

In key practice 4, the non-aggressives do construct an analysis model of the various problems they are solving. It’s as good as the aggressives’ model. That fact that the conservative analyses are biased toward the positions they want to support is irrelevant.

But the non-aggressives lose out in key practice 5 by optimistically assuming that a sound analysis is all it will take to converge on the correct solution. It is not. It must be converted into an appealing message that will convert the maximum number of the right decision makers. Thus they score only a 2 here.

Key practice 6 is packaging the solution as self-implementing. Aggressive conservative think tanks do an outstanding job of this by producing self-implementing meme carriers. These are think tank staff that, after being indoctrinated in the goals, dogma, and rationales of a think tank, graduate into the government. Once there, the solution is self-implementing, because its carrier is now in power.

Sharon Beder describes this marvelous ability (Or should I say frightening ability?) this way: (Italics added)

“In the past two decades, the most important function served by the network of conservative think tanks has not been the germination of new ideas, but the creation of a 'new cadre' of professionals…. Not only have the dozens of conservative think tanks created a framework for disseminating ideas that exists largely outside the established infrastructure of academic journals, university presses, and commercial printing… they have also designed career vehicles for conservative activists and thinkers.

“…when a new US government is elected, top level personnel in the administrative arm of government are changed for people whose ideology is more suited to the incoming government. Think tanks provide a ready source of such personnel, and Presidents from Carter to Clinton have made great use of them to fill high level government positions. Think tanks provide a fast track to a political career and a public profile in the policy area. They also provide a place for discarded government officials to go when there is a change of government, where they can be employed until ‘their’ government is re-elected, whilst still having some influence over public policy in the meantime.
Why Environmental NGOs Are Failing to Achieve Their Objectives

Below is a table comparing the ratings for the processes of Classic and Analytical Activism in normal and expected use. Here is a short summary of those two processes:

**Classic Activism** is the use of the same three solutions to all problems. These are to find the proper practices necessary to resolve an important problem, tell people about the problem and the proper practices, and then if that fails to get people to adopt the proper practices.

**Analytical Activism** says yes, those three things need to be done, but for difficult problems so much more is required that a relatively complex, formal problem solving process is mandatory. This process is the Analytical Method, which has all the steps necessary to solve any kind of problem, since a key step is picking a process that fits the problem.

There are vast differences between the process of Classic and Analytical Activism. The process ratings table shows the differences are so large that it’s amazing that Classic Activism has been able to make as much progress as it has. I would attribute this to the early popularity of the novel concept of environmentalism in the 1960s and 80s, combined with the shock of knowing there was a gigantic new problem that needed solving, and the fact that the opposition had not yet created an effective response.

By now you are probably so familiar with the 12 key practices that the ratings in the table are self-evident. They are so lopsided that Classic Activism scores from 0 to 2 in all practices and has a relative productivity of 484, while Analytical Activism scores from 4 to 5 and has a productivity of 7,744. This tremendous difference is what happens when an accident of nature, Classic Activism, meets an engineered-from-scratch new process, Analytical Activism.

After several years of study of this matter, I’ve come to the conclusion that these ratings are approximately correct and that environmentalism is currently using the process of Classic Activism. If both of these propositions are true, it follows that the primary reason for the environmental movement’s failure to achieve its objectives is the low process efficiency of Classic Activism.

Furthermore, if the ratings on Analytical Activism when used correctly are also approximately correct, then it follows that the movement can achieve its objectives by transforming itself into one based on Analytical Activism.

The center column is for you to rate your own organization. Be honest with yourself. Don’t do it alone in five minutes. Take days or weeks and involve others.

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### Classic Versus Analytical Activism

A Rough Comparison of Solution Factory Types

<table>
<thead>
<tr>
<th>Key Practice</th>
<th>Weight</th>
<th>Classic Activism</th>
<th>Your Organization</th>
<th>Analytical Activism</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Formal process used</td>
<td>2</td>
<td>Raw Score 0</td>
<td>Weighted Score 0</td>
<td>Raw Score 5</td>
</tr>
<tr>
<td>2. Formal post mortems performed</td>
<td>1</td>
<td>Raw Score 2</td>
<td>Weighted Score 2</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>Domain Specific Practices Subtotal</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Problems clearly and correctly defined</td>
<td>1</td>
<td>Raw Score 1</td>
<td>Weighted Score 1</td>
<td>Raw Score 5</td>
</tr>
<tr>
<td>4. Analysis model constructed</td>
<td>3</td>
<td>Raw Score 3</td>
<td>Weighted Score 3</td>
<td>Raw Score 5</td>
</tr>
<tr>
<td>5. Analysis model drives solution convergence</td>
<td>1</td>
<td>Raw Score 1</td>
<td>Weighted Score 1</td>
<td>Raw Score 5</td>
</tr>
<tr>
<td>6. Solution packaged as self-implementing</td>
<td>1</td>
<td>Raw Score 0</td>
<td>Weighted Score 0</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>7. Solution results feedback loop is in place</td>
<td>4</td>
<td>Raw Score 2</td>
<td>Weighted Score 2</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>Main Work Flow Subtotal</td>
<td>10</td>
<td>Raw Score 13</td>
<td>Weighted Score 13</td>
<td>Raw Score 45</td>
</tr>
<tr>
<td>8. All key assumptions become hypotheses</td>
<td>1</td>
<td>Raw Score 1</td>
<td>Weighted Score 1</td>
<td>Raw Score 5</td>
</tr>
<tr>
<td>9. All hypotheses undergo experimentation</td>
<td>3</td>
<td>Raw Score 3</td>
<td>Weighted Score 3</td>
<td>Raw Score 12</td>
</tr>
<tr>
<td>10. Knowledgebase (KB) has high quality gate</td>
<td>1</td>
<td>Raw Score 0</td>
<td>Weighted Score 0</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>Experimentation Subtotal</td>
<td>5</td>
<td>Raw Score 4</td>
<td>Weighted Score 4</td>
<td>Raw Score 21</td>
</tr>
<tr>
<td>11. KB enters into all decisions affected</td>
<td>1</td>
<td>Raw Score 2</td>
<td>Weighted Score 2</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>12. All KB changes become improvements</td>
<td>1</td>
<td>Raw Score 0</td>
<td>Weighted Score 0</td>
<td>Raw Score 4</td>
</tr>
<tr>
<td>Knowledgebase Mgt Subtotal</td>
<td>2</td>
<td>Raw Score 2</td>
<td>Weighted Score 2</td>
<td>Raw Score 8</td>
</tr>
<tr>
<td>Process Rating on scale of 0 to 100</td>
<td>20</td>
<td>Raw Score 22</td>
<td>Weighted Score 22</td>
<td>Raw Score 88</td>
</tr>
<tr>
<td>Relative Productivity = R^2</td>
<td></td>
<td>Raw Score 484</td>
<td>Weighted Score 484</td>
<td>Raw Score 7,744</td>
</tr>
</tbody>
</table>
Try to end up with a rating that a core group believes in. It will probably be low. And it will probably be lopsided. The key practices that are the lowest are the places to start to improve first. As you assess your own rating, you may decide to add additional practices (or subpractices) and weights. This is exactly what you should do, because it will greatly improve the power of the assessment to pinpoint your unique organization’s strengths and weaknesses.

Next, let’s find out if it’s possible to combine what we’ve learned in this chapter into a cohesive set of principles.

**Measuring Process Efficiency**

**Process efficiency** is the ratio of process output to input, which is output / input. The greater the output for a given input, the higher the efficiency.

If efficiency is less than 100% you have a worthless process. In a for-profit business one measure of process efficiency is income divided by expenses. If the result is over 100%, the business was efficient and turned a profit. If the business was inefficient then its process efficiency is less than 100%, it’s losing money, and it will sooner or later go out of business.

The process efficiency of governments and non-profit businesses is not nearly as easy to measure. In fact, there is no standard measurement. But because you cannot manage what you cannot measure, we need a way to fairly accurately measure the process efficiency of any institution.

The output of any institution is the changes it causes to the system that are external to the organization. The input of any institution is the energy it takes from its surrounding system to cause those changes to happen. This gives a process efficiency ratio of:

\[
\text{changes to external system} / \text{energy from external system}
\]

However this will not do. It is too all encompassing. We need a tighter, more relevant ratio that can be used for strategic planning and management, at the mission level. So let’s try this ratio:

\[
\text{energy output} / \text{energy input} = \text{process efficiency}
\]

Even this may be too broad unless we define the terms for non-profits and for-profits. (For simplicity of discussion, governments are included as a type of non-profit.) Let’s address for-profits first. In a for-profit business the standard measure of efficiency at the highest level is return on investment (ROI), which equals:

\[
\text{profit} / \text{investment} = \text{for-profit process efficiency}
\]

This formula is much more useful because the simpler measure of income / expenses is actually not a measure of efficiency. It only appears to be. For example, if it took a 10,000 euro investment to turn a profit of 100 euros on sales of 200 euros, that is a 50% profit. That’s great if all you are looking at is profit. But the bigger picture is that from a management or stockholder viewpoint, all that really matters is profit and input, which is profit / investment. From this viewpoint ROI is only 1%.

In a non-profit organization we cannot use the formula profit / investment = process efficiency, because profit is not the output that matters. Instead, it is how well the organization has achieved its mission. All objectives can be quantified. How well they are achieved can thus be measured as a percent of objective achieved. This gives:

\[
\text{percent of mission achieved} / \text{investment} = \text{non-profit process efficiency}
\]

This is how funders look at non-profits, whether they are foundations donating big money, or individuals donating small amounts of money or their own volunteer labor. This formula is a whole new way of thinking because it forces managers to start measuring progress in mission achievement.

For example, if your mission is solving the global environmental sustainability problem, then you might use the Ecological Footprint of the world as a measure of global environmental sustainability. Presently the world’s Ecological Footprint is about 125% and growing. Your organization’s management might set a long term objective of reducing the footprint to 100% in 50 years. Or it might think smaller, and set a sub-objective to making a specified contribution to achieving the top objective, such as by forming a guiding coalition to focus the efforts of environmental organizations. Either way, percent of mission achieved can be measured. And so can the investment required. The result is you now have a measure of process efficiency.

Once you can measure your own process efficiency, improving it becomes much easier, because you can start measuring cause and effect as you try to improve the process. Without an accurate measurement, a serious process improvement program is impossible. But behind that lies an even bigger problem. Without an accurate measure of mission achievement an organization is adrift and unfocused. It will tend to be unable to agree on or determine the best way to pursue its mission, be-
cause there is no accurate way to measure if one alternative is better than another.

Accurate measurement of an organization’s process efficiency is so important, that when for-profit businesses finally figured out how to do it, it was such a breakthrough that it transformed the business landscape. The breakthrough occurred in the 13th century, when Italian merchants perfected the practice of double entry bookkeeping. At last they could accurately calculate the following three formulas. The first is that over any period of time:

\[
\text{income} - \text{expenses} = \text{profit}
\]

The second is that at any point in time:

\[
\text{assets} - \text{liabilities} = \text{equity}
\]

The third formula relates the first two with:

\[
\text{profit} = \text{change in equity}
\]

Suddenly all was light. In a few centuries the new method of accounting swept the Western business world, because it allowed even a large, dispersed firm to accurately measure and thus better manage what really mattered, down to the last penny. Never before had this been possible. Because the fundamental mechanism of business performance measurement was now scaleable, small family businesses as the norm were quickly replaced by larger, often national firms. These were later replaced by international corporations as the most powerful institutional forces on the planet.

But a similar revolution has yet to happen in the non-profit world. Certainly all successful large non-profits measure their financial performance. But how many measure

\[
\text{percent of mission achieved} / \text{investment} = \text{non-profit process efficiency}
\]

which is what really matters? I am aware of none.

Thus to solve the larger problem of sustainability, the environmental movement needs to first solve the smaller problem of being able to accurately measure problem solving progress. Only then will non-profits be able to scale up and become large and powerful enough to make the global elephant dance to the tune of sustainability.

The Three Principles of Solution Factory Process Efficiency

An environmental organization with low process efficiency is probably making little or even negative progress towards achieving its objectives. It will eventually go out of business, due to inability to attract enough funding, volunteers, or both. On the other hand, an organization with high process efficiency is almost invariably achieving its objectives, even if they are extremely demanding. Organization maturity is really process maturity, and process maturity is really high process efficiency. Thus process efficiency is the key to success.

The process efficiency principles of solution factories follow easily from The Solution Factory Work Flow model on page 336, the 12 key practices of solution factories, and the central message of this book. Accurate measurement of process efficiency allows closing the all important Evolution of the Actual Solution feedback loop on the work flow model, as well as implementing key practice 7, solution results feedback loop is in place.

The principles, in the form of three simple rules, are:

1. Follow the Analytical Method.
2. Use the 12 key practices of solution factories as the starting point for the process chosen as the second step of the Analytical Method.
3. Use the Solution Factory Work Flow model as the starting point for your strategy on how to best manage that process.

If these principles are followed, your process efficiency will soon be very high. But please beware, for there is a towering roadblock ahead called change resistance. From my experience most people and most organizations, especially environmental NGOs, are allergic to thinking like this. When confronted with a message such as what you have read in this book, almost all environmentalists and environmental organizations I’ve encountered so far have soundly rejected these concepts, and have continued down the path of Classic Activism, and of course, down the path of continual failure.

But a courageous few have seen the wisdom of these suggestions, a spark has lit up in their eyes, and they have astonished those around them by proceeding to resolutely spread these concepts, one mind at a time.
How to Create the First Wave of Solution Factories

There’s no need to reinvent the wheel here. To create the first wave of solution factories, we just follow the same pattern as the Powell Memo of 1971. That short document outlined the major reasons that CAPIs were needed, and how to get started on creating them. It inspired a few wealthy businessmen to make a few key large startup donations, and it inspired a few conservatives to found the Heritage Foundation in 1973 and other CAPIs. The success of the first ones proved the concept was valid, causing an audible swoosh as dozens of new CAPIs were founded in rapid succession.

The pattern of how US conservatives created the first wave of Corporate Agenda Promotion Institutions was:

1. A sufficient precipitating event occurs. This was the Powell Memo.
2. One or more new institutions are founded using the new model suggested in the precipitating event. These were think tanks, PR firms, lobbying groups, and other types of very aggressive CAPIs.
3. In a few years the pioneers prove that the new way will work. The Heritage Foundation did this, and inspired a host of imitators.
4. The first large wave of new institutions is founded. This occurred over the next several decades. The number of conservative think tanks in the US increased from less than 10 in 1971 to over 50 in 2000.

Forward thinking environmental movers and shakers can do the same. And because they will have a clear model of what they are doing and it’s been done before, they can move much faster. There is no real reason the first wave of solution factories cannot be created in less than 5 years, other than that familiar bugaboo, change resistance. But the Powell Memo showed that it is possible for a good precipitating even to overcome even strong resistance. Thus it can happen again.

And it will happen again, if we can perform all four steps in the pattern correctly.

To do that, I ask you one simple question: What is your role in that pattern going to be?

There are two kinds of readers this book is targeted toward. One is the ardent environmentalist who earnestly wants to learn better ways to make a difference. The other is the same thing, but with one addition: they are also decision makers in an influential organization.

If you are an ardent environmentalist, here’s what you can do to help create the first wave of solution factories and other Humanist Agenda Promotion Institutions:

1. Study this book and related messages like it, and fully understand the message.
2. These messages will have their flaws. See through them and correct them, so that you have not internalized anything that will jeopardize your mission.
3. Individuals no longer make much of a difference. But individuals working through the right institutions do. Find the one(s) you want to work with.
4. Alert them to the message that they need to become a solution factory, and that the first step is to adopt the three principles of solution factory process efficiency.
5. Stay with them as they do it, until success is assured.
6. Then go out and help found more solution factories.

If you are also a decision maker, you can do even more, and probably do it faster. The above steps apply to you as well, with some slight changes. Let’s assume you are a top level manager of an environmental NGO. Your steps are:

1. Study this book and related messages like it, and fully understand the message.
2. These messages will have their flaws. See through them and correct them, so that you have not internalized anything that will jeopardize your mission.
3. Present your organization with the message that it needs to become a solution factory, and that the first step is to adopt the three principles of solution factory process efficiency.
4. Stay with them as they do it, until success is assured.
5. Then go out and help found more solution factories, or encourage people from your own organization to do this. But as you are doing this:
6. Help found a guiding coalition so that the solution factories are working together as a unified whole from day one. Each should be working on its own carefully selected contribution to the problem, so that the movement as a whole achieves high process efficiency.

That’s about as detailed as the precipitating event can be. Good luck!
Improving the Transformation Simulation Model Even More, with the Creation of Solution Factories

Run 15 reduced time to 99.9% solution success from 72 to 58 years. It did this by changing the fitness of problem solving strategies curve to a more aggressive one, due to the expected greater efficiency of solution factories. But the improved solution success curve was only a modest improvement, because it only took into account the prediction that adoption of the general idea of solution factories will make the environmental movement more effective. It did not consider what effect the explicit creation of highly visible solution factories would have on system response.

Run 16 considers this by explicitly starting a wave of solution factories in 2015, 5 years after the precipitating event. This is identical to the way a wave of C APIs started after the Powell Memo. The system response is assumed to be an increase in the normal total investment rate from 100 to 300. This is identical to the way the Powell Memo caused a massive sudden increase in conservative investment, much of which went to the founding and later the running of conservative think tanks. Running the Transformation Simulation Model with this scenario gives the results shown below:

In Run 16 the new wave of solution factories starts in 2015. But as the simulation curves show, there is no immediate obvious system response. This is because the increased funding that solution factories attract doesn’t have much effect on solution success at first, because it takes years for the Process Components necessary for improved process efficiency and attraction of more top talent to be created. This is akin to the way it takes years for an industry to adopt radically new practices. This slow rate of change is captured in the model in many ways, such as the process creation delay of 5 years, the analysis creation delay of 3 years, and many other delays in the model structure.

The biggest difference in system behavior between runs 16 and 12 is the Analysis and Solution Components curve. In run 12 this was flat until about 2040. After that it curved gently upward until it reached about a 45 degree slope. But in run 16 the curve starts to turn upward in about 2018, which is 22 years sooner. This is just what you would expect, if the hypothesis that solution factories are a breakthrough is true.

The graph shows that it doesn’t take long for more Analysis and Solution Components to cause solution success to also start curving upward much sooner and much steeper. The long flat plateau of the solution success curve is replaced by one that starts curving upward in about 2022. It continues at a steady pace. The result is that the time to solution success is reduced from 72 to 47 years. Our efforts to better engineer the solution are starting to pay off.

Notice how the run 16 curve for Analysis and Solution Components sails right off the top of the graph, instead of stopping at an asymptote as in all runs before run 12. This is because the process of Analytical Activism is so efficient compared to Classic Activism that “solution overshoot” occurs. More Analysis and Solution Components are produced than is necessary. This is nearly unavoidable if one is to be certain that the problem is solved as fast as possible with the required confidence level. It is a little ironic that to solve the environmental overshoot problem, the problem solvers themselves have to resort to their own form of overshoot.

Run 16 is based on the proposition that it is entirely realistic to assume that the first wave of solution factories will have started by 5 years after the precipitating event. This is probably a conservative estimate, judging by how quickly the Powell Memo worked.

The first wave of solution factories is not going to have an easy time. They will be pioneering many things. They will have trouble. But if they follow in the footsteps of the near miraculous explosion of new ideas that followed the invention of the Scientific Method, they will succeed. All they need to do is follow their own newly minted process.

It is a little dicey to predict what will happen 20 years from now. But we expect that the first big challenge for solution factories will be to invent a breakthrough for compressing time to solution even more. This can probably be done by:

The One Year Success Feedback Solution Element

The first wave of solution factories will face many challenges. One is simply getting started, with a new business model that has not been tried before. The world has seen invention factories, and it has seen think tanks. But it has never seen solution factories, whose prime
output is solution components in the form of well engineered memes that are so well designed they do not require “aggressive marketing,” because their acceptance by the human system has been treated as just another part of the problem to solve. The output of solution factories will push on system points with such high leverage that little force will be required, unlike the low leverage solutions of today that require such huge amounts of force to work they usually fail.

I believe that the concept of solution factories is so sound that it will attract many talented people. It will also attract the funding it needs. But after a few years, if the first solution factories have not achieved obvious, significant progress, they will soon fail. Therefore they need to take the fastest track possible to learning how to solve the sustainability problem.

This can be done by reducing the time it takes the solution success feedback loop to complete one cycle. In the Transformation Simulation Model this is the success delay. In the Solution Factory Work Flow model this is the time between when a meme carrier leaves the factory with some solution memes, and the time that measurement of results is possible.

Currently the success delay is set at 5 years. But in the section in the previous chapter on how to reduce the many delays in the system on page 254, analysis of the model and run 13 showed that reducing the success delay from 5 years to 1 year was realistic—if we had a process breakthrough. Solution factories are that breakthrough, so let’s return to that angle of attack and explore it further. You may want to reread the section on page 254 and the material about run 13 before continuing.

The goal of the One Year Success Feedback solution element is to reduce the time it takes to find out if a solution element is going to work to one year.

Normally this cannot be done, because it takes many years to determine whether or not a solution is going to work once it is implemented. But solution factories are not normal organizations, so the old rules do not apply. This is because solution elements are not released until experimentation has shown that there is a very high probability of the solution element working—if it passes the critical change resistance step of system acceptance. If it passes that step, the next steps, which are moving the system from the present state to the goal state and then keeping it there indefinitely, are a cake walk.

It should not take solution factories very long to learn how to predict, given the system’s response in the first year after a solution element is released, if the element is going to be accepted or rejected. Signs of rejection (meme replication failure) are foot dragging, lower than expected levels of understanding of the many novel aspects of the solution elements, decision maker confusion, missed milestones, and so on. Which signs are reliable can be statistically determined by experimental tracking of the first few solution elements or sub elements.

As a result, the simulation run below can probably be accomplished:

Run 17 reduces time to success from 72 to an impressive 33 years. This may be as much as we can realistically hope to compress time to success, due to the strong change resistance the system exhibits for the first ten years or so after the precipitating event occurs in 2010. Thus nothing much appears to be happening from 2010 to 2020. But after that the system responds vigorously. The Analysis and Solution Components curve grows only a little faster than in run 16. But due to the sensitive nature of the process used to solve the problem, and the fact that the One Year Feedback Success solution element is pushing at high leverage points, the curve that matters the most, solution success, grows much faster than in run 16. This is an example of the high degree of amplification that pushing on a high leverage point can cause.

Is this final scenario realistic? I think so, because it is no more difficult that what millions of scientists have been doing for centuries. All environmentalists need to do is become as serious as scientists about the power of the right process.
Summary and Conclusions

Solution factories are a logical evolutionary extension of invention factories. The latest US patent number is over 7,000,000 and the Derwent World Patents Index is growing by 1.5 million patent documents a year. If invention factories can churn out inventions by the millions, then solution factories can produce solution components to social problems by the hundreds, and then the thousands, and then the millions. As long as the three laws of evolution do not change, this will come to pass.

But it will only come to pass soon enough to avoid catastrophe if we can compress time to solution success from approximately 70 years to 30 years. This can be done by first inventing solution factories, and then by using every trick in the engineering book to make them highly efficient in record time. A possible way this could play out is summarized in the graph below:

Run 12 represents the transformation of the environmental movement from Classic Activism to full Analytical Activism. While even that would be a pleasant success, it is not enough, because the basic process of Analytical Activism would take a long time, about 72 years, to solve the problem. That is so long that failure to solve the problem by then would cause such loss of system functionality that the system could easily become unable to cope with the problem. It would then have reached the point of insolvability, regardless of how clever the problem solvers were.

But there is a way out. Using mankind’s greatest tool, reason, it appears possible to engineer a breakthrough and greatly accelerate the solution. The principle method to do this is the invention of solution factories.

Run 15 uses the enhanced process efficiency of solution factories to revise the effect of funding on solution fitness. This reduces time to success from 72 to 58 years.

Run 16 adds the effect of increased attraction of funding due to the appearance of solution factories. We are duplicating the success of the Powell Memo here. That historic document proposed a new type of entity, aggressive think tanks, and pleaded for their funding, which conservatives did not fail to provide immediately. The same will hopefully happen once this book, Analytical Activism, is published. Or perhaps a similar concept will appear. Regardless of the exact vehicle, the right precipitating event will cause funding to the environmental movement to soar. It will flow to what is attracting it: solution factories. According to the model, this will reduce time to success from 72 years to about 47 years.

But that is still not enough. The first sink or swim challenge that solution factories will face is how to compress time to success even further. We suspect that they will take the route of reducing the feedback delay on whether a released solution element will work or not from about 5 years to 1 year. This would cause the system to respond as shown in run 17, which reduced time to success from 72 years to about 33 years.

Now for the big picture: If we change the X axis on the graph from a 70 year range to the full range of the simulation model, we get the graph shown below:

This shows that even though run 17 takes 33 years to solve the problem, that’s not so bad compared to the 30 years we’ve already wasted since the solution success curve peaked around 1980, to the earliest reasonable time for a high quality precipitating event in 2010. The dramatic fall in the curve after 1980 shows the magnitude of the problem. That is a formidable curve to turn around. Run 17 or anything even close, if it occurs, will be reason enough for celebration, because guess what? We will not only have solved the global environmental sustainability problem. We will also have solved the New Dominant Life Form problem, and the concurrent enslavement of Homo sapiens problem, which was growing as fast as the curve above was falling.

Next, how can we convert the solution oriented models presented in this book into an Implementation
Plan? Well, we almost don’t have to, because the models are the strategic Implementation Plan. Using the concepts of the System Improvement Process and solution factories, there is little need for a traditional Implementation Plan. This is especially true once solution factories get rolling, because their output, solution memes and meme carriers, are self-implementing. But still, there remains a pressing need for this book to express at least a high level written strategic Implementation Plan.

This is easily done by examining the philosophy behind the Implementation Models. Of these, the most important was the Transformation Simulation Model. That model employed a very small number of key strategies. Those problems solvers picking up the thread of this book and converting to Analytical Activism will be following these strategies, which are:

1. Create a good precipitating event. Don’t rush it.
   The quality of the event is far more important than its timing. The right event will set off the right auto-activation chain.

2. Pick a process that fits the problem and follow it as if the life of *Homo sapiens* depended on it.

These two rules are all the high level strategic Implementation Plan needs at this point. The rest will follow logically and easily, if these two strategies are practiced fully.

Creating the One Year Success Feedback solution element, or something like it, will probably be the first major challenge of solution factories. But there is another even greater challenge that will follow. Or it may even precede it. This is finding a shortcut to causing the power of corporate proxy conservatism, as practiced in the most powerful country in the world, to collapse. This would accelerate the solution even more, and remove the greatest remaining risk of solution failure. (This is a much higher risk than this book has portrayed, so that an optimistic tone was possible and we could focus more on other aspects of the problem, particularly a suitable process.)

Is there an elusive high leverage point in the memetic structure of the US conservative movement and the corporate proxy machine that is their system’s *Achilles’ heel*? Could problem solvers walk up to that structure, and with the flick of a finger, cause it to collapse into smithereens? Can it be done?

We may have already found that high leverage point. It is *general ability to detect political deception*. Then again, maybe we haven’t found it, because that hypothesis remains untested.

However, there is something that matters much more. Finding the right high leverage point is beyond the scope of this book, because the central purpose of this book is not to find *the* solution, but a path leading to one.

* * *

By now you may be wondering what you can do to help the system start moving down that path. We have a possible answer to that in the next chapter.
Chapter 18

What Can I Do Tomorrow Morning?

When this manuscript was in its very early stage, I mailed out 160 copies of the first three chapters to every board member, executive, field office, and chapter in the Sierra Club. This is a typical, well known, influential environmental organization. Surely, I thought, they can give me proper feedback.

They did. But sitting at the top of all the replies was one that stuck in my mind. It was from Doug la Follette, a board member. He wrote:

“The biggest question is how one would implement any of these concepts. So, what exactly do we do tomorrow morning?”

This chapter is an answer to that question, starting with some advice on what not to do:

“Beware the symptomatic solution. Solutions that address only the symptoms of a problem, not fundamental causes, tend to have short term benefits at best. In the long term, the problem resurfaces and there is increased pressure for symptomatic response. Meanwhile, the capability for fundamental solutions can atrophy.”

This “management principle” comes from The Fifth Discipline: The Art and Practice of the Learning Organization, by Peter Senge. The principle seems not to have reached the environmental movement, who has been promoting nothing but symptomatic solutions. This is normal. That’s why Peter wrote his book, so that learning organizations could see that on certain kinds of problems they are only treating the symptoms.

Symptomatic Solutions

A symptomatic solution is a solution that solves a problem temporarily or partially, because it addresses only the symptoms of the problem. This leaves the fundamental causes untouched. The result is the problem reappears or remains only partially solved.

The history of environmentalism can be seen as one long series of symptomatic solutions. Earlier on page 321 we discussed the stages of environmental policy evolution. The first was conservation oriented. The symptom being treated was the loss of unspoiled large chunks of land. By setting some aside as protected parks, it was hoped we would always have those places and that they would somehow keep the rest of the earth from becoming too degraded. This did not work.

The second stage was end-of-pipe solutions. Here the symptom being treated was the production of large amounts of pollution, more than the environment could withstand. The solution was to clean up after the fact and to penalize producers of pollution. This too did not work for two reasons. One is that defect removal (cleanup) is much more expensive than defect prevention (proactive avoidance of the need to cleanup). The other is that dominant system agents still had stronger incentives to pollute than to not pollute. This caused them to circumvent the solution in so many ways that it was only partially effective.

The third stage, degradation source management, is where we are today. Here the idea is to treat the symptom of environmental degradation at its source, by direct management of the many sources of degradation. This is done with quotas and free market mechanisms like tradable permits, natural resource policies, product life-cycle policies, waste management policies, and explicit regulations to cover the rest. This is beginning to work. But it is also beginning to show its limitations, because in the long run it is command and control in disguise.

While degradation source management goes further than end-of-pipe and conservation solutions, it still does not treat the fundamental causes. The result is just what Peter predicted: “…short term benefits at best. In the long term, the problem resurfaces and there is increased pressure for symptomatic response.”

The problem resurfaces because the fundamental cause of systemic change resistance has not been treated. Nor has the fundamental cause of improper coupling of the human system to the environment. Nor has the fundamental cause of poor quality of political decision making. And so on.

Because the problem is still not solved “there is increased pressure for symptomatic response.” For example, intense pressure is put on more countries to join those who have already signed the Kyoto Protocol. But that is just a package of binding quotas for a single subproblem of the sustainability problem. Why is there so much resistance from the United States and others to signing the protocol? Why are China, India, and many
others excluded? Why has pressure to make these countries and many others get serious about environmental sustainability had little effect? Until questions like these have answers at the fundamental level, symptomatic solutions will continue because there is no alternative.

But there could be, if problem solvers applied the tools of Analytical Activism. This would lead away from the trap of symptomatic solutions and toward:

**Structural Solutions**

We don’t have much time, however, because as Peter pointed out, “Meanwhile, the capability for fundamental solutions can atrophy.” As environmental degradation worsens, the system goes into overshoot. According to Ecological Footprint data this occurred around 1985. Since then overshoot has grown to about 25%. This causes some sections of the system to begin experiencing the first symptoms of collapse, such as water shortages, famine due to crop failure, severe health problems and death due to pollution, and so on. This is happening now. Overshoot also causes reduced capability to solve the problem, because parts of the human system are now too weak to help, and resources that could have been used to solve the problem are now being used to help the weakened parts of the system. A vicious cycle has set in. Once it passes a certain point the problem becomes insolvable, even if the solution is known, because there are now insufficient resources available to invest in the solution.

But there is a way out of this trap. There is still time for structural solutions.

A **structural solution** treats the fundamental causes of a problem by changing the structure of the system. The result is you now have a different system. It will not behave the same as the old one. If a structural solution is based on a structural analysis that is correct, then it will work. The analysis will be correct if it has revealed the true critical social structures involved, found the fundamental causes of the problem, found the high leverage points that can resolve the causes, found a way to correctly push on those points, and all key assumptions have been proven using the Scientific Method.

This approach agrees with what Peter says on page 101 of his book: “To change the behavior of the system, you must identify and change the limiting factor.”

The limiting factor is the root causes of the problem. In a difficult complex social system problem this is always dominance of the wrong feedback loops. The only way this can be corrected is a structural solution.

This leads to the golden rule for what you can do tomorrow morning: *Don’t treat the symptoms, change the system.*

**Lists of Symptomatic Solutions**

Most lists of what you can do to solve the environmental sustainability problem are really lists of symptomatic solutions. A current example is the dozens of things listed at the end of Al Gore’s *An Inconvenient Truth*. Here are some from the book version of the movie:

1. To calculate how much CO2 you produce, visit www.climatecrisis.net/takeaction. Armed with this information, you can take effective action and work toward living a carbon-neutral life.
2. Save energy at home.
3. Energy efficient lighting.
5. Heat and cool more efficiently.

And so on. But you could do all of these things and the problem would remain unsolved, for several reasons:

The first is that the choices available to you are insufficient. For example, for sustainable home energy the only solution that will achieve 100% sustainability is to reduce the average home’s greenhouse gas emissions to about 10% or less of what they are today. This requires tearing the house down and rebuilding it, using passive solar heating, thermal mass energy storage, near zero air infiltration, and other high efficiency practices. How many homeowners are going to do this?

Another reason is these solutions only address your behavior. They do nothing to change the behavior of the over six billion people who will never see the movie. They do nothing to change the behavior of the over two billion people who are so impoverished they don’t care about sustainability. All they want is to survive. And they do nothing to change the behavior of the New Dominant Life Form, whose behavior matters far more than people.

The movie also implored you to contact your political representatives and ask them to support solutions to the climate change problem. But there are much more powerful agents asking them to do just the opposite: to ignore the need for a huge commitment to solving the problem because it would “hurt the economy,” which really means it would hurt their short term profits. Furthermore, there are many more people than environmentalists asking their representatives to do other things.

Lists like these are symptomatic because they do not address the underlying causes of the problem. Why don’t homeowners have choices that would allow them to live sustainably? Why aren’t politicians and the New Dominant Life Form working as hard as environmentalists are to solve the problem? The answers to questions like these would lead to entirely different lists of what
you can do, because the answers would involve structural changes to the system.

We have been asking these questions. Below are some of the answers. All are ways you can help to change the system, rather than continuing to treat the symptoms.

While these are all tasks you can start tomorrow morning, none of them can be finished in a day. This is to be expected, because there is no such thing as an easy simple solution to a difficult complex problem.

If You Are a Concerned Citizen

1. **Vote for candidates with the highest Truth Ratings, the highest Decision Ratings, and the lowest Corruption Ratings.** If ratings do not exist yet, then make helping them appear your top priority. For example, in the US tell organizations like vote-smart.org, Consumer’s Union, The League of Women Voters, or the nonpartisan Government Accountability Office about this book and why you think politician ratings could help make a race to the top happen.

The idea here is *don’t change the bad agent, change the system*. A remove-the-bad-guys strategy requires large amounts of continual effort. But bad agents are a symptom of an underlying flaw in the system. Until the flaw is resolved they will reappear as fast as you remove them, putting you in the position of having to constantly bail the water out of a leaky boat to stay afloat. Better is to find the leak and fix it permanently.

2. **Purchase products that have fees reflected in their price, until all products do.** If no fees exist, see the next item. Once all the products that fit a particular need have fees, buy the one you normally would, considering the usual tradeoff between price and utility. Ignore which claims to be greener, because that is now reflected in the price.

3. **Support legislation to change the system,** such as Environmental Property Rights, Truth Ratings, Corruption Ratings, and Decision Ratings.

4. **Donate to and join environmental organizations that are moving toward Analytical Activism or its equivalent.** Quit the rest.

5. **When you write and talk to others,** base your arguments on logic, root causes, and a structural perspective as much as possible. Avoid emotionalism and treating the symptoms.

6. **When you encounter others using fallacious arguments, point out the fallacy.** Do this even if you agree with the conclusion, such as that so-and-so is a bad politician. Otherwise you are encouraging race to the bottom tactics. Common fallacies are:

   - *Ad hominem* – Latin for “against the man,” this is an attack against the person rather than the person’s positions.
   - *False dilemma* – This occurs when a limited number of options are presented (usually two) when in fact there are more.
   - *Biased sample* – This occurs when the evidence presented to support a conclusion is not representative of all the evidence available. Instead it is biased toward the position favored by the argument peddler.
   - *Straw man* – This occurs when an opponent’s argument is reinterpreted as a different argument, one that is so weak it’s as easy to knock down as a straw man. This is then used to imply that the original argument is false, which does not follow.

There are many more. Do a web search on “common fallacies.” Study them, master the top ten, and use that knowledge to inoculate yourself and others against false memes.

If You Work with or Manage an Environmental Organization

7. **Pause to reflect on the concepts presented in this book.** Are they sound? What is missing? Would they turn the tide if you, your organization, and most others adopted them?

   a. If no, then how can they be improved so that you could say yes?

   b. If yes, then help to convert others to the new paradigm. This will not be easy because change resistance is everywhere. Start with those who think like you. One way to get others thinking in this new direction is The First Experiment. After that try showing them this book.

8. **Study the new tools.** You will know your organization has converted when they start to become driven by a formal process that fits the problem. To make that transition fast and less painful, read up on process and organizational change. Later study up on the rest of the new tools.

9. **Once your organization has converted to Analytical Activism, don’t try to solve the whole problem.** Instead, bite off a piece of the apple that fits your capabilities. Then refine your process to fit that smaller problem so well that you can solve it. After you’ve solved it, come back and bite off a bigger piece.

10. **Work with a guiding coalition to avoid duplication of effort, suboptimization, and poor overall strategy.** If the coalition doesn’t exist, start one.
A guiding coalition is mandatory, because difficult environmental problems usually have systemic root causes. No one organization is influential enough to exert the force required to implement solutions where the structure of the global human system must be radically changed. Nor is any one organization capable of performing the many analyses and experiments required to arrive at the correct collection of solution elements necessary to solve the complete sustainability problem.

11. Avoid the trap of assuming the root cause of a problem is local rather than systemic, or vice versa. For example, if your problem is how to get certain local pro-environmental legislation passed, you may have a case of systemic change resistance. No amount of analysis is going to reveal a shortcut solution. Instead, your only solution path may be to change the entire system, or at the very least a bigger system than the one with the local problem. This can happen, for example, when the local problem is at the state level but the systemic problem is at the national level. Or the local problem could be at the national level but the systemic problem is at the international level. If this is the case, you may have no choice but to work with other organizations and a guiding coalition in order to solve the systemic problem.

If You Write Popular Articles and Books

12. Avoid emotional arguments, including the use of emotion laden photographs, exhortation that so-and-so MUST be done, and literary inspiration. Only a light dose of this helps. Anything more is counterproductive. Emotional arguments are too easily ignored by those not already convinced and can cause backlash. They also teach readers to decide on emotion instead of logic and fact, which makes them more susceptible to fallacious appeals from the opposition. Even worse, it causes them to use emotion instead of logic to solve the problem. Also avoid emotional arguments of any kind.

13. Avoid the symptomatic solution. If you have been promoting these, publicly admit your error and then move right into the alternative of systemic solutions that resolve root causes. Educate your readers on the difference. Point out that this is a systemic problem, and the only thing that will solve a systemic problem is changing the system.

14. Help to reframe the sustainability debate to focus on the social side of the problem, instead of the technical side. Point out that until systemic change resistance is overcome, all this talk of technical details on how to be more energy efficient, less polluting, and so on is like discussing how many angels can dance on the head of a pin. It doesn’t matter, because the social side is the crux of the problem. Once that is solved we can shift attention to the head of the pin and can talk about how many proper practices can dance upon it.

15. Find the ten concepts in this book and other analytical approaches that you feel would make the critical difference, and weave them into your work. Help paint the new paradigm, and at the same time educate your readers on how to use the new tools to create it.

For example, the book *What's the Matter with Kansas? How Conservatives Won the Heart of America* shows that: “The largely blue collar citizens of Kansas can be counted upon to be a ‘red’ state in any election, voting solidly Republican and possessing a deep animosity toward the left. This, according to author Thomas Frank, is a pretty self-defeating phenomenon, given that the policies of the Republican Party benefit the wealthy and powerful at the great expense of the average worker.”

If you write books like this you could use the Dueling Loops to explain the fundamental reasons why “self-defeating phenomenon” like this one exist.

If You Are Wealthy or a Grantmaker

16. Support the Proper Coupling Package by investing in Environmental Property Management corporation startups.

17. Steer your green funds to those environmental organizations with the highest certification scores. If none exist then invest in some certification company startups.

18. Steer your political donations to those politicians with the highest Truth Ratings, the highest Decision Ratings, and the lowest Corruption Ratings. If none exist then invest in some rating company startups.

If You Are a Synthesist

A synthesist is someone who creates a greater whole from existing elements. They can create new insights of great depth. These are in the form of hypotheses, theories, or even complete new paradigms. Probably less than 1% of the population is synthesists.

19. The new paradigm has barely begun. There is an entire field out there awaiting its fundamental principles, experimental exemplars, etc. The field is the new science of Human System Engineering and Optimization, in which environmental sustainability is merely one problem to solve. What are the few foundational building blocks that are going to make the crucial difference?
If You Are a Refiner

The rest of us are refiners. Instead of creating new ideas we improve old ones.

For example I am a refiner. There’s not a single new idea in this book—only a recombination of old ones and an effort to divert attention to certain old ideas that have lain neglected for far too long.

The ultimate refiner is Mother Nature. Using the near magic of the evolutionary algorithm, she improves each generation by a usually imperceptible amount. But when millions of incremental improvements are added up over time, they have the same end result as synthesis: a new entity has been created.

Memetic evolutionary refinement is how the global environmental sustainability problem will be solved. If you are a refiner, here’s how you can help:

20. Master the Scientific Method. It has been sprinkled liberally throughout this book. There’s a reason for that.

21. Start running social experiments to test and improve the key concepts in this book. Become a habitual experimenter. Be able to design a simple experiment in minutes to test any new assertion you or your colleagues come up with. Social experiments can be as simple as walking down the hall and seeing how three people react to a clever but fallacious statement designed to get them to respond in a desired manner, and then how three more respond to the same statement if you precede it with the comment, “Watch out for fallacies.”

22. Identify a promising concept that, if it was refined far enough, could make a notable difference. Then make it your analytical passion, and don’t let go until you have taken it to the next stage where it can make the difference, or you have determined that it won’t work. Expect most of your efforts to be failures. But if you are using a process that fits the problem to generate your hypotheses, then sooner or later you’re going to hit the jackpot.

* * *

When I started writing this book in 2005 I believed it was environmentalists in the popular sense I was trying to reach: grassroots activists, seasoned environmental organization managers, writers, scholars, and movement visionaries. It is they who are leading the charge. But now, as the precipitating event gathers its full form, I can see I was wrong. That group will not be enough.

The most powerful life form on the planet has, as its soldiers, people like you and me. These are the businessmen and women who run the corporations that run the world. Some are pro-sustainability. A few will be able to see the possible wisdom in these pages. It is to them that we must turn, for without them we are lost. With them we can awaken the conscience of the New Dominant Life Form from within. Once that begins we will have a glimmer of hope we can win. Therefore:

If You Are a Corporate Manager

23. Support the implementation of the Proper Coupling Package, or something like it, by voluntarily adding fees to your goods and services to reflect their environmental impact. At first do this in only a few critical areas. As a percent of sales the fees can be very small, less than 1%. But if you direct fee income toward the emerging industry of Environmental Property Management corporations, the fees will allow the industry to grow quickly because it will have the equivalent of its startup capital.

24. Once Environmental Property Management corporations start to appear, aggressively cooperate with them to find the most efficient and least disruptive ways to install fees and buys on your industry. They will really appreciate this.

25. Consider that buys will become a multi-trillion dollar industry overnight. Where is your company going to be positioned in that market? When will you make your move into it? What can your firm offer to provide as buys that will help most to solve the sustainability problem and at the same time offer the largest returns to your stockholders?

26. Does your firm have expertise that would make a venture into the fees side of Environmental Property Management profitable? Do you see environmental properties that you could manage wisely and profitably? If so, will you be able to file your claims before your competitors do?

27. If you cannot file those claims because Environmental Property Rights do not yet exist, then initiate or support legislation to create them. Work with a coalition taking a universal global approach so that this new form of property rights can be engineered and added to the human system in the most inherently efficient way possible.

Next comes the biggest thing you can do, because as a corporate manager only you know how to do it:

28. Help to transform the quality of political decision making to where it is as good as for-profit corporate management decision making. The way to do this is to work hand in glove with politicians to help them succeed on the next item, because they cannot do it alone.
If You Are a Politician

29. Create and support structural mechanisms for improving the quality of political decisions.

As a politician you are the people’s elected problem solver. You, your staff, and the other politicians you work with are a problem solving organization working on one difficult problem after another. Because the more difficult the problem the more mature the process used to solve it must be, your best strategy is to use the most mature process possible. This will have the effect of maximizing the quality of political decisions, just as the many mature processes that corporations use serve to maximize their profits. If you are serious about improving the quality of decisions, then enlist the help of top corporate managers, because they are the best there is.

There’s another reason we need to improve political decision making. The full Dueling Loops of the Political Powerplace model found that quality of group decision making in politics is a high leverage point for solving the sustainability problem. Presently quality is low, due to poor process. This causes legislative decisions to be too easily controlled by corrupt politicians and special interests, notably members of the New Dominant Life Form who owe their allegiance to that life form instead of Homo sapiens. Poor process also causes the process to not adapt fast enough to changing times, due to insufficient continuous improvement. This creeping obsolescence results in a growing inability to solve new types of problems, which leads to crisis management, bickering, and clever attempts to shift the blame for solution failure to others. A side effect of poor process is excessive partisanship, due to the focus of participants on personal or party gain instead of doing what is best for the whole.

All these problems would be greatly reduced if we could dramatically improve the political decision making process. This can be done with the Decision Ratings solution element. This has the complexity and power of double entry accounting and financial management, but because politicians manage something else entirely, it is totally different. However the principles of quantitative measurement of what you are managing, performance feedback, and relentless continuous improvement apply equally well to political and business decisions making processes.

Since we have not presented this solution element before, here’s how it works:

Decision Ratings

The objective of Decision Ratings is to improve the political decision making process to the point of being able to solve problems at the level of global social control models. This is ambitious, but it’s exactly what’s needed because only a satisfactory global social control model will solve a difficult global problem like environmental sustainability.

The strategy is to create a race to the top among politicians to see who can accumulate the best decision ratings over their career. Under Decision Ratings, legislation undergoes a strictly monitored lifecycle. The lifecycle steps are objective, proposal, enactment, and outcome. For simplicity we will ignore evolution, solution management, and obsolescence.

Expert, non-partisan ratings are used to create powerful feedback loops over the course of a politician’s career. The most important ratings occur early in a bill’s lifecycle in the objective and proposal steps, when small improvements can have the greatest influence. This agrees with the fact that in legislative bodies the real work goes into drafting legislation, not in voting or managing solutions once they go out the door.

How Decision Ratings works is shown in the process map on the next page. To keep this section short we have omitted how ratings work dynamically and other details. Here’s how Decision Ratings handles the lifecycle steps of a piece of legislation:

A. The Objective Step – Decision Ratings uses a hierarchy of objectives. At the top sits a nation’s standing goals. These are enshrined in its constitution or a similar document. At the bottom are all the bills currently in force. Between the top and bottom is an implied but unwritten set of layers of intermediate objectives. Those doing the ratings work with legislatures to develop a published system for keeping track of the hierarchy. Eventually certain bills will probably be created to define portions of the hierarchy.

When a bill is first created its objectives are listed. These are then rated for four things: difficulty, importance, favoritism, and coherence. The last is how well the objectives support the existing hierarchy of objectives. The last three are then weighted to create an overall rating of quality of objectives. If any favoritism or irrelevancy exists, this will cause a low quality of objectives rating, because that would mean the bill’s objectives clash with the hierarchy.

It will not be long before committees set a high quality bar, such as 90%, that the objective rating of all new bills must pass to be developed by committees into full proposals. Who created the objectives is recorded for later use.

B. The Proposal Step – After a bill is fully developed it becomes a proposal. It is then submitted to the raters who rate it on how likely it is to achieve its stated objectives, which is called its success probability rating. At first the raters must study the lifecycles of lots of past bills, calibrate their predictive process, and make edu-
cated guesses. With experience and specialization they will get better and better. The raters will themselves be rated by an independent body for how well their past ratings correlate with outcomes, which will allow a confidence level for a rater’s ratings. Multiple rating organizations will specialize in different types of legislation and compete to see who can get the highest confidence levels, because that’s who politicians are going to want to rate their bills. Proposals are also rated on favoritism.

Again, it will not be long before congressional bodies insist that a proposal must have at least an 80% or so probability of success and no more than a 5% or so favoritism rating before it may be brought to the floor. Under these conditions we are going to see the instant disappearance of midnight earmarks, late amendments, and all the trickery that pops out of the sky when bills come out of committee. This is because any change is made the proposal must be rated again. This takes days to weeks at a minimum, costs a considerable amount of money, and any favoritism or poor quality of decision making that has crept in will hurt the bill’s ratings. If the probability of success falls too low or the favoritism rating rises too high then alternative bills will take its place or it will not be allowed on the floor.

The raters record who the authors are for each bill. The simplest way to do this is to see who is on the committee that created it. Better ways will evolve to reflect who did the

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1. **Objective Step**
   - Set the bill’s objectives
     - Rate the objectives for:
       - Difficulty
       - Importance
       - Favoritism
       - Coherence
   - Quality of Objectives Rating
   - Good enough to develop?
   - Worth improvement?

2. **Proposal Step**
   - Develop the bill’s proposal
     - Rate the bill for probability of success in achieving its objectives
     - Success Probability Rating
     - Good enough for committee to approve?
     - Worth improvement?

3. **Enactment Step**
   - Vote on bill
     - Pass
     - Implementation
     - Fail

4. **Outcome Step**
   - Long Delay
   - Outcome state reached
   - Rate outcome
   - Calculate politician decision ratings

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**Process Map for Decision Ratings**

**Legend**
- DECISION
- PROCESS STEP
- DATA
- EXTERNAL EVENT

**Bill dies**

**Better quality of decision making at many places in the process**

**Better politicians elected**

**Elect this politician?**

**Bad politicians weeded out**
real work and made or suggested the key decisions.

C. The Enactment Step – If a proposal passes, the raters record who voted for and against it.

D. The Outcome Step – Finally, years later, the raters measure the bottom line: how well a bill achieved its objectives. This is done for all enacted bills.

The results are then correlated with enactment votes to see who has the better record on voting for bills that better achieved their objectives. The correlation is then adjusted for the difficulty of the objectives. This gives the voting rating for each politician. The same thing is done for outcomes versus the records of who authored each proposal, plus adjustment for difficulty, which gives the proposal rating for each politician. Finally, the same thing is done for outcomes versus quality of objectives, plus adjustment for difficulty, which gives the objective rating for each politician.

Objective ratings are the most important, because they represent the strategies and priorities behind a politician’s work. Next in importance are the proposal ratings. They represent the quality of the bulk of that work. The public will know this and weight the three ratings accordingly, probably around 50% for objective ratings, 40% for proposal ratings, and 10% for voting ratings. This completes process description.

If Decision Ratings is setup at the local, state, national, and ideally the international level, all politicians will have lifetime ratings. Voters will look long and hard at a candidate’s ratings history as they make their choices. They will probably consider it more than any other factor, because now they have an objective, reliable, understandable, comparable measurement of what they have always wanted to know: How well is a candidate probably going to do in the future to help achieve my society’s objectives? The result will be a race to the top among politicians to see who can accumulate the best decision ratings over their career.

This brief sketch should explain how creating the right feedback loops can dramatically improve the quality of group decision making at all levels of politics. The system will now have automatic accountability, if voters use the ratings as I suspect they will. Imagine what the beneficial effects might be. And imagine what problem would already be solved if Decision Ratings already existed.

Decision Ratings would cause a sea change in the way bills are developed. High ratings would require sound analysis of the causes of a problem, deep understanding of how people and systems behave, a thorough look at all reasonable alternatives, lots of synthesis to create new ideas, a method of picking the best solution path, and techniques to prove that all this is correct and not just highly plausible. This is exactly how successful businesses have worked for a long time.

If you are a politician, then the best long term structural change you can make is to help create something like Decision Ratings. Or this short sketch may give you even better ideas. Start simple.

Now let’s review a few other things that you as a politician can do tomorrow morning to change the system:

30. Publicly commit yourself to the race to the top and the path of a virtuous politician. This is the use of truth rather than falsehood and favoritism to gain supporters. The end result is the optimization of the system for the common good of all, rather than the few. To avoid having to stoop to race-to-the-bottom tactics to win, change the system so that is no longer the winning strategy.

31. Support efforts to raise the level of general ability to detect political deception from low to high. This is the high leverage point to push on first. As a politician trying to solve the sustainability problem, you will continue to encounter more change resistance than you can overcome until your potential supporters can tell true memes from false memes.

32. Base your own appeals to supporters on sound arguments and the objective of optimizing the system for the greatest good for all. This will require some study and practice, and possibly a rewrite of your platform or the one you support. It will also require tremendous self-discipline, because at first corrupt politicians will be able to beat you. But as you refine your electioneering and career strategy to take advantage of a rising general ability to detect political deception and the introduction of politician ratings, you will start to win.

33. Counter your opponent’s fallacies by identifying what kind they are and comparing them to similar well known fallacies. Have dozens of canned refutations and examples of fallacies ready that are focus group tested to be instantly understood and can bring anyone who utters a fallacy crashing down to earth every time. Stun your opponents and the moderator by doing this on television appearances and debates, without notes and with the calm confidence of a certain winner. See item 6 for more on this subject.
34. Resist the temptation to join the race to the bottom, especially as an election approaches. Instead, prepare your base and swing voters well ahead of time to expect negative campaigning (ad hominem attacks) and other fallacious appeals from your opponent. Inoculate your supporters against these false memes.

The Exploitation Archetype

If you are a politically savvy structural thinker, you may have recognized that the Dueling Loops is an instance of an archetype, which is a common fundamental social structure. To the left is the amazing Archetype Tree from The Fifth Discipline Fieldbook: The Art and Practice of the Learning Organization. The tree is used to more quickly find the social structure causing a problem and to train new systems thinkers. Frequently the tree contains an archetype that matches the problem or comes close enough to serve as a starting point.

The closest to the Dueling Loops is Success to the Successful. But that pattern doesn’t quite fit. It is just two reinforcing loops sharing one limited resource, as shown on the previous page. Success to the Successful appears often in the business world, where it is called First to Market. Here’s how it works:

“In a ‘Success to the Successful’ situation, two activities compete for a common but limited resource. The activity that is initially more successful is consistently given more resources, allowing it to succeed even more. At the same time, the activity that is initially less successful becomes starved for resources and eventually dies out. Example: the QWERTY layout of typewriter keyboards.”

The Dueling Loops is similar to Success to the Successful, because the race to the bottom and top share a limited resource: supporters. But the reason a runaway imbalance occurs in Success to the Successful is nowhere near the same reason one loop becomes dominant in the Dueling Loops, where loop dominance occurs because of the inherent structural advantage each loop has and how strongly the structure’s high
leverage points are currently being pushed.

The Dueling Loops are a case of the Exploitation archetype, as shown above. When there is no exploitation only the lower loop exists and Success by Cooperation goes well. But as soon as an exploitable strategy and an exploitation multiplier device to take advantage of that strategy are discovered, Success by Exploitation becomes possible.

The strength of the exploitation loop starts to grow when the first of many exploited acts occurs, such as falsehood or favoritism. This increases unequal provision of development needs, such as tax breaks for the rich or corporations, employment discrimination, and the creation of false wars to steer billions of dollars to the military-industrial complex, which takes those dollars away from other more socially beneficial areas. This in turn increases the development of the exploiter.

However, more exploited acts also decreases the equal provision of development needs of cooperators, such as by reducing median income or the minimum wage. This is the exact point where exploitation hurts others. In a society with finite resources, one person’s gain is another person’s loss.

As development of the exploiter increases, so does the exploiter’s competitive advantage. This heightens their commitment to exploitation. It also increases the appeal of exploitation strategy, which increases defection of cooperators, which adds to the number of agents with a commitment to exploitation. As this goes up so does the incentive to rationalize to achieve exploitive goals, since the end now justifies the means because one is no longer a cooperator. Anything goes, including the twisted logic it takes to convince yourself and others to perform what you previously (as a cooperator) considered inhuman. These rationalizations cause still more exploited acts and the loop starts all over again. Over time the Success by Exploitation loop can grow to horrendous strength.

The causal flow diagram has been drawn to emphasize its symmetrical shape, simplicity, and leverage points, rather than logical correctness. That requires a simulation model.

The diagram shows how the exploitation multiplier device is a high leverage point for the degenerates. Because of the symmetry that exists in most fundamental social problem structures, there is usually a corresponding high leverage point for the rationalists. In this archetype this is the exploitation demultiplier device. Since in this book “high leverage point” implies one that if pushed on will solve a problem, only that high leverage point is underlined.
The demultiplier works by counteracting the force of the multiplier. The demultiplier increases the amount of detected exploitation, which decreases defection. This causes commitment to exploitation to fall and commitment to the common good to rise. If enough of this happens the Success by Exploitation loop collapses as its practitioners stampede to the only game left in town: cooperation.

The diagram shows how, after a long delay, growth in unequal provision of development needs increases the need for the exploitation demultiplier device. The demultiplier starts to appear as the effects of prolonged exploitation start to become painfully obvious and some cooperators begin to sense what’s happening. This causes automatic activation of the You Can’t Fool All of the People All of the Time balancing loop. How fast it fully activates determines how long it takes to solve a particular exploitation problem. Full activation can be greatly accelerated by engineering the demultiplier device, instead of waiting a long time for one that works to randomly evolve using trial and error.

Plugging in the italicized terms (like false memes) turns the archetype into the Dueling Loops of the Political Powerplace. Our hypothesis is that there are many more social problems that would also plug right in, if someone took the time to model them.

The Exploitation archetype could have been in the Dueling Loops chapter. Putting it here allows us to emphasize the archetype’s potential, which may be considerable. Or it may have a problem we have not noticed.

If You Are a Structural Thinker

35. Use the Exploitation archetype to explore the hypotheses that most of society’s persistent social problems are cases of this pattern. They can be solved if the demultiplier high leverage point is identified and a way is found to push on it strongly and efficiently enough. Using this archetype as a starting point and system dynamics as the main tool, there is now a standard way to turn invisible social structures into visible ones, and suddenly see for the first time what the true form of many social problems really is.

A look at the past may help us better understand the present. One horrific example of an exploitation multiplier device was the way “that group is inferior because they are black” was used to convince entire white populations to use blacks as slaves. The bigger the multiplier, the more inferior they were, the argument went. The exploitable strategy was potential slavery. The exploited acts were slavery, which was much greater than the cooperative acts of no slavery. This caused the side effect of lots of subnormal development of others (not shown) since slaves were undereducated, undernourished, under housed, and overworked. But the main effect of more of the exploited acts was to greatly increase the exploiter’s competitive advantage. This caused even more commitment to exploitation and defection, and the loop started all over again. It soon grew to tragic size.

Fortunately an exploitation demultiplier device appeared in the form of the democracy for all. At first the “all” excluded slaves. But as democracy took hold and became the norm its underlying concept of freedom and equality of opportunity for all strengthened, until finally the demultiplier was strong enough to counter the exploitative multiplier. Once that happened a race to the top of Success by Cooperation went dominant, and everyone could now enjoy equal provision of development needs, which led to a much higher development of all.

The saddest part of a dominant Success by Exploitation loop is all those beautiful human beings who never develop to their fullest potential.

Now let’s look at the present. Many types of exploitation and the resulting low achievement of a person’s fullest potential remain. Small amounts probably always will. But large amounts are within our abilities to correct if we can see the exact structures involved.

For example, many more types of discrimination remain. There is also poverty. Some of this is unavoidable if people live in a resource poor area. But probably most is avoidable. How much of this is structural poverty, caused by invisible social structures that relentlessly push too many people’s lives to the bottom of the barrel? Then there is crime. How much of this is also structural? What about war? Systemic lack of interest or disrespect of education? Voter apathy? Child labor? The rising inability of some developed nations to economically and socially assimilate culturally different immigrants?

It will take some effort, but analysis of the above problems would probably show that most are a case of the Exploitation archetype.

36. Are there any other fundamental social structures that would allow society to solve more of its major problems or seize more of the many opportunities lying all around, such as those involving something other than exploitation? Is there an archetype tree for social problems? Such an all inclusive pattern would have the same effect on social system engineering as discovery of the Periodic Table had on chemistry.

37. Increase the explanatory power of The Dueling Loops of the Political Powerplace model. One way to start would be to calibrate the existing model by measuring a real system and using that to set the esti-
mated parameters in the simulation model. That should lead to large changes in model structure. This in turn would lead to increased explanatory power.

38. How can the Dueling Loops of the Political Powerplace be used as the starting point for a scientifically based strategy of how to achieve a permanent majority of virtuous politicians? It is plain to see that in some countries the main two political parties employ what are basically race to the bottom or top strategies. There are existing cases of parties even touting their dominance as a “permanent majority,” such as conservative Republicans in the US. Unfortunately, they are relying on the vicious cycle rather than the virtuous one. What they really mean when they say the chilling words “permanent majority” is that their top strategy is a race to the bottom. What we need instead is a permanent race to the top.

In this section we have begun to move from focusing on problems to opportunities. Let’s go all the way, so that we can reap the full benefits of the new paradigm:

If You Are a Social System Visionary

A social system visionary can do two things few others can: They can see a distinct vision of a better future for society, and they can offer a practical way to turn it into reality. Popular visions include eradicating poverty, ending war, eliminating large disparities in wealth distribution, and ending the many forms of discrimination and other causes of unnecessary suffering that still exist. The hard part is not the vision but how to achieve it.

Analysis shows that all of these visions have a common theme. They require cooperation for the good of the group, rather than competition for the good of the individual. The latter is the norm because the best strategy of all independent intelligent agents is to maximize the net preset value of their competitive advantage. If they do not follow this strategy then they will lose out to those who do.

Further analysis shows the choice is not between cooperation and competition. It is between constructive and destructive competition. Competition itself is not necessarily bad. Only destructive competition is.

Constructive competition is a good thing. For example, in a brainstorming session people compete to see who can come up with the best new idea. In a group critique of a project plan, members compete to see who can provide the most useful insights. In a legislative committee working on drafting a tricky bill, the chairman may challenge the team with “Does anyone have a better idea?” Managed wisely, constructive competition is a powerful force for the better.

There is a way to apply this force to the sustainability problem and all social visionary problems. All you have to do is install a race to the top on the dominant agents involved.

This principle and the concept of types of competition leads into the first thing you can do to change the system if you are a social system visionary. You can:

39. Change your central strategy to center on a permanent race to the top. This counters the opposition’s strategy of a permanent majority, whatever the problem may be. The best example in this book is the Dueling Loops of the Political Powerplace. This simple social structure contains two main loops. In the race to the bottom the agents are trapped in a ruthless, vicious cycle of destructive competition, because the end justifies the means. But in the race to the top the same agents are caught up in a virtuous cycle of constructive competition.

What makes this so constructive is we have found the right high leverage point to push on. Finding high leverage points and a way to push on them that works is the key to creating a permanent race to the top. This holds true for many and perhaps most social system problems, including impossible utopian dreams like full and equal women’s rights, which appeared quickly once the invention of modern democracy created a permanent race to the top in which politicians competed to see who could provide the greatest freedom of opportunity for all.

Social systems contain countless races to the bottom. In a modern democracy most unsolved social problems probably have, at their structural root, a dominant race to the bottom. Your challenge as a social system visionary is to uncover the invisible structures involved, so that why a particular race to the bottom is dominant becomes as clear as why apples fall down and not up.

After that your model will probably lead you right to why the associated race to the top is not dominant. The reason will probably be that no one is pushing on the right high leverage point, and so the right auxiliary loops are not in place, such as the many loops in chapter three belonging to the six solution elements.

The power of an abstraction increases exponentially with its universality. The chapter on The Dueling Loops of the Political Powerplace had this to say on page 293:

“Allow me to make a personal observation. The dueling loops structure is generic. It applies to any problem, not just environmental sustainability. The successful exploitation of the race to the bottom by the modern corporation and its allies is THE fundamental reason progressive activists are encountering such strong resistance in
achieving their objectives. If progressive philosophy is defined as promotion of the objective truth for the good of all, then progressives (no matter what party they belong to) are rationalists at heart, and thus eschew falsehood and favoritism in its many forms. Progressives may not realize it, but their central strategy is the high road of winning the race to the top.”

Our point is that once the dueling loops and how to cause the race to the top to go dominant are understood, that knowledge can be used to move forward on any social problem whose solution is being blocked by a dominant race to the bottom. This includes, I think, not just the environmental sustainability problem, but most of the problems dear to progressives.

There are a few cautionary points to make, however. The most important is:

40. Engage in some self-discipline to see that the environmental sustainability problem takes precedence over all other problems, including social problems like those mentioned above. We must all remember that if the human carrying capacity of the environment collapses, then none of these other noble intentions will matter at all, because life will now be nasty, brutish, and short.

The next item is more subtle.

41. Wait for the new paradigm to take hold before you go for your favorite dream, the one you know is possible. Once the new paradigm has been used to start on a solution path that will finally work for the global environmental sustainability problem, there are going to be a lot of people who can now help you solve some of society’s other top problems, using a whole new way of thinking. But you must wait patiently, because paradigm change takes time. Avoid panicking and trying something else out of sheer impatience.

However, if the precipitating event triggering the forces leading to paradigm change has been well engineered and well received by people like you, a system phase transition could happen overnight.

And none of us would have to wait.

* * *

Finally, there is one more thing everyone can do to change the system instead of continuing with symptomatic solutions. It is perhaps the most encouraging:

42. Something is about to happen that has not happened for four hundreds years, since the age of invention of the Scientific Method. This turned a rag tag gaggle of alchemistic researchers and philosophers into an army of bona fide scientists. That army, driven by a race to the top to find every more productive new scientific truths, brought us the world we live in today.

Another virtuous army is about to wake up and find that it is strong. All it has to do if find the right collection of races to the top, activate them in succession, and climb aboard.
Appendix

Many, many, many thanks to all the people who have helped make this alternative approach to a solution happen.
# Timeline of the Three Cycles of Dark Ages and Ages of Reason

“Those who cannot remember the past are condemned to repeat it.” – George Santayana (1863 to 1952)

| 500,000 BC – Fire tamed by Homo erectus (upright man). |
| 2,000,000 BC – Homo habilis (Latin for handy man) appears. |
| 3,000,000 to 4,000,000 BC – First replicator appears spontaneously. |

## First Dark Age

| 20,000 BC – Invention of the bow and arrow. |
| 500,000 BC – Fire tamed by Homo erectus (upright man). |
| 20,000 BC – Homo sapiens (wise man) appears. Cranial expansion allowed superior power of reason. |
| 10,000 BC – Agriculture invented. At this point progress entered an entirely new mode. |

## First Age of Reason

| 500 BC – The First Age of Reason begins when Aristotle (582 to 496 BC) invents the basic rules of logic. People could now reason correctly for the first time. |
| 312 BC – Work begins on the Appian Way, the “queen of roads” of the Roman Empire. |
| 300 BC – Euclid’s Elements published, the foundational math textbook for the next 2,000 years. |
| 551 to 479 BC – Confucius teaches social harmony can be achieved only if people are free from deprivation and given proper education. Civil service exams begin in China. Passing rate during the Tang Dynasty is only 2%. Civil service exams were not adopted in Europe until the 1800s. |

## Second Dark Age

| 1000 – Chinese discover a weak form of gunpowder, used mainly for firecrackers. |
| 1041 – Movable type printing press invented in China by Bi Sheng, using clay type. |
| 1180 – Windmills appear in Europe. |
| 1453 – Modern printing press invented by Johann Gutenberg, causing a memetic explosion through the rise of literacy and the much lower cost of meme replication. |

## Second Dark Age

| 1620 – Sir Francis Bacon publishes the Novum Organum in which he “attempted to describe a rational procedure for establishing causation between phenomenon.” He argued that “scientific theories should remain as close to the fact as possible.” He emphasized in the language of the time that this meant that “The understanding must not therefore be supplied with wings, but rather hung with weights, to keep it from leaping and flying. Now this has never been done; when it is done, we may entertain better hopes of the sciences.” |
| 476 – The Second Dark Age begins with the fall of the Roman Empire and the rise of the power of the church to fill the vacuum. Intellectual progress stagnates, because reason has been replaced by dogma. |
| 500 BC – The First Age of Reason begins when Aristotle (582 to 496 BC) invents the basic rules of logic. People could now reason correctly for the first time. |
| 1000 – Chinese discover a weak form of gunpowder, used mainly for firecrackers. |
| 1041 – Movable type printing press invented in China by Bi Sheng, using clay type. |
| 1180 – Windmills appear in Europe. |
| 1267 – Roger Bacon (1214 to 1294), a Franciscan monk, writes and sends his first major work, the Opus Majus, to Pope Clement IV at his request. In his work “Bacon described a repeating cycle of observation, hypothesis, experimentation, and the need for independent verification.” |

## First Age of Reason

| 1453 – Modern printing press invented by Johann Gutenberg, causing a memetic explosion through the rise of literacy and the much lower cost of meme replication. |
| 1620 – Sir Francis Bacon publishes the Novum Organum in which he “attempted to describe a rational procedure for establishing causation between phenomenon.” He argued that “scientific theories should remain as close to the fact as possible.” He emphasized in the language of the time that this meant that “The understanding must not therefore be supplied with wings, but rather hung with weights, to keep it from leaping and flying. Now this has never been done; when it is done, we may entertain better hopes of the sciences.” |
| 1000 – Chinese discover a weak form of gunpowder, used mainly for firecrackers. |
| 1041 – Movable type printing press invented in China by Bi Sheng, using clay type. |
| 1180 – Windmills appear in Europe. |
Chapter 18. What Can I Do Tomorrow Morning?  381

1619 to 1637 – The Second Age of Reason begins due to invention of the Scientific Method. René Descartes begins his Rules for the Direction of the Mind in 1619 and completes his Discourse on Method in 1637, which presented a full characterization of the Scientific Method. Descartes’ work, combined with Francis Bacon’s, defined enough of the Scientific Method for it to be learned, applied, and improved by others, such as Galileo and Newton. After this point, the exponential progress of science that started with the invention of agriculture entered another new mode, and began to accelerate even faster.

1632 – Galileo Galilei publishes the Dialogue Concerning the Two Chief World Systems, which supported and explained the Copernican system of the Earth and other planets orbiting around the Sun. In his work Galileo pioneered the use of quantitative experimentation, such as his use of inclined planes and rolling balls, timed with his pulse (watches did not exist then), to determine the law of acceleration of falling bodies. Threatened by the Catholic Inquisition in 1633 with torture and death on the stake, Galileo recanted and denounced his own work. The Dialog was added to the official list of banned books and not removed until 1822, showing how long paradigm change can sometimes take.

1687 – Sir Isaac Newton publishes the Principia Mathematica, which established the three laws of motion and the universal law of gravity. It was also a tremendously influential display of the power of the Scientific Method, the rock upon which Newton based development and proof of his theories.

1700 – Clockmakers begin using interchangeable parts.

1763 – The Industrial Revolution begins with the invention of the first efficient usable steam engine.

(At this point new major inventions become too numerous to list, so we skip to the next truly big events.)

1962 – Rachael Carson publishes Silent Spring, precipitating the modern environmental movement.

1971 – The Powell Memo is published by the US Chamber of Commerce.

1972 – The Club of Rome releases their landmark study, Limits to Growth, which provides the first globally accepted model and proof that civilization is approaching its environmental limits.

1985 – Overshoot begins. According to the Ecological Footprint graph, a project of Redefining Progress (See rprogress.org), civilization entered global environmental overshoot around 1985.

1987 – Montreal Protocol signed, thus controlling future emissions of CFCs and solving the ozone hole problem.

This was the first major victory in solving the many global sustainability problems that were by this time rapidly appearing. It gave the environmental movement hope it would succeed. But as it turned out, this was the height of the movement’s influence and success, which was already in decline. The 1960s, 70s, and 80s are now considered the Golden Age of the modern environmental movement.

1999 – The United States Senate rejects the Kyoto Protocol treaty on climate change by a resounding 95 to zero, and it has not been brought back to the floor since. This signaled that the sole remaining economic and military superpower in the world was dead set against environmental sustainability, sending shock waves of horror and pessimism throughout the environmental movement.

2001 – The Third Dark Age begins when the George W. Bush administration ascends to power in the United States. This event marked the rise of the New Dominant Life Form to world control, acting though its chief proxy country, the United States. This increased and consolidated the power of the forces working against sustainability to such a degree that progress started to go backward in the US and stalled or also went backward elsewhere. Because speedy, aggressive progress is required to proactively solve the complete global environmental sustainability problem in time, this means the problem as a whole is now growing much worse, with no credible solution in sight.

2010 – US Supreme Court grants corporations the right to spend unlimited amounts to influence elections. Corporations can now legally elect whoever they want to run the system, including their own business managers. System control by the New Dominant Life Form is nearly complete. Darkness is now upon us.

???? – The Third Age of Reason will begin when the global environmental sustainability problem is on the way to being solved, and Homo sapiens is no longer on a path to self-destruction and extinction. This is surely the most illogical act any life form with the ability to reason could commit. Thus when this act ceases new feedback loops will trigger a system phase change to the Third Age of Reason.

But will humanity use this third chance, and perhaps its final one, to end the cycle forever or not?

Sources for timeline: ideafinder.com/history/timeline.htm, wikipedia.org, and miscellaneous readings.
Endnotes

1 Source of Humanity’s Ecological Footprint graph: World Wildlife Fund, 2006 Annual Report with improvements. The graph is also in the third edition of Limits to Growth, 2004, which is where I first encountered it.

Acknowledgements
2 Bill Joy’s essay on Why the Future Doesn’t Need Us was first published in April 2000 by Wired Magazine. It is available at www.wired.com/wired/archive/8.04/joy.html.

Part 1 – How the Environmental Movement Can Find Its Way Again
3 The quote by Ernest Mach, ”Every real problem can and will be solved, entirely by accurate observation and close, searching thought,” is from A New Sense, one of many lectures in his Popular Scientific Lectures of 1897. The translation used is from Galileo’s Commandment: 2,500 Years of Great Science Writing, edited by Edmund Bolles, 1999. The quote itself is on page 28.

Chapter 1 – Why the Environmental Movement Needs the Right Process
4 The special series is at www.grist.org/news/maindish/2005/01/13/doe~intro. There The Death of Environmentalism essay can be found, along with other material, including Carl Pope’s response. The original essay is at www.thebreakthrough.org/images/Death_of_Environmentalism.pdf.

5 The long passage about Jay Forrester’s experience on “The Beginning of System Dynamics” is from sysdyn.clexchange.org/sdep/papers/D-4165-1.pdf. This was a “Banquet Talk at the international meeting of the System Dynamics Society, in Stuttgart, Germany, July 13, 1989.”

6 From a scientific viewpoint, all solution attempts are actually experiments. This attitude helps to keep problem solvers thinking in terms of always being somewhere in the process of the Scientific Method, as well as other related processes they may be following.

7 The paragraph on low leverage points is from World Dynamics, by Jay Forrester, 1971, page 95.

8 The image of Archimedes using a lever to move the world is from Milestones of Science, by Curt Suplee for the National Geographic Society, 2000, page 33.

Chapter 2 – Why Environmentalists Are Facing Such Hostile Opposition
9 Please note that in the United States, opposition to environmental sustainability was strong long before the George W. Bush administration began in 2000. For example, in 1999, under a Democratic presidency, the US Senate rejected the Kyoto Protocol by a vote of 95 to zero. As another example, during Prep Com IV in New York City for the Rio Earth Summit of 1992, 139 nations voted for mandatory stabilization of greenhouse gases at 1990 levels by the year 2000. Only the US delegation opposed achieving this goal. The US then proceeded to use its muscle to strip these targets and compulsory aspects of the treaty away, in a deplorable series of behind-the-scenes arm twisting and deal-making efforts. This left only a weak shell to take to the final conference in Rio. Thus the current US administration is merely a stronger opponent than usual.

Also note that the US is not the only country opposing environmental sustainability. But it is the strongest one, and it often uses its power and influence to steer other countries to support its position. Why is this? Probably because the New Dominant Life Form is strongest in the United States.

10 On www.nrdc.org/about/ the Natural Resources Defense Council writes that, “We are confident we will continue to make progress, for even in this harsh political climate, we have seen signs of hope.”

In their 2003 Annual Report at www.ucsusa.org/ucs/about/index.cfm the Union of Concerned Scientists wrote, “We are confident he [Kevin Knobloch, their new President] is the person best able to lead the organization in what is, without question, the most hostile environment in which we have ever struggled to advance our goals.”
Chapter 18. Endnotes


13 For proxies of the New Dominant Life Form, the *end justifies the means* because their master has inhuman goals while their opponents are human, and thus have human goals. If the New Dominant Life Form was a true servant of *Homo sapiens*, as he started out as, then his goals would still be human, the end would not justify the means, and the sustainability problem would probably not exist, because it would be in the best interests of the New Dominant Life Form to proactively solve it, so as to protect *Homo sapiens*. It is possible that the New Dominant Life Form might have done this so well that the very concept of environmental sustainability would have never entered the public meme stream.

14 The table of the world’s 100 largest economies is from *Global Inc.: An Atlas of the Multinational Corporations*, 2003, by Gabel and Bruner.

15 The definition of vision is from *Webster's Encyclopedic Unabridged Dictionary*, 1989, page 1597.

16 The vicious cycle quote is from *Urban Dynamics*, 1969, by Jay Forrester, page 70.

**Chapter 3 – How to Raise the General Ability to Detect Political Deception**

17 The most interesting account of the complete problematique I’ve seen is at www.cwaltd.com/pdf/clubrome.pdf.

18 However simple these solutions may appear today, they were actually complex solutions to complex problems. The reason these solutions appear simple today is the components involved are now taken for granted. For example, we may see democracy as very simple—you just let people elect their leaders. But that requires an independent judiciary to enforce the laws required to do that, various checks and balances so that no one elected body or official can abuse their power, and so on. A democracy cannot be defined in less than the length of a constitution. Thus the idea of democracy is simple, but the actual solution is not.

19 The image is from tsa.ucsf.edu/~snlrc/encyclopedia_romana/greece/hetairai/diogenes.html.

20 The article with the quote on “truth predictor software” is from www.ft.com/cms/s/06adcbce~5345~11db~99c5~0000779e2340.html.


**Part 2. First Things First: Solving the Transformation Problem**

22 The five steps of breakthrough thinking are from *The Eureka Effect: The Art and Logic of Breakthrough Thinking*, by David Perkins, 2000, pages 9 to 10.

**Chapter 4 – The Transformation Strategy Map**

23 Concerning the argument that for-profit large corporations attract the best talent because they pay much more – A common rebuttal is that small non-profit organizations do pay just as well, if you consider the size of the organization, in terms of sales or number of paid employees. Actually this is true—they do pay just as well. But the argument still holds for two reasons: (1) One is that the average for-profit corporation is much bigger than the average environmental organization, probably by an order of magnitude. Thus the average for-profit corporation is paying much more than the average non-profit one. The result is most of the talent goes to the for-profit corporations. (2) The other reason is that environmental organizations usually rely on lots of volunteer work. This is the norm for activist organizations, because they don’t have a product to sell, but they do have a goal to achieve. Again, pay is the determining factor. Volunteers get zero or very low pay. The result is to not attract nearly the same level of talent as for-profit corporations, who seldom rely on volunteers.
24 The “Give a man a fish…” proverb is from the *Tao Te Ching*, written by Lao Tzu in the 6th century BC. This is the “man’s version” of the proverb. The woman’s version is, “Give a man a fish and you feed him for a day. Teach a man to fish and you’ve got the whole weekend to yourself.” From The Daily Dose: www.thedailydose.com/modules.php?name=News&file=article&sid=481.

25 Perhaps it is the double negative in no universal incentive to not pollute that makes this flaw so invisible.

26 Strategy maps are a diagrammatic form of balanced scorecards. For the Harvard Business Review article this quote came from, and a great introduction to the subject, please see http://harvardbusinessonline.hbsp.harvard.edu/b01/en/common/item_detail.jhtml?id=5933. For a shorter introduction to strategy maps, see my article on them at www.thwink.org/articles/003/StrategyMaps.htm.

**Chapter 5 – Process Step 1. Problem Definition**

27 “An undefined problem has an infinite number of solutions” is attributed to Robert A. Humphrey. Numerous online sources include this quote, but none that I could find provide the actual source.

28 The quote on “The pertinent question…” is from *Managing for Results*, by Peter F. Drucker, 1964, page 6. The context of this quote is quite educational. Here are the two paragraphs the quote is from: (Italics are his)

> “Resources, to produce results, must be allocated to opportunities rather than to problems. Needless to say, one cannot shrug off all problems, but that can and should be minimized.

> “Economists talk a great deal about the maximization of profit to business. This, as countless critics have pointed out, is so vague a concept as to be meaningless. But ‘maximization of opportunities’ is a meaningful, indeed a precise, definition of the managerial job. It implies that effectiveness rather than efficiency is essential in business. The pertinent question is not how to do things right but how to find the right things to do, and to concentrate resources and efforts there.”

29 Source: *Summary for Policymakers*, by the Intergovernmental Panel on Climate Change (IPCC), www.ipcc.ch/pub/spm22-01.pdf. Two of their terms themselves are vague and have been modified. “Virtually certain” has been changed to “Almost certain.” “Medium likelihood” has been changed to the more understandable accurate one of “Could go either way.”

30 The quote about Six Sigma is from www.isixsigma.com/library/content/six-sigma-newbie.asp.

**Chapter 6 – Process Step 2: System Understanding**

31 The quote by Dr. Harold Dodge is from *Four Days with Dr. Deming: A Strategy for Modern Methods of Management*, by Latzko and Saunders, 1995, page 48. The page notes that “We still need inspection, but we should not depend on it” as the prime source of high quality.

**Chapter 7 – An Assessment of Problem Difficulty**

32 The pie chart showing Sources that Harm the Ozone Layer is from www.policyalmanac.org/environment/archive/ozone.shtml. It was prepared by the U.S. Nuclear Regulatory Commission on January 2003.

33 The photovoltaic material is from www.solarbuzz.com/StatsCosts.htm.

34 The quote about the Montreal Protocol is from www.ciesin.org/docs/003-006/003-006.html.

35 The quote on the dread factor is from www.ciesin.org/docs/003-006/003-006.html.


**Chapter 8 – An Assessment of Process Maturity**

37 The revised problem difficulty rating for the urban decay problem is calculated this way: Starting at the first factor and multiplying raw scores times weights, $1 \times 1 = 3$, $3 \times 3 = 9$, $1 \times 2 = 2$, $1 \times 2 = 2$, $1 \times 2 = 2$, $2 \times 4 = 8$, and $1 \times 6 = 6$. These add up to a total weighted rating of 32. Squaring this gives 1,024.
38 The definition of best practice is from en.wikipedia.org/wiki/Best_practice, which contains a good introduction to the philosophy of best practices. The article begins with:

“In business management, a best practice is a generally accepted ‘best way of doing a thing.’ A best practice is formulated after the study of specific business or organizational case studies to determine the most broadly effective and efficient means of organizing a system or performing a function. Best practices are disseminated through academic studies, popular business management books and through ‘comparison of notes’ between corporations.”

39 The quotes from Working at Inventing: Thomas Edison and the Menlo Park Experience, edited by William Pretzer, 1989, may be found on pages 60 and 61.

40 The discussion of the pitfalls of an instinctive, intuitive analysis is from The Thinker’s Toolkit: 14 Powerful Techniques for Problem Solving, by Morgan D. Jones, 1998. One of the techniques is causal flow diagramming, which is only one step away from simulation modeling. Another technique is hypothesis testing. Part one, Why We Go Astray, is the best I’ve seen on the proper mindset required for solving difficult problems.

41 The characteristics of complex social system problems were derived from a list of ten characteristics causing dynamic complexity, in Business Dynamics: Systems Thinking and Modeling for a Complex World, by John Sterman, 2000, page 22.

42 The quote by film critic Roger Ebert is from en.wikipedia.org/wiki/An_Inconvenient_Truth.

43 See www.chelseagreen.com/2004/items/limitspaper/ForTheMedia which says of The Limits to Growth, “The book became a bestseller with over 30 million of copies sold in more than 30 translations.” I’ve been unable to find my source for Silent Spring.

44 The Club of Rome’s mission statement is from clubofrome.org/about/index.php on August 23, 2006.

45 Regarding “either its process is inadequate or its goals are impossible to achieve;” Sometimes both are true, if due to an inadequate process an organization has failed to discover that it is pursing an impossible goal.

46 This alternative is so promising that my own work has come to a similar conclusion: the principal underlying cause of resistance to adopting a solution to the global environmental sustainability problem is a particular “fundamental power structure.” This has been modeled as The Dueling Loops of the Political Powerplace.

47 From World Dynamics, by Jay Forrester, 1971, page 95. Professor Jay Forrester of MIT was the key person in initiating the Limits to Growth project. It was he who invented system dynamics, it was he who offered to apply his modeling skills to the Club’s global issues problem, and it was he who rapidly created World1 and then World2, which became the World3 simulation model of the Limits to Growth project.

48 The Environment DG’s mission statement and much of the material used in the assessment is from their website, at ec.europa.eu/dgs/environment/index_en.htm.


52 Available at ec.europa.eu/environment/enveco/waste/guareport.pdf. This document is listed on ec.europa.eu/environment/enveco/studies2.htm as Analysis of the Fundamental Concepts of Resource Management.


54 The overview of The Natural Step is from www.naturalstep.ca/about.html. For an even better overview, see www.ortns.org/framework.htm.
The problem definition is from www.interfaceinc.com/getting_there/natural.html.

The four Natural Step principles diagram is from http://www.sustainability-ed.org/assets/TNS-picture.gif.

The four system conditions for sustainability are from the above source.


From Managing the Non-Profit Corporation, by Peter F. Drucker, 1990, page 5.

From Our National Parks, by John Muir, 1901.


The not very productive study was the "National Purpose, Local Action" project, also known as the "Harvard Project." See www.thwink.org/sustain/articles/006/CritiqueOfHarvardProject.htm for a critique.


The picture is of the little boy in the giant drain is from www.unep.org/GEO/geo3/pdfs/Chapter1.pdf.

The list of “How UNEP Works” is from www.unep.org/PDF/ABOUT_UNEP_ENGLISH.pdf.

From www.ourplanet.com/imgversn/102/sand.html.

From www.iisd.ca/journal/toepfer.html.


The history of UCS is from www.ucsusa.org/ucs/about/history.html. The history of TNC is from www.nature.org/aboutus/history.

Another statement revealing the same reliance on Classic Activism appears on www.wri.org/about/goals.cfm under the mission statement: “Because people are inspired by ideas, empowered by knowledge, and moved to change by greater understanding, WRI provides -- and helps other institutions provide -- objective information and practical proposals for policy and institutional change that will foster environmentally sound, socially equitable development.”


Chapter 9 – Finding the System’s Low and High Leverage Points

The article on The Right-Wing Express is so full of insightful material that we suggest that all serious problem solvers read it, at www.alternet.org/story/21192. For a further close look at the context surrounding the Powell Memo and the role of the memo, see The Powell Manifesto: How A Prominent Lawyer's Attack Memo Changed America, at www.mediatransparency.org/story.php?storyID=21. Some writers feel the influence of the Powell Memo is mostly a myth. For an example of this point of view, see The Legend of the Powell Memo at www.prospect.org/web/page.ww?section=root&name=ViewWeb&articleId=9606.

The complete Powell Memo, with a short introduction, is at reclaimdemocracy.org/corporate_accountability/powell_memo_lewis.html.


80 It was Paul Reavis, President of Partner Software in Athens, Georgia, who introduced me to the power of the Technology Adoption Life Cycle. Again and again he analyzed his customers, products, and competition in terms of innovators, early adopters, and so on. This affected how Pioneer Software designed its products, its pricing structure, its marketing, and even its approach to individual customers. And it worked.

81 The passage on the Technology Adoption Life Cycle is from the revised edition of *Crossing the Chasm*. By Geoffrey Moore, the revised edition, 1999, page 11.

82 The quoted material about William Harvey and his book is from *Books that Changed the World*, by Robert Downs, revised edition, 1983. I find it interesting that before the Age of Reason, about half the books that changed the world were either fiction or religious. But after the Age of Reason, only 1 out of 18 was fiction, which was *Uncle Tom’s Cabin*. All the rest were non-fiction. They included Harvey’s *Anatomical Exercise on the Motion of the Heart and Blood in Animals* in 1628, Machiavelli’s *The Prince* in 1532, Newton’s *Principia Mathematica* in 1687, Thomas Paine’s *Common Sense* in 1776, Adam Smith’s *Wealth of Nations*, also in 1776, and more, ending with Rachael Carson’s *Silent Spring*, published in 1962. Every one of these books, like the Powell Memo, changed the world because they were the right precipitating event for the conditions of the time.

The image of the title page of Harvey’s book is from www.rcplondon.ac.uk/college/exhibition/exhib_harvey_demotu.htm.

83 This quote is not by a scientist, but by a playwright: Bertolt Brecht. In his play *The Life of Galileo*, it is the lead character, Galileo, who says “Science knows only one commandment: contribute to science.” From *Galileo’s Commandment*, edited by Edmund Bolles, 1999, page xvi.

84 Primitive societies had an average lifespan of 28 years, according to *Dynamics of Growth in a Finite World*, by Meadows et al, 1974, page 61. “We set the normal life expectancy at 28 years, the approximate value for a primitive population with no medical advances and with a food supply near the subsistence level.”

85 The quote on different worlds is from *The Structure of Scientific Revolutions*, by Thomas Kuhn, the 1996 edition, page 150. It was first published in 1962.

**Chapter 10 – Process Step 3. Solution Convergence**

86 The literal translation of Victor Hugo’s most famous quote is nowhere near the popular one, as the following soaring passage shows. This is from *History of a Crime*, the purpose of which was to expose the true nature of Napoléon's coup d'etat on December 2, 1851. Written 1852, it could not safely be published until 1877, where it and Hugo played a role in helping the French Revolution of 1789 come about. This version has been translated and made available by Project Gutenberg at www.gutenberg.org/files/10381. The passage is from the third to the last paragraph in the 152,000 word book. Notice how Hugo seems to also argue that the truth is the highest good imaginable, which is why, unlike an army, it cannot be resisted. (Italics added)

“The star possesses no anger; the dawn bears no malice. Light is satisfied in being light. Light is everything; the human race has no other love. France knows herself beloved because she is good, and the greatest of all powers is to be loved. The French revolution is for all the world. It is a battle perpetually waged for Right, and perpetually gained for Truth. Right is the innermost part of man; Truth is the innermost part of God. What can be done against a revolution which has so much right on its side? Nothing. To love it. That is what
the nations do. France offers herself, the world accepts her. The whole phenomenon lies in these few words. 

*An invasion of armies can be resisted; an invasion of ideas cannot be resisted.*

Hugo used this passage to build to the final mighty climax of his book, and finished with what has turned out to be there prophetic words:

“One day, before long, the seven nations, which combine in themselves the whole of humanity, will join together and amalgamate like the seven colors of the prism, in a radiant celestial arch; the marvel of Peace will appear eternal and visible above civilization, and the world, dazzled, will contemplate the immense rainbow of the United Peoples of Europe.”

87 The material on Maslow’s *Hierarchy of Needs* is from www.pateo.com/article6.html.

88 Source of definition of peer reviewed journal: en.wikipedia.org/wiki/Peer-reviewed_journal.

89 Source of data and text describing peer reviewed articles: www.eprints.org/openaccess/policysignup/sign.php.

90 The Fiksel article is at ejournal.nbii.org/progress/2006fall/0608-028.fiksel.html.


92 Source of Kent Beck’s three steps: Personal participation in a group discussion forum about 2000, the same year that his book *Extreme Programming Explained* was published.

93 The more usual form of this quote is “Genius is one per cent inspiration and ninety-nine per cent perspiration.” However this is not what Edison actually said. It is only a paraphrasing of the full quote. Source: en.wikiquote.org/wiki/Thomas_Edison.

**Chapter 12 – Process Step 4: Implementing the Model and the Map**


95 The list of Six Sigma companies is from main.isixsigma.com/forum/showmessage.asp?messageID=25758.

96 GE is the world’s second largest company, per www.forbes.com/2006/03/29/06f2k_worlds-largest-public-companies_land.html.

97 How important Six Sigma is to GE is from www.ge.com/en/company/companyinfo/quality/qualityatge.htm.

98 The story of the bet is from www.isixsigma.com/library/content/c020815a.asp.


101 The Georgia Tech green belt certification program is described at mgt.gatech.edu/exec_ed/prof_dev/programs/8A.html?link=prof_dev.

102 The quote by Jack Welch on why he was attracted to Six Sigma is from *Jack Welch on Leadership*, by Robert Slater, 2004, page 114.

103 The quote by Rudy Giuliani is from blogs.isixsigma.com/index.asp?Block=1&page=2&m=11 &y=2006&d=1&rc=1&s=bloggers&ci=0&ui=Michael%20Cyger.

**Chapter 13 – The First Experiment.**

104 See thwink.org/sustain/work/exp/Exp001/Experiment001.htm for everything you need to run The First Experiment.

105 The general model diagram is adapted from the one in *Design and Analysis of Experiments*, by Douglas Montgomery, 2005, page 2.

According to the Wikipedia entry on the Great Depression, “Monetarists, including Milton Friedman and Ben Bernanke, stress the negative role of the American Federal Reserve System in turning a small depression into a large one by cutting the money supply by one-third from 1930 to 1931.” (December 9, 2006)

The description of the first social experiment is from *Social Experiments: Evaluating Public Programs with Experimental Methods*, by Larry Orr, 1999, page 2.


A special thanks to Dan Procter for pointing out how the last chapter in the second edition of *World Dynamics* discussed the under emphasis on solving the social side of the problem. This occurred while I was writing the chapter. Working in this material caused the chapter to veer into a very different ending from what I had originally planned, and greatly improved the chapter.

Regarding the claim that “For the solution to have a 95% chance of working, the assumptions must each have a 99.5% probability of being true.” This is calculated as follows: .995 times itself ten times equals .9511.

### Chapter 14 – The Dueling Loops of the Political Powerplace

The 2003 annual report of the Union of Concerned Scientists stated that “We are confident he [Kevin Knobloch, their new President] is the person best able to lead the organization in what is, without question, the most hostile environment in which we have ever struggled to advance our goals.” Source: www.ufusa.org/assets/documents/ucs/ Annual_Report_2003_1.pdf.

The book on *The Dueling Loops of the Political Powerplace* defines **progressive philosophy** as a comprehensive rationale and value set whose goal is optimizing the human system for the common good of all. It follows that **degenerate philosophy** is just the opposite: a comprehensive rationale and value set for optimizing the system for the good of the few, who are the degenerates. Given these definitions, a **rationalist** is the same as a progressive. (There is probably a better term than “rationalist,” but that’s what we went with early on. Humanist? Virtuous? The idea behind the choice of rationalist is they decide on reason, which in mankind’s greatest tool.)

It is important to distinguish between supporters and politicians for degenerates and rationalists. A degenerate politician **is** a degenerate. Likewise, a rationalist politician **is** a rationalist. But a degenerate supporter may or may not be a degenerate. He or she is **not** if they have been fooled into supporting a degenerate politician. But they **are** if they made the decision consciously.

Interestingly, the same does not apply to rationalist supporters, because they are not fooled into supporting rationalist politicians. They only decide on the truth. Thus a rationalist supporter is always a rationalist, though there may be occasional errors of logic. This distinction reveals that the beautiful symmetry of the Dueling Loops structure does not go as deep as it may first appear.

The quote on fear from George Gerbner is from an obituary in the Washington Post on January 2, 2006, at www.washingtonpost.com/wp-dyn/content/article/2006/01/02/AR2006010200577.html.


The actual quote is “All power tends to corrupt and absolute power corrupts absolutely.” Lord Acton. 1887. Letter to Mandell Creighton. en.wikiquote.org/wiki/Lord_Acton.

According the Wikipedia entry on Homo sapiens, “Anatomically modern humans appear in the fossil record in Africa about 200,000 years ago.” Previously this appearance was thought to be only 130,000 years ago.

Source of quote about conservative versus liberal think tanks: www.gih.org/newsletter2679/newsletter_show.htm?doc_id=329675. This was part of a presentation by Andrew Rich, assistant professor of political science at the City College of New York, and author of *The War of Ideas: Why Mainstream ad Liberal Foundations and the Think Tanks They Support Are Losing in the War of Ideas in American Politics*, which appeared in the spring 2005 issue of the Stanford Social Innovation Review.
Chapter 15 – The Proper Coupling Package

Source: Per www.cosmos-club.org/journals/2002/katzer.html the United States consumes 125 billion gallons of gasoline per year. At about 25% of the world’s total this is 500 billion gallons per year for the entire world. A fee of .10 euros per gallon would raise 50 billion euros a year.

Per en.wikipedia.org/wiki/Carbon_dioxide there was 2.94 trillion tons of CO2 in the atmosphere as of 2006. As of March 2006, CO2 levels are 381 parts per million (ppm), which is 100 ppm above the pre-industrial average. 100/381 = 26%. 26% of 2.94 = excess .76 trillion tons of CO2, or 760 billion tons.

The statistic of 25% environmental overshoot is from the work on the global Ecological Footprint. For more please see the Living Planet Reports by the World Wildlife Foundation.

The 300 ppm in the last 600,000 years is from Al Gore’s An Inconvenient Truth, 2006.

The article is online at www.quickmba.com/entre/business-model.


Chapter 16 – Goodbye to Command and Control

For example, Nicholas Kristof wrote in the New York Times that “We know what is needed: a carbon tax or cap-and-trade system, a post-Kyoto accord on emissions cutbacks, and major research on alternative energy sources.” http://select.nytimes.com/2006/10/31/opinion/31kristof.html?hp.


Source: www.epa.gov/waterscience/cs/zeeman.pdf.


The article on Soot, Smoke and Mirrors is from www.economist.com/world/europe/displaystory.cfm?story_id=8167968.

From World Dynamics, by Jay Forrester, 1971, page 95. Professor Jay Forrester of MIT was the key person in initiating the Limits to Growth project. It was he who invented system dynamics, it was he who offered to apply his modeling skills to the Club’s global issues problem, and it was he who rapidly created World1 and then World2, which became the World3 simulation model of the Limits to Growth project.

There are six levels of systems thinking: no awareness, shallow awareness, deep awareness, novice, expert, and guru. For a short essay on this perspective see www.thwink.org/sustain/glossary/SystemsThinking.htm.

Chapter 17 – Solution Factories

The paragraph on Menlo Park is from Menlo Park Reminiscences, Volume One, by Francis Jehl, the Dover edition of 1990, page 105. The book was first published in 1937.


A special thanks to Michael Hollcraft for pointing out this command and control preference and its elimination by self-implementing solutions.

The photograph of the DNA model is from osulibrary.oregonstate.edu/specialcollections/coll/pauling/dna/pictures/dna-model.html.
Chapter 18 – What Can I Do Tomorrow Morning?


Regarding “A coalition can also help you avoid the trap of assuming the root cause of a problem is local rather than systemic, or vice versa.” – This is similar to what the field of quality control calls common and special causes of variation. **Common variation** is slight random fluctuations from the norm, which is acceptable. Examples are slightly corrupt politicians and some European Union countries slightly exceeding their sustainability targets while others are slightly below. **Special variation** is variation from the norm that is so large or so much in one direction that it must be due to an underlying flaw in the system. Special variation indicates a systemic root cause.
There is a third type of variation to be aware of, however: **local variation**. In large systems a local problem’s root cause may be limited to a small, local subsystem. Examples are poor local implementation of international treaties, misinterpretation of central decisions, and poor management of a local natural resource. Local variation cannot have a system wide root cause because only a local system is involved.

Dr. Walter Shewhart, author of *The Economic Control of Quality of Manufactured Products*, 1931, found that confusion between common and special variation leads to “tampering. That is, the management action ends in making matters worse.” For much more on this subject see the literature on quality control. (This quote and the material on common and special variation is from *Four Days with Dr. Deming*, by Latzko and Saunders, 1995, page 148.)

The quote about *What’s the Matter with Kansas* is from the first editorial review on www.amazon.com/Matter-Kansas-Conservatives-Heart-America/dp/0805073396.

In *A Model in Crisis*, what a social control model is starts with the notion that there is “a model in crisis.” But what does this term mean?

A **model** is a simplified representation of reality. Models serve as references for decision making. A model may be physical or mental.

Models fall into several classic types: **Descriptive models** are data, such as maps and history. **Behavior models** describe how and why something behaves, such as physics, biology, and system dynamics simulations. **Control models** are built to allow control of the world around us, such as the principles of architecture or the rules followed to tame a wild horse. A control model is the complete set of rules needed to control the outcome of something.

A crucial type of control model is the social control model. A **social control model** defines how a social unit works. Once a social control model is perfected, it can be used over and over. Examples of modern social control models are the ones used by families, school systems, countries, congregations, and corporations. Each has an unwritten and/or written set of rules that describe how the social unit should work. For example a legislative body follows the rules of a constitution and, during deliberations, follows Robert’s Rules of Order or some other set of debate rules.

From the viewpoint of solving the sustainability problem, the most important social control model is the one that global civilization is using to run itself. This is the model in crisis.

To be even more precise, the model is in the Model Crisis step of the Kuhn Cycle, as described on page 173.

Later even a 5% favoritism rating will be too high, as structures are built that cause a zero tolerance to corruption. This will cause favoritism to fall to zero.

The archetype tree is from *The Fifth Discipline Fieldbook*, 1994, page 150. The Success to the Successful archetype diagram is from page 385.

The explanation of the Success to the Successful archetype is from www.thesystemsthinker.com/tstglossary.html. The QWERTY typewriter layout won the race because it was first to market. Another example is the Windows operating system. A more subtle example is the way the English language is becoming the global standard for interculture communication.