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Third Draft

Thoughts on Success

The Diagnostic Project proposed in the paper on *Taking Up Where Limits to Growth Left Off* is in the early planning stage. The purpose of this document is to help the project succeed. It contains some of the ingredients needed for an experienced project manager, such as Steve Gale, to take the wheel and produce his own project plan.

This work effort could go terribly wrong. In fact, judging by past similar efforts at solving society's toughest social problems, it probably will. The best laid plans of mice and men often go astray, as this one surely will if we let it.

Let's begin by examining a sobering scenario:

The New York Times

The Hatch Thwinkers Call It Quits

BRUSSELS, July 1, 2013 – After running through upwards of 250 million dollars in six years, what had long been assumed to be the world's best hope to solve the sustainability problem has ended.

In a hastily called press conference in Brussels on Tuesday, project spokesperson Ms. Wee Tried announced that funding had run out, no more was coming, and that the 300 plus team of scientists, scholars, and engineers was disbanding.

"We regretfully inform our backers and the citizenry of the world that, despite our best efforts, we have been unable to achieve the goal of this project," said Ms. Tried. "This was to solve the complete problematique of the global environmental sustainability problem. As you know, this ambitious project was launched in mid 2007 with the greatest of expectations. We were using state-of-the-art methodologies in process, modeling, and continuous high speed experimentation. We had a hand picked team of the best and brightest specialists on the world. It was an approach and a brain trust that could not fail."

"But it did," she continued, in a tone of bitter disappointment. "And we are now asking ourselves why. But we've asked those questions before, and we thought we had found the answers. Now we know that we did not."

At this point Sir Whimsy Skepticus of the International Commission on Sustainable Development and Other Oxymorons interrupted with "This is rather stunning news. But from where we sit we could see this coming. Why did you not take corrective action much earlier?"

"As I already explained, we did," replied Ms. Tried. "But nothing worked. Two years ago our models were showing us we were right on the verge of final proof on how to break the change resistance deadlock and flip the system into a path to sustainability almost overnight. But those models were getting ponderously large, and only two modelers, the ones who did the first iterations, could understand them. The rest only thought they did. This caused what we all thought were high quality hypotheses to actually be low quality ones. They were not worth the money we invested in experimenting on them. But none of us could see this, because we were generating an average of 80 hypotheses a day and working overtime. We were exhausted by then. We had over 6,000 in the backlog queue, awaiting experimentation. The experimenters were running behind, so we told them to speed up. They did. But something happened, and they stopped telling the modelers they were generating trash. And…"

"Then why," Sir Skepticus asked, "did you not step in and fix such an obviously broken process?"

"We tried. But what I'm telling you today is all in retrospect. In the fog of war no one can see these things. Our process was obviously still immature in some areas."

"Why was it immature?" probed Sir Skepticus.

"It takes years to move up the scale of process maturity. We were at a level that process auditors deemed capable of managing the type of work we were doing. But now we can see those ISO auditors were wrong. Perhaps we should have been auditing the auditors?"

"No, I don't believe that would have helped, because your project was so complex and advanced it was beyond anyone's ability to manage," offered Sir Skepticus. "We all knew from the start that this project was our best hope and you might fail. Hmm, let me change that. We knew you probably *would* fail. But what else could we do? Six years ago in 2007 there were no other options. There still aren't."

He paused to let that sink in and continued. "So despite the fact that you have called it quits today, I would hold your heads high. You did all you could. No one could have done better. What has really happened here is you have run an expensive experiment. We tested the hypothesis that an analytical approach plus the best brains money can buy plus all the funding you needed would work. It didn't. So the hypothesis is false. No problem. In my book this just proves an even bigger unstated hypothesis: that the problem is *insolvable*. There is no earthly way humanity will ever be able to proactively solve the sustainability problem."

"I thank you and your magnificent team for proving this unstated hypothesis. Now let's just save ourselves a lot of further time and expense, and end this press conference, so we can get back to work. All we can do is let collapse come and then make the best of it. Don't you agree?"

This reporter watched as Ms. Tried and the rest of the project management team simultaneously dropped their jaws and were speechless. An unusual dead silence swept the room, as if there was a consensus that this was an epic moment. No one spoke for at least 20 seconds.

And then one of the reporters in the rear shouted out "I agree. Let's all go home."

That is exactly what happened next.

Jolting Ourselves into the Right Mindset

The above scenario is similar to the one described in *The Elegant Solution: Toyota's Formula for Mastering Innovation*, by Matthew May, 2007, page 188. Titled "The University of Toyota Calls It Quits: A Requiem for a Noble Concept," its purpose was to "galvanize" the startup staff of Toyota University "into collectively creating and owning a picture of the desired future," one that would succeed and not fail like the scenario. The first thing the startup team did was to study their mission and write another scenario that did not make the same mistakes. The exercise worked. The team "redrafted the article to be not an obituary, but a front page story trumpeting the success of the university." The team "clarified the single issue" that, if they had not correctly identified it, would have led to their demise.

From what I've seen and read, Toyota manages innovation better than any other large organization in the world. We need to mimic the masters and then do even better, because we are charged with solving a problem an order of magnitude harder than Toyota or anyone else has ever solved. Or attempted.

The above scenario should serve to jolt us into the beginning of the right mindset. This is a mindset so subtle it has no name. To label it would be to mislead, because no single word or phrase can begin to describe the philosophy behind the largest stream of innovations the world has ever seen—if we succeed.

This mindset permeated the Toyota team that solved the problem of how to build the best car in the world. Here is the tale of how they did it, starting on page 42 of *The Elegant Solution*:

"Toyota pursues perfection by starting with the ideal, then working backward, removing anything that stands in the way. That means looking at the target in a fundamentally different way. It means asking *what's blocking perfection?* instead of *what can we improve?* That's what differentiates their brand of continuous improvement from all others.

"So what does the pursuit of perfection look like? The best way to bring it to life in a meaningful way is through the compelling story of Lexus, Toyota's luxury brand that has become the *de facto* embodiment of the endless pursuit of perfection.

"The secret luxury vehicle project under development by Toyota in the mid-1980s was codenamed F1, for 'flagship one.' The mission was impossible: beat BMW and Mercedes-Benz at their own game. That meant besting both in comfort, styling, performance, handling, noise, aerodynamics, weight, and fuel efficiency. It meant putting every element under the microscope. It meant six years, 1400 designers, 3700 engineers, 900 engine prototypes, 450 test models. And nearly two million test miles.

"When the LS400 made its debut in 1989, it stunned the automotive world and set a new luxury standard. The facts made history: in every category rated by *Car & Driver*, the LS400 trumped the best of the best: BMW 735i and Mercedes 420SEL. The Lexus LS400 was five decibels quieter, 120 pounds lighter, 17 miles per hour faster, got more than four more miles to the gallon, and retailed for $30,000 less than the BMW 735i.

"Here's how it happened:

"The timing couldn't have been better when in the summer of 1983 Toyota chairman Eiji Toyoda issued the challenge to build the best car in the world. The company had seen twenty years of steadily improving market share on U.S. soil culminate in nearly a decade as the leading import. A significant share of Toyota customers had moved up in class and wealth, and were searching for a vehicle to match their status.

"Building the best car in the world meant dethroning the kings of luxury: BMW, Mercedes, Jaguar, and Cadillac. But the venture wasn't as crazy as it sounded. Luxury and performance wasn't completely uncharted territory. Toyota built limousines for executives and dignitaries. Toyota engineers worked on World War II fighter jets. Toyota had competed in motorsports for over a century.

"In Toyota's view, they weren't building a car, they were redefining perfection. The goal demanded a perfect plan; anything less would leave them short of the target. No amount of execution acumen would make up for a solid strategy. The plan would take six months, but the decision was clear: start clean. Design the car from the ground up. It was the only way. Nothing in the current stable was even close to the class of car needed.

"The first step was to assemble the A team. Shoji Jimbo, master designer of Celica and Cressida fame, was chosen as chief engineer. Needing the best behind him, creative leaders willing to unshackle themselves from the conservative Japanese styling, Jimbo recruited Ichiro Suzuki for the body structure and Kunihiro Uchida for the exterior design. Suzuki wanted to dire Akihiro 'Dezi' Nagaya, a kid still in design school who thought cars were sculptures that just happened to move. By October 1984 the team was in place.

"The second step was to identify the target. To do so, the team needed to grasp the situation and understand the competition. The decision was made to escape the confines of the corporate environment and begin to formulate ideas. They decided that the only way to truly get a bead on the competition was to drive the hundred forty-plus miles out to the countryside near Fujiyama, each team member taking separate cars, each renting a member of the competitive set: BMW, Mercedes, Cadillac, Jaguar, Audi, and Volvo. It worked. The targets were unanimously identified: Mercedes S class and BMW 7 series. They were the best of the best, and true icons.

"Step three was to understand the customer, to get inside the hearts and minds of American luxury buyers, to learn the ways of luxury, to understand the values. The decision was made in 1985 to take the team to Southern California and live the lifestyle, where a beachfront house in Laguna Beach would be the team's quarters for several months.

"The house was actually part of the research. It was also close to Toyota's Newport Beach design center, Calty Design Research, where the car would be designed. Chief engineer Dennis Campbell and Toyota designer Michikazu Masu, on assignment at Calty, would have major roles.

"A tour of the luxury lifestyle became the centerpiece of study, including expensive malls, tony restaurants, country clubs, trendy nightclubs, and designer boutiques. Valets, caddies, chauffeurs, and caterers were queried to find out druthers of the upper crust. The team continued their competitive study by leasing Mercedes, BMWs, Porches, and Jaguars. Similar tours of San Francisco, Miami, New York City, Houston, Denver, and Chicago were conducted. The luxury scene was a whole new world for the team. Only criminals in Japan lived that way.

"To bolster the observations, anthropologists, psychologists, and focus groups weighed in. The research showed that luxury-car owners bought image,

quality, resale value, performance, and safety, in that order. Quality, resale, and safety are right up Toyota's alley. That performance is down on the list is a surprise, and a key opportunity. But the biggest hurdle for Toyota would be image.

"In August 1985, all but five of the core team returned to Japan, and the real work began. Image and performance became the top two objectives.

"Back in Japan, engineers had begun dismantling the top-end BMWs and Mercedes, laying out every part and keeping only the best as the minimally accepted standard.

"Meanwhile in Newport Beach, deciding what the car would look like was the first order of business, Uchida took three concepts back to Japan, all of which were panned universally. It's the first of many, many failures. The rejection centers on the aggressive styling: it's not bland enough, and too American. The American team was stunned, knowing conservatism won't cut it. But it's back to the drawing board for more sketches and more clay models.

"Round two was rejected as well, so Uchida began going back and forth to Japan nearly every month with revised sketches and models. By the end of 1986 there was still no resolution on what the car would look like.

"As 1987 began, Jimbo would get promoted and name Ichiro Suzuki, chief body structure engineer, as his replacement. It's a new regime, and Suzuki laid down the law. Perfection demands a perfectionist. There would be no compromises, no derivatives, and nothing Japanese about the car. Suzuki fixed his vision on luxury and performance, and set the bar high. The car must best, not match, the BMW 735i in all performance measures. It must be faster, quieter, lighter, easier to handle, more comfortable, and more fuel efficient.

"The BMW 735i had a top speed of 138 mph, got 19 mpg, had an aerodynamic drag of .32, a sound level of 61 db at 60 mph, and weighed 3800 pounds. The Mercedes 420SE trailed ever so slightly in all areas, but was the import sales leader in the United States. Beating Mercedes is sales volume would signal success. Suzuki's vision: Top speed, 155 mph. Fuel efficiency, over 22.5 mpg. Coefficient of drag, .29. Noise level, 58 db at 60 mph.

"The reaction from the army of engineers and technicians was unanimous: impossible! The goals were individually attainable but collectively unreachable. Greater speed needs more power, which means a heavier engine, which demands more fuel and makes more noise.

"Suzuki would accept nothing less than a V8 with a displacement of 4.0 liters. But trying to put a 5-liter V8 into a lightweight luxury car was unheard of. Legend has it that product engineering chief Akira Takahashi told Suzuki he was crazy, but that Suzuki refused to leave Takahashi's office unless he agreed to attempt the engine at least once.

"Months passed and progress slowed on all fronts. The look still wasn't right. Failures far outweighed successes. Designers and engineers were in conflict. Hundreds of prototypes would litter the trail. The project was taking its toll, and tensions were running high.

"Suzuki pushed harder, moving the invisible lines in the org chart and creating working groups that cut across departments and divisions, with team leaders held accountable. Every problem was broken down to the smallest obstacle and tackled at its root. Design and engineering began to realize complementary goals. One by one, the elegant solutions appeared.

"For example, aesthetics and aerodynamics complemented each other—fitting window glass and door handles into the metal itself yielded a cleaner look and better airflow. Sloping the rear window just enough to push air off the trunk and building a spoiler into the trunk lid to make the back end more stable resulted in a sleeker profile. The innovations kept coming.

"The exterior was nearing the mark, but something was missing. Suzuki turned to Uchida, who called up Dezi to sketch a front end worthy of the world's best car. Dezi's sketch would be the keeper.

"Late in the game, overall weight was still too high, fuel efficiency was off the mark, and the cabin wasn't quiet enough. Suzuki ordered an engine rebuild, invoking the spirit of the Zero, World War II's finest warplane and demanding the highest power, lowest weight, and finest precision. One could not be sacrificed for the other.

"The solution was dramatic: an engine cast almost entirely from aluminum. Block, pistons, valve lifters, cam covers, everything. It works. The car is 120 pounds lighter than the BMW 735i, gets better mileage, and avoids the gas guzzler tax.

"Only the noise problem remained. A fuel injected 4.0 liter V8 with double overhead camshafts and 32 valves with continuously variable valve timing packs a mean wallop. The goal was silence, or something very close to it: 58 decibels.

"Every moving part was examined to find the noise. It was the shaft. Like most rear-wheel drive cars, the propeller shaft is in two parts, with an angled knuckle connecting them. The solution: Build a perfectly straight one. The noise disappeared.

"By 1989 the car was ready. But the perfect car needed the perfect name, the perfect logo, the perfect tagline, and the perfect dealership. It could not be a Toyota. It wasn't a brand extension, it was a new brand. Lexus was chosen from hundreds of possibilities. In a departure from a typical focused tagline, 'The Relentless Pursuit of Perfection' appropriately defined the core philosophy. Only 81 of the very best dealers in the nation were selected out of 1600 possible candidates. Everything was in place.

"When the Lexus LS400 went on sale September 1, 1989, it was by all objective measures the best in the world. Mission accomplished.

"Now *that's* how to build a better mousetrap. So much better that upon tearing down two LS400s given to General Motors by a Southern California dealer, Cadillac engineers concluded that the Lexus cars could not be built. At least not by them.

"The Lexus LS400 story gives a vivid portrayal of the innovation process behind an irrefutably elegant solution. Toyota redefined the luxury automobile by aggressively and ambitiously pursuing the highest ideal possible. Obviously there exist many more facets to the story than can be told in a few short pages. But a host of immediate innovation imperatives abound.

"Like you have to time it right. How you need a clearly visible milestone. How you must thoroughly understand value through your customer's eyes. How nothing less than full commitment will work. How you need to break the problem down to its smallest definable elements and attack each one with ingenuity. How you must drive through the creative tension born of conflicting goals. How you have to match talent to task. How big leaps forward are achieved not in one big swag but through the cumulative effect of a multitude of much smaller hits. *How innovation is not an event-driven thing, but a process.* How significant departures from the brand require different identities, organizational structures, and distribution systems. How necessary it is to circumvent or manage competing corporate interests. How intelligent risk—defined as testing the limits of a proven capability—managed well, pays off handsomely. How you learn much more from failure than success. And how successful business innovation *is* about finding a way to do something better than it's ever been done before."

Can We Build a Solution Factory as Good as the One That Built the Lexus?

I found this story electrifying, because it was so packed with transferable knowledge that applies to our project. Above all, it jolted me into seeing that a solution factory approach on our project is not only possible, but required. After all, that's what Toyota did on the Lexus project. The only difference is they were solving a mostly technical problem, while we are solving a social problem.

The Elegant Solution book opens with the extraordinary claim that "The Toyota organization implements a million ideas a year. It's a fact."

That is a solution factory on steroids. The book follows up the claim with the benefits:

> "One million seems like an impossible target if you're talking about business ideas. But it's not, at least not for Toyota. It's the reason they're one of the planet's ten most profitable companies. It's why they make well over twice as much money as any other carmaker, and with under 15% of the market. It's why their systems, processes, and products are the envy of the world. It's the source of their competitive advantage and staying power. It's their engine of innovation."

If we are to mimic the masters and our problem is an order of magnitude more difficult than Toyota's, it follows that building a solution factory as good as theirs is not good enough. It must be ten times as good. Thus our first problem to solve is how to do that.

This may not be as impossible as it first appears. The chapters on The First Experiment and Solution Factories in *Analytical Activism* describe the basic architecture of social problem solution factories.

Logical proof this will work is presented by comparing this architecture to the extraordinary productivity of (1) Thomas Edison's invention factory and the (2) Scientific Method. Further proof lies in the long passage above on the (3) Lexus project.

This architecture will not work perfectly at first. That will take years of continuous improvement. But all it has to do is to work one tenth as well as any of the above three approaches to be ten times better than the universal standard of today: Classic Activism.

Note how the long passage emphasized that:

> "In Toyota's view, they weren't building a car, *they were redefining perfection*. *The goal demanded a perfect plan*; anything less would leave them short of the target. No amount of execution acumen would make up for a solid strategy. The plan would take *six months*, but the decision was clear: start clean. *Design the car from the ground up.* It was the only way. Nothing in the current stable was even close to the class of car needed."

And nothing in the world is close to the class of solution factory needed to solve the toughest and most important problem in the world. It will probably take six months or more to design and build. Our goal demands the same perfect plan, which will center on designing the factory from the ground up. It is the only way.

The Toyota team saw their real goal clearly: "They weren't building a car, they were redefining perfection." Ours is only slightly different. We aren't building a solution. *We are redefining how to solve large, messy, insanely difficult social problems that have defied solution for generations.*

This is a stretch goal. But then so was the goal Edison set for himself when he promised he would "invent some minor thing every ten days and some big thing every six months." And he did it. So was the goal scientists set for themselves to usher in the Age of Enlightenment by figuring out how to use mankind's greatest tool, reason, to completely redefine how science is done. And they did it, by inventing and perfecting the Scientific Method. So was the goal to build the best car in the world, even though conventional wisdom said it couldn't be done, because BMW and Mercedes has already done it. You can't top perfection. But by applying their formal "innovation process" Toyota "redefined the luxury automobile by aggressively and ambitiously pursuing the highest ideal possible." Others thought the goal was impossible. But they were not Toyota, where "innovation is not an event-driven thing, but a process" and where "intelligent risk—defined as testing the limits of a proven capability—managed well, pays off handsomely."

If Thomas Edison and science and Toyota can do it, then why can't we?

Defining the Project Context

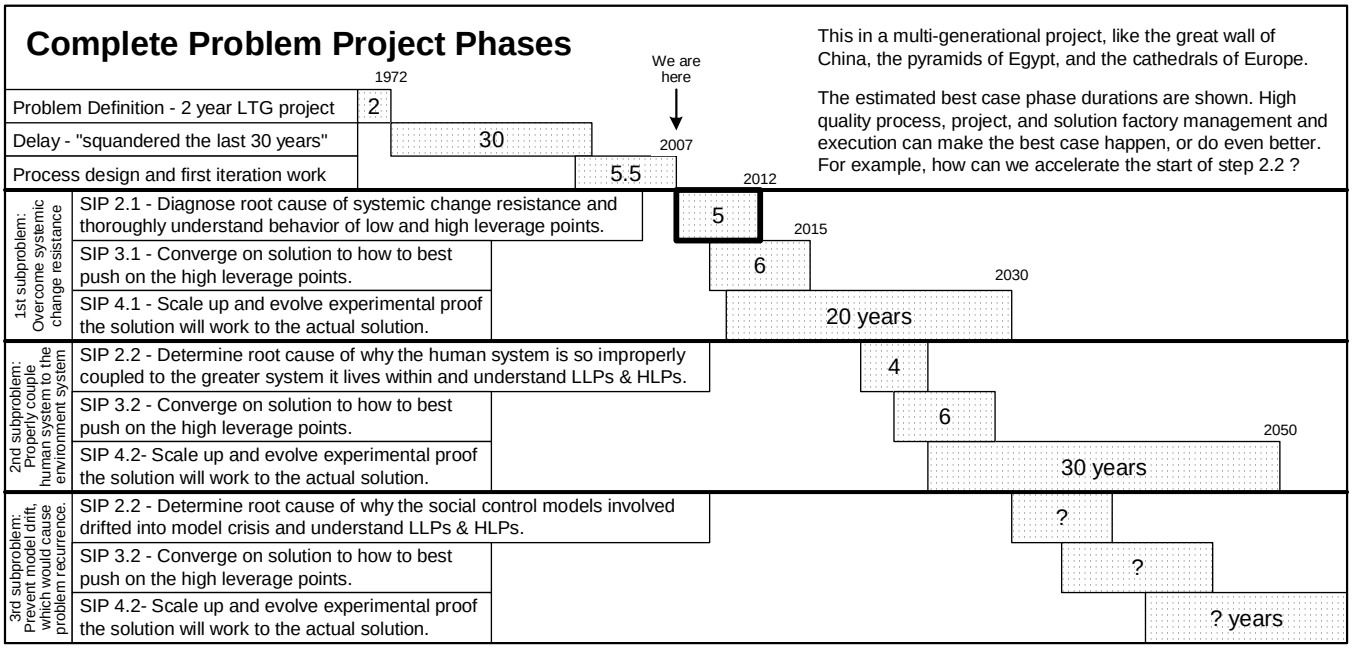
Let's move into the diagnostic project context. Later we will return to the stretch goal of building the world's first social problem solution factory, and use it to achieve the project output goal.

It is important to clearly define the context of this project, so its output (both direct and indirect) can better support the "customers" of the project. The following discussion assumes you are familiar with the steps of the System Improvement Process and the Dueling Loops.

As agreed at the meeting near Atlanta on February 3 and 4, 2007, with Phillip Bangerter, Michael Hollcraft, and Jack Harich, our long term goal is a permanent race to the top. Our medium term goal is to solve the global environmental sustainability problem. *Our short term goal is to prove or disprove the existence of the Dueling Loops structure.* Somewhere between the short and medium term goals lies the goal of the Diagnostic Project, which is to execute step 2.1 of the System Improvement Process.

The short term goal of testing the existence of the Dueling Loops will allow us to leverage the proof, if it's found, into all sorts of things that can accelerate the project. This is a key strategy.

Given these goals, the first major milestone of the Diagnostic Project will be to prove or disprove the tentative diagnosis with experimentation. The tentative diagnosis hypothesizes that the current dominance of the race to the bottom in the Dueling Loops structure is the root cause of systemic change resistance to solving the sustainability problem. If the hypothesis is true then the rest of step 2.1 can proceed rapidly. If false then we have to revise the model or start over.



How long it will take to achieve these goals is highly unpredictable, since this is a scientific frontier project. Solving the complete global environmental sustainability problem is estimated to take 20 to 60 years, for the best case. It is a multi-generation project, just as the great pyramids and the cathedrals of Europe were. *Thus our top challenge is to initiate a formal analytical effort in such a manner that it is self-sustaining for the next several generations.* How to do this is just another part of the problem to solve.

How the Diagnostic Project fits into the greater scheme may be seen in the diagram above. This shows the SIP steps as phases over the time it will take to execute the process and solve the complete problem. Notice the three phases that have taken us up to where we are today in 2007, and the best case scenario that follows. This is a valuable perspective, because it helps to preserve the conceptual integrity of the strategic problem solving approach.

The bolded box represents this project. 5 years is a very rough best case estimate, as are all time estimates on the diagram. There will be significant task/step overlap so as to move forward at maximum speed. The diagram shows how the earliest step 4.1 can start is about half way through step 2.1. It also shows how step 4.2, which most people consider "solving the problem," cannot start until most of step 4.1 is complete and step 3.2 is about 1/3 complete.

Discovering and perfecting the ability to engineer global social control models, along with setting up a high speed solution factory, are what it will take to fully achieve the project goal as fast as possible. What the diagram does not show is the better we do this in step 2.1, the faster all subsequent steps will go, because the more we will be able to think and act like process and principle driven engineers and scientists, as opposed to intuition driven artists.

Examine the pattern of the three subproblems. The first step to solve each subproblem (steps 2.1, 3.1, and 4.1) determines the root cause of the subproblem and thoroughly understands the behavior of the LLPs and HHPs so well that the remaining steps are relatively easy. The second step in all three subproblems is to "Converge on solution to how to best push on the high leverage points." The third step, also for all three subproblems, is to "Scale up and evolve experimental proof the solution will work to the actual solution." This deliberate repetition means that once the project team perfects how to do step 2.1, *most of that skill is transferable* to steps 3.1 and 4.2. The same holds for the transfer of the skills developed in step 2.2 to steps 3.2 and 4.2. Ditto for steps 2.3, 3.3, and 4.3. This heavy reuse of what we have learned will contribute to a highly efficient process, one that will astonish us with its capability and speed.

Defining the Project Goal

The goal of the Diagnostic Project is to execute step 2.1 of the System Improvement Process. This project will solve the problem of what is the root

cause of why the human system is unable to self-correct in time to avoid environmental catastrophe, despite being able to see that if it doesn't change course in time, catastrophe is certain. In other words, why is there such strong *systemic change resistance* to living sustainably?

Project goal achievement relates to how well project models can explain past systemic change resistance, and how well the models can predict the collapse of that resistance when changes are made to the system. These changes are made to high leverage points. This is analogous to physics models that can explain how a system will respond when a force is applied at a certain point, and medical models that explain why a root cause is causing a disease and what happens when the root cause is resolved by treating the system at certain points.

The project goal is achieved when the predictive power of the project models rises to the point where it is sufficient to clearly and obviously show where the high leverage points are, and that pushing on them correctly will resolve the system change resistance problem. This will be quantified in a similar manner to the way the Problem Definition step quantified the goal state in the *Analytical Activism* manuscript. The standard SIP problem definition format is how can we:

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

Filling in this format will define our **target**. The Lexus team did the same:

> "*The second step was to identify the target.* To do so, the team needed to *grasp the situation and understand the competition.* The decision was made to escape the confines of the corporate environment and begin to formulate ideas. They decided that the only way to truly get a bead on the competition was to drive the hundred forty-plus miles out to the countryside near Fujiyama, each team member taking separate cars, each renting a member of the competitive set: BMW, Mercedes, Cadillac, Jaguar, Audi, and Volvo. It worked. *The targets were unanimously identified*: Mercedes S class and BMW 7 series. They were the best of the best, and true icons."

The quantified project goal will probably involve experimental proof at a 95% or higher confidence level, backed up by expert opinion reviews. Small scale real world experiments can be used to prove that pushing on the identified HLPs will work. Parallel experiments on the same small scale systems can also prove that pushing on identified low leverage points fails, which will enhance the credibility of the models and experimental results.

Judgment must then be used to decide if what works in the small will work in the large, that is, on the global system. Or let's set ourselves another stretch goal: by the time we get this far we will have a method of proving that the small scale real world experimental behavior is scalable.

Note that this project will not attempt to determine *how to best push* on the high leverage points. That is the responsibility of SIP step 3.1. This project will only demonstrate that the HLPs can be pushed on successfully, which is required to prove the HLPs exist and that their present state is the key part of the root cause of systemic change resistance.

The Role of Critical Experiments

The power of a model lies in its ability to explain the past and predict the future. If we can prove the HLPs work as predicted, then we have proved the entire model is sound, including its diagnosis of the root cause. The experiments it will take to do this are known as **critical experiments**. The Wikipedia entry on this subject says that:

> "In the sciences, an *experimentum crucis*, or critical experiment, is an experiment capable of decisively determining whether or not a particular hypothesis or theory is correct. In particular, such an experiment must typically be able to produce a predictable result that no established hypothesis or theory is capable of producing.
>
> "The production of such an experiment is considered necessary for a particular hypothesis or theory to be considered an established part of the body of scientific knowledge. It is not unusual in the history of

science for theories to be developed fully before producing a critical experiment.

"A famous example in the 20th century of an *experimentum crucis* was the expedition led by Arthur Eddington to Principe Island in Africa in 1919 to record the positions of stars around the Sun during a solar eclipse. The observation of star positions confirmed predictions of gravitational lensing made by Albert Einstein in the general theory of relativity published in 1915. Eddington's observations were considered to be the first solid evidence in favor of Einstein's theory."

Our solution factory must be capable of producing critical experiments like these as reliably as a chicken lays eggs. The right experiments can turn night into day, and accelerate the project by many years.

Using First Iteration Diagnosis Work

The project can also be greatly accelerated if we use the first iteration work. As described in the *Taking Up Where Limits to Growth Left Off* paper, one set of tentatively identified HLPs are in the Dueling Loops model. This set of HLPs is general ability to detect political deception, repulsion to corruption, and quality of decision making. Another set is in the Proper Coupling Package, as described in a chapter in the *Analytical Activism* book. Here the HLPs are consumption efficiency and consumption cost efficiency.

Not only have these HLPs been identified, so have possible ways to push on them. These are described in the *Analytical Activism* chapters on How to Raise the General Ability to Detect Political Deception and The Proper Coupling Package, and the chapter in the *Dueling Loops* book on How to Raise the Quality of Political Decision Making.

The fortunate thing about this preliminary work is further work can now proceed on several independent fronts, rather than in a single chain. We have essentially identified three ways we can possibly solve the systemic change resistance problem. These are:

A. Push on the **general ability to detect political deception** HLP with the six solution elements of Freedom from Falsehood, the Truth Test, Truth Ratings, Corruption Ratings, No Servant Secrets, and the Sustainability Index.

B. Push on the **quality of decision making** HLP with Decision Ratings.

C. Push on the **consumption efficiency** and **consumption cost efficiency** HLPs with the Proper Coupling Package.

This is great news. *If even one of these works the change resistance subproblem is solved.* As a bonus, all three accelerate solving the proper coupling subproblem by at least an order of magnitude. The first gives politicians a strong incentive to solve society's top problems, because that is now in their best interests. The second does the same and radically improves the quality of the political world's problem solving effort. The third takes the biggest step of them all by enlisting the help of the New Dominant Life Form, who now has a strong incentive to solve the environmental sustainability problem because that behavior is now so profitable.

Thus the project team has three identified lines of attack to work on. They can also perform further analysis to identify more. (When the *Taking Up Where Limits to Growth Left Off* paper was written, I overlooked these additional opportunities, and spoke of only one tentative diagnosis.)

Let's return to the Complete Problem Project Phases diagram. Identifying these three lines of attack allows us to realistically move up the start of step 2.2 to today. It can start at the same time as step 2.1, because by pursuing solution strategy C, the Proper Coupling Package with its attractive business model, we can engineer a proper coupling mechanism that has the built-in ability to overcome change resistance. If that is the case, then this line of attack lets us skip steps 2.1, 2.1, and 2.3 entirely, because they are essentially already done. This is an example of the elegant solutions that the book *The Elegant Solution: Toyota's Formula for Mastering Innovation* is all about.

The other two solutions are also elegant, but in different ways. Solution strategy A, increasing the general ability to detect political deception, derives its power from the enlightening elegance of the ever-so-simple Dueling Loops structure. If this structure does indeed exist, then pushing on its high leverage point, even gently, will tip the human system into a new mode that automatically seeks to solve the sustainability problem as fast as possible.

Solution strategy B, pushing on the quality of decision making HLP with Decision Ratings, obtains its elegance from the way the change is so simple and obvious, now that it has been pointed out. Once you understand the solution, you can see that "driving" present political systems is like driving an airplane without a cockpit dashboard. If the slightest problem arises, like rain, clouds, nightfall, or a nearby plane outside your field of vision, then the problem difficulty instantly exceeds the pilot's ability to solve it, even if he is the smartest pilot in the world. The pilot is doomed without the correct timely feedback about the rest of the world, just as voters are currently lost about who to best vote for, because of the absence of the correct timely feedback mechanism of Decision Ratings.

The discovery of these three lines of attack illustrates what can happen when a difficult problem is tackled with a process that fits the problem.

* * *

Now we move into formulating the right strategy. This is done in two steps: making the startup phase succeed, and making everything after that succeed.

Making the Startup Phase Succeed

Let's call the first six to twelve months of this project the startup phase. The strategies for making the startup succeed need to include:

1. Assemble a small high performance team. This is the normal way to get started in the business world. The Lexus project did it by:

> "*The first step was to assemble the A team.* Shoji Jimbo, master designer of Celica and Cressida fame, was chosen as *chief engineer*. Needing the best behind him, creative leaders willing to unshackle themselves from the conservative Japanese styling, Jimbo recruited Ichiro Suzuki for the *body structure* and Kunihiro Uchida for the *exterior design*. Suzuki wanted to dire Akihiro 'Dezi' Nagaya, a kid still in design school who thought cars were sculptures that just happened to move. By October 1984 *the team was in place*."

2. Agree on our goal. Toyota's was redefining perfection. Our proposed goal is a bit tougher: to redefine how to solve large, messy, insanely difficult social problems that have defied solution for generations. This goal covers our entire work effort, not just this project. For the Toyota team, their goal applied to all further work after the Lexus was launched. In a sense, goals (really missions) are forever and targets are for tomorrow.

3. Correctly identify the target of this project. For the Lexus team this was their second step. For us it is filling in the blanks in the standard SIP problem definition format, as it applies to SIP step 2.1. The format is:

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

4. Get on first base as soon as possible. – We need a big early win, to convince ourselves and others we are on track to success. A way to do this has been identified: prove or disprove the existence of the Dueling Loops structure. If we can do this, the world will see it as a home run the first time up at bat. But we know better.

After this the team will have the momentum it needs to eventually achieve the target and then move on to the other steps of the process, including improving the process itself. The end of the startup phase will be marked by the first big win, which will probably be proving the existence of the Dueling Loops. Or if it is disproved, the first big win will lie in the other two hypothesized ways to solve the change resistance problem, or in a new way.

Proving that any of the structures in these hypotheses exists will not only signal the end of the startup phase. *It will also demonstrate that our process has the ability to achieve goals like these.* Once we have done this the first time, the second time will be much easier, faster, and predictable. The third time will be even more so. And so on, as the process efficiency of our solution factory swiftly matures to where it can handle the truly sticky parts of solving the complete problematique.

Strategies for Long Term Success

Let's look beyond the startup phase to what comes next, all the way to solution of the entire environmental sustainability problem, and even much

further, to a permanent race to the top. What are the key things we need to do right today for success over the next several generations?

I'm sure the team will come up with more, but here are the ones I see today:

A. Use traditional project management to get on first base, and then transition to **an entrepreneurial, corporate style management approach**. Tell the team we are doing this, and act as if we are a corporate startup from the beginning. But let's walk before we run.

B. This is **a scientific frontier project**. It will attempt to solve a problem that is clearly an order of magnitude more difficult than any our species has solved before. This will require many small scientific breakthroughs and a few large ones. If we want stellar breakthroughs, **then we need stellar core team members**. This means the best of the best in the areas we have pinpointed, such as innovation process management (from Toyota?), high speed experimentation (from a great R&D lab?), modeling (from MIT?), memetics (Dawkins or a protégé?), synthesis of hypotheses (a Nobel laureate or two?), and understanding of the real way social control models work (a highly successful politician, like Al Gore?).

To attract them we can show that we are working on the toughest problem ever tackled, by an order of magnitude; that it is the most important problem facing mankind, also by an order of magnitude; that they will be pioneering a radical new way to solve such problems; and that we will not only be shooting for solving the sustainability problem, but also flipping the global social control model into a permanent race to the top. *That* should get their attention and commitment.

We probably will not be able to attract world class staff at first, because we have only logical credibility. But that will change dramatically once we get on first base.

C. **As a scientific frontier project, this work effort will require lots of fundamental breakthroughs.** However, it is nearly impossible to tell someone to go out and make a big breakthrough, and then have them do it. Instead, functional goals need to be set. Achieving them will require breakthroughs, but this will come as a **long relentless series of small, incremental improvements**. An emergent property of these will be the larger breakthroughs we are seeking. And once we become proficient at incremental discoveries, the occasional large discovery will happen. But it will be as a side effect of a greater process, the one producing the stream of incremental breakthroughs. The few big breakthroughs get the attention in the press. The many small breakthroughs are what build the product.

D. **Keep the high performance team small** until we get on first base. That way we won't be focusing on typical management problems, but on process execution and improvement.

E. **Keep the Diagnostic Project conceptually simple.** All we have to do to succeed is figure out why the Limits to Growth project succeeded, and do it again. In theory this is already done, as described in the *Taking Up Where Limits to Growth Left Off* paper. Think in terms of all we have to get right is the inputs, and we can't lose. The inputs are:

1. The use of the right tool, system dynamics, to make the core analysis and argument.
2. A conceptual breakthrough by "seeing" certain system structures/behaviors that had never been identified before.
3. Starting from a preliminary first pass at the project that almost guarantees success.
4. A highly qualified, well managed team.
5. A world class project sponsor, one who will move heaven and earth to make the effort succeed, and knows how to do that.
6. Adequate project funding.
7. A process that fits the problem extraordinarily well.

This is our project success checklist. Ticking off each of the items, it appears that as of today, February 11, 2007, we have only a highly qualified team, funding, and further process improvement to go. Everything else is covered, though it would be nice to get some additional sponsors, such as Interface and Toyota.

F. **Let's not forget about solving the Transformation Problem.** The precipitating event still needs to happen well. It has actually already started to succeed, as shown by the fact this is no longer a one man project. But imagine how much more likely we will be able to solve the sustainability problem if we have a thousand organizations and a hundred thousand activists working with us, all rowing in the same direction. This will make it much easier to contract out experimentation, which will soon be the bottleneck. It will allow more independent teams to tackle tough goals simultaneously, and the best solution wins. It will provide millions of eyeballs to review our work as it progresses, and spot problems and opportunities. And finally, it will reduce the counterproductive efforts that Classic Activism has been bringing to the table for far too long, because these efforts siphon energy from high leverage points to low leverage ones.

Related to this, the pattern so far is that **businesses and business people** are much more receptive to the Analytical Activism paradigm. Furthermore, corporations are the dominant agent. We should thus focus on transforming and enlisting businesses and business people. The precipitating event should be refocused to reflect this.

G. The traditional project management process stresses **risk management**. But this applies to projects where discovery is low. We have a high discovery project. A risk management mindset is not what we need. Instead we need an innovation mindset. We thus need the project to be driven by an **innovation management process**. This is why this paper takes such a thorough look at how Toyota does this.

H. A large challenge will be to keep this from becoming **a mega project that is impossible to manage**. I believe that since this is a social problem, we will be able to find a way to deftly change the social control models involved, with only a small amount of force. The change itself will be relatively small. But it will be designed to grow into a large, pervasive, system wide change that solves the problem. This can be done with the concepts of auto-activation chains and agent attractive, self-managing solutions. If these assumptions are true, then staff size can be much smaller than other historical high impact projects. It may even be possible to keep it below a hundred, especially if we can contract out social experiments.

Creating a High Performance Team

The first step Toyota took, once the goal of building the best car in the world was set, "was to assemble the A team." We all know how crucial this is. But how can we do it?

In the section on Strategies for Long Term Success, strategy B concluded that "If we want stellar breakthroughs, then we need stellar core team members." This is not entirely true. There is an alternative: **If we want stellar breakthroughs, we need a stellar problem solving process.** A truly good process turns sharp thinkers into incredible ones, because it removes the barriers to a continuous stream of innovation that keeps getting better and better, until the results exceed what anyone thought was humanly possible.

This is old news to those who have seen what the right formal quality/innovation control process can do. These processes were perfected in Japan, though the concept started in the United States. To make a long story short, nobody would listen to W. Edwards Deming in the U.S., so in the 1950s he went to those that would: the Japanese, who were rebuilding almost from scratch after World War II. Then after Japan's international businesses began to demolish American ones in the automotive, electronics, and other markets, American managers invited Deming back in the 1980s. But it was too late. The Japanese had built up too big a lead. Today, Japanese companies like Toyota, Honda, Canon, and Sony continue to trounce their American counterparts.

Deming's core message is hard to summarize, but here's a high level view from *The Man Who Invented Quality: How W. Edwards Deming Brought the Quality Revolution to America*, by Andrea Gabor, 1990, page 7:

> "[Deming] advocates *a process-obsessed management culture* that is capable of harnessing the know-how and natural initiative of its employees and fine-tuning the entire organization to higher and higher standards of excellence and innovation."

It appears that the company that has become the best in the world at the "process-obsessed manage-

ment culture" that Deming advocates is Toyota. No one else comes close. For proof, let's turn to this "oft-told" story from page 61 of *The Elegant Solution*:

"Many have speculated that much of Toyota's success can be attributed to 'Japanese management' or the so-called 'Japanese business culture.' A more accurate assessment would attribute much of their success to the systems they employ. Witness the miraculous transformation by Toyota of a General Motors factory in Fremont, California. It is an oft-told story, but one worth retelling in the context of understanding the power of systems and structures to produce 360 degree innovation.

"It was 1982, the first full year of Reaganomics, and trade friction was developing between the United States and Japan over the volume of import cars. American industry wasn't exactly booming. The General Motors (GM) plant in Fremont, California, was in a death spiral. It was GM's worst plant by far in terms of quality and productivity: double-digit defects in every car, with average hours to assemble a vehicle far higher than in any other GM plant. Lack of employee pride and confidence was evidenced by the absence of Fremont-built cars in the employee parking lot.

"Labor conditions were militant, toxic, even violent, with multiple strikes and sickouts by the United Auto Workers. The plant had a backlog of some 5000 union grievances. Absenteeism topped 20%, requiring the hiring of that many more workers on any given shift. Rampant drug and alcohol abuse required special cleaning crews to clear the liquor bottles and drug paraphernalia from the employee lot after shift change.

"In February, the factory closed, the entire workforce laid off.

"Enter Toyota, looking to ease trade tensions and test its production system and management approach on U.S. soil with American unions and suppliers. GM's plant was the target. Toyota and GM formed a joint partnership in 1983 to reopen the Fremont line, naming it New United Motor Manufacturing Inc. (NUMMI). A rebadged Toyota Corolla and Chevrolet Prizm were to be the products.

"The venture carried risk. Conditions of the deal posed seemingly insurmountable challenges. Toyota would inject cash, manage the plant, and implement the Toyota Production System. But there was a hiccup. They had to use the same workers, the same union, the same facilities and equipment. GM wanted the secrets of lean production and successful compact car design, and the UAW wanted recognition and representation.

"Toyota itself was split, the primary concern being giving away production methods and quality processes to a direct competitor. Toyota Chairman Eiji Toyoda, though, saw it as the perfect challenge, the perfect experiment, and the perfect opportunity to test the viability and transportability of the Toyota Production System. It was the chance to see whether people of different cultures with different philosophies and attitudes could adapt to the Toyota system and structure. It was the necessary first step leading to wholly-owned Toyota manufacturing in North America.

"Toyota took the highest road possible. They hired back 85% of the Fremont hourly union workforce. Workers would have a strong voice in plant operations. A no-layoff policy was instituted.

"1984 was spent ramping up operations. Toyota provided a new social context for work. They spent over $3 million to send 450 new group and team leaders to Toyota City for training in the Toyota Production System. UAW's hundred-plus line job descriptions were replaced by one: team member. Management hierarchy was flattened from fourteen levels to three: plant management, group leader, and team leader.

"Employees began participating in decisions regarding their work. Team members were trained in problem solving and Kaizen practices to become the experts in their respective operations. *Employee roles expanded, the primary responsibility becoming one of proactive thinking and improving, not simply doing.* Team leaders and members began engaging in group problem solving. Ideas for improvement were quickly implemented by team members, with successful solutions becoming standardized. All associates were empowered to stop the line at any time to fix a problem, by pulling a cord running around the entire facility. Cooperation and confidence replaced coercion and conflict.

"Full production began in 1985, and by year-end 1986, NUMMI had the highest quality and productivity of any GM plant. Quality defects dropped from 12 to 1 per vehicle. Cars were assembled in half the time.

Absenteeism dropped to 3%. Worker satisfaction and engagement soared. Operational innovation was on the rise, with employee participation over 90% and nearly 10,000 ideas implemented. *Same people, same union, same equipment. Radically different outcome. All in under two years.*

"By 1988, NUMMI was an award-winning plant. By 1990, the Toyota Production System was being heralded as the world-class standard for manufacturing operations.

"Take-home lesson: change the context, change the system, and change the structure. Make it meaningful, and make sure everything fits.

"Then watch the culture of innovation flourish."

There is much to be learned from this story. But perhaps it can all be boiled down to a single question: **What is our Solution Factory Production System going to be?**

If we can answer this question, then we don't need the best brains in the world. That's good news, because we are not going to get them. At least not at first. But if we can create the world's first and best social problem solution factory, one renown for creativity and breakthroughs that astound the world with their applicability to the most important problem on the planet, then who do you think we will attract?

If I could travel back in time, I'd want to be there when Aristotle invented the rules of logic, and allowed mankind to reason correctly for the first time. I'd want to watch Sir Isaac Newton writing his Principia and stopping frequently to run his ingenious supporting experiments. Moving to the 19th century, I'd want to follow Thomas Edison's every move as he opened the world's first invention factory. In the 20th century I'd do the same for the geniuses that invented and perfected the Toyota Production System. As I went, I'd ask all of these thinkers what was the essence of their success.

And I'd put it in a bottle and bring it back to the team that, in the 21st century, was about to open the world's first social problem solution factory.

What would be in that bottle?

Summary and Conclusions

Normally this section is a page or two. But this is not a normal endeavor. Therefore it is up to you to write this section.

One way to do that would be to sit down in a comfortable chair, and ask yourself one simple question:

> *How would you rewrite the scenario that opened this paper, so that this problem solving effort succeeds where all that have gone before it have failed?*

And then, after the startup team is assembled, they can jointly ask themselves the same question.