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SOLVING DIFFICULT LARGE-SCALE SOCIAL SYSTEM PROBLEMS WITH ROOT CAUSE ANALYSIS

Jack Harich has a background of twenty years business management and consulting, with a BS in Systems Engineering from the Georgia Institute of Technology, US. Presently he is systems engineer at Thwink.org. Founded in 2001, the goal of Thwink.org is to help solve the environmental sustainability problem using the most efficient and effective methods available. This has involved a novel line of research. The article reports on this research.

INTRODUCTION

There exists a class of problems that have defied solution for generations. This class includes environmental sustainability, over population, recurring wars, avoidable large recessions like those of 1929 and 2008, endemic corruption, and excessive wealth inequality. These problems can be characterized as systemic, difficult, large-scale, and involving social systems of multiple intelligent social agents. They also involve systemic lock-in. For example, Garrett Harding, in his classic analysis of the environmental sustainability problem in *Tragedy of the Commons,* found that: "Each man is *locked into a system* that compels him to increase his herd without limit – in a world that is limited."

The existence of this class of problems raises the question that sits foremost in the minds of millions of global activists: How can we solve these problems? This question is so ubiquitous that the theme of this journal issue is Systemic Change: "How and where does systemic change manifest? How does it unfold? What are the leverage points, the forces and dynamics at play?"

However, what is the right question to ask first? Perhaps we should consider Albert Einstein's viewpoint: "If I had an hour to solve a problem and my life depended on the solution, I would spend the first 55 minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes[1]."

This is the road Thwink.org has taken. Our work initially focused on the environmental sustainability problem and later broadened to the class of problems described above. Our 55 minutes took two years and led to a very different question: WHY are popular solutions failing? This subsequently led our research down a road less traveled. The answer, found in a matter of days, was that popular solutions are failing because they do not resolve root causes. We know this to be so because all problems arise from their root causes[2].

This hypothesis, that popular solutions for this class of problems are failing because they do not resolve root causes, has defined our work ever since. If the hypothesis is true then we can make a prediction. We should be able to find root causes that are not being addressed by popular solutions, however elusive those root causes may be.

Our research approach has been to develop a formal process, based on root cause analysis, that fits this class of problems. This parallels what the business world has successfully done with its own classes of problems.

This approach led to the System Improvement Process (SIP). The remainder of this article reports on how SIP works, describes the application of SIP to one particular problem, and concludes with discussion of how the application results confirm or deny the prediction that root causes exist which are not being addressed by popular solutions.

METHOD OF ANALYSIS: THE SYSTEM IMPROVEMENT PROCESS

SIP was designed from scratch to solve the highly intractable class of problems described above. Let's pause to give the class a name. The problems listed above are difficult and large-scale. They involve the lock-in factor reported by Hardin and multiple intelligent social agents acting together in a social system. We need a meaningful acronym to identify this class. Let's label the class Difficult Intelligent Social Multiple Agents Large-scale Lock-in (DISMALL) problems.

More than anything else, what makes DISMALL problems difficult is lock-in. Deep, well hidden, poorly understood forces exist that lock social agents into self-destructive behavior and make it excruciatingly

difficult to break free, despite the prolonged effort of problems solvers. Therefore, if we are to successfully effect systemic change we must understand the systemic forces involved.

For DISMALL problems this requires root cause analysis, which is the practice of finding and resolving a problem's root causes. The driving principle is that all problems arise from their root causes[3]. Evidence of the effectiveness of root cause analysis is irrefutable. Vast swaths of industry have adopted root cause analysis. Generic processes like Six Sigma, Total Quality Management, Kaizen, and the ISO 9000 family of standards have evolved from application of root cause analysis. Root cause analysis processes like the fabled and widely emulated Toyota Production System lie at the very heart of corporate success[4].

SIP works by breaking a problem down into smaller and hence easier to solve subproblems. For example, when solving the problem of how to put a man on the moon and bring him back, NASA divided the problem into six subproblems: how to achieve earth orbit, how to move to lunar orbit, how to land on the moon, how to achieve lunar orbit again, how to move to earth orbit, and how to land on the earth. Once SIP has divided a problem into subproblems, each subproblem undergoes analysis to find its one or more root causes and to identify the high leverage points for resolving the root causes. Solution elements are then developed for pushing on the high leverage points. The solution elements are then implemented. For each subproblem the process looks like this:

1 ~ Subproblem Definition
2 ~ Analysis (This is complex so it contains five substeps.)
2.1 ~ Find the immediate cause of the subproblem symptoms in terms of the system's dominant feedback loops.
2.2 ~ Find the intermediate causes, low leverage points, and superficial (symptomatic) solutions. (Intermediate causes are defined below.)
2.3 ~ Find the root causes of the intermediate causes.
2.4 ~ Find the feedback loops that should be dominant to resolve the root causes.
2.5 ~ Find the high leverage points to make those loops go dominant.
3 ~ Solution Convergence.
4 ~ Implementation.

The purpose of the Analysis step is to find the important causal chains in a subproblem. Causal chains work as shown below. An arrow means one thing causes another. Intermediate causes are defined to be causes in a causal chain that occur between root causes and symptoms.

ROOT CAUSES À INTERMEDIATE CAUSES À SUBPROBLEM SYMPTOMS

If the root causes of a problem are unknown, problem solvers have no choice but to attempt (usually in vain) to resolve the intermediate causes by pushing on their connected low leverage points with superficial solutions. If the root causes are known, then problem solvers can attempt (usually with success) to resolve the root causes by pushing on their high leverage points with fundamental solutions[5].

For example, before the root cause of infection was known, treatment was directed to intermediate causes like fevers (with cold baths), festering wounds (with concoctions like mouldy bread and warm soil), and speculated causes in general (with trepanning, incantations, and all sorts of herbs and charms). The cure rate was low. But once the root cause of infection was found to be infectious agents like viruses and bacteria, revolutionary treatments that usually worked could be directed to high leverage points, such as avoiding infection (by hand washing and vaccination) and killing bacteria once an infection was established (with antibiotics). The result has been a high avoidance and cure rate.

The most urgent DISMALL problem is global environmental sustainability. There have been countless practical ways offered for solving the problem, like regulations, conservation, population reduction, and carbon taxes. But society doesn't want to change its behavior and adopt these practices. Therefore how to overcome change resistance is the crux of the problem[6].

As an example of how root cause analysis can work on DISMALL problems and to test the prediction that root causes exist which are not being addressed by popular solutions, let's review what the SIP analysis found for the change resistance subproblem of the global environmental sustainability problem. The analysis was built using a feedback loop model of the subproblem.

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)[7]. 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

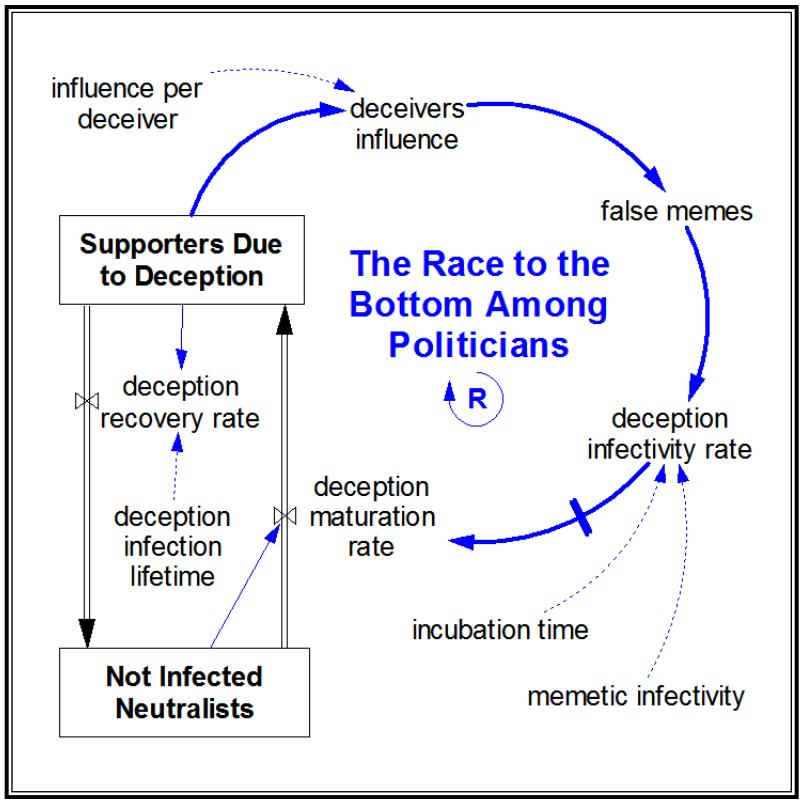


FIGURE 1 ~ The Structure of the Race to the Bottom. The reinforcing loop grows in strength by using corruption in the form of highly appealing falsehood and favoritism. This increases the number of supporters of corrupt politicians, which increases their influence, which in turn increases their power to peddle still more falsehood and favoritism. Over time the loop can grow to tragically high levels.

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 have long dominated political strategy. Most politicians use rhetoric, half truths, glittering generalities, the sin of omission, biased framing, and other types of deception (propaganda) to appeal to the greatest number of people possible for election or reelection. Once in office many politicians engage in acts of favoritism, also known as patronage.

For example many 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 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 falsehood and favoritism 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 modeled using system dynamics[8] in FIGURE 1. Once this loop takes hold a society's leaders are locked into a systemic race to the bottom. They will make poor decisions on problems whose solutions would benefit the majority of the population, i.e. the common good.

To understand how the loop works, let's start at *false memes*. (Node names are italicized.) A meme is a mental belief that is transmitted (replicated) from one mind to another[9]. Rather than show falsehood and favoritism, the model is simplified. It shows only the larger factor, falsehood.

The more *false memes* transmitted, the greater the *deception 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 *deception maturation rate*, which causes supporters to move from the pool of *Not Infected Neutralists* to the pool of *Supporters Due to Deception* as they become committed to the *false memes* they are now infected with. *Supporters Due to Deception* times *influence per deceived* equals *deceivers influence*. The more influence a deceived politician has, the more *false memes* they can transmit, and the loop starts over again. As the reinforcing loop goes around and around, each node increases in quantity, often to astonishing levels. The loop stops growing when most supporters are committed.

Once a supporter becomes deceived, they become deceivers themselves in order to spread what to them is the truth to others. The *deceivers influence* node reflects this behavior. The race to the bottom loop creates a giant political echo chamber, as deceivers compete to see who can do the best job of spreading more (false) beliefs. This maximizes the number of false memes, minimizes defection, and ensnares additional neutralists into their fallacious paradigm. These effects explain the high level of (false) proselytization and dogmatism seen on the far right in many political systems.

The behavior of the race to the bottom is of considerable importance. A deceived person has fallen (degenerated) from the norm of discerning the truth. The health of a society whose leaders are elected relies on the majority of its voters to be able to discern the truth about who would make the better leader. They can't do this perfectly, but they should be able to satisfice[10] and do it most of the time. If the majority can be routinely deceived into supporting those who have used falsehoods to garner their support, then that society is in serious trouble.

THE IMPORTANCE OF GRAPHS AND ANALYTICAL THINKING

Authors of this journal issue were invited to consider these questions: "How and where does systemic change manifest? How does it unfold? What are the leverage points, the forces and dynamics at play? What are the conditions for its empowerment and enablement? How do agency and structure come into the picture?" These questions can be systematically answered with root cause analysis of the problem, construction of a model of the problem's structure, and close study of how the forces in the model dynamically play out over time. These dynamics are best presented in the form of graphs.

A time based graph shows how various factors behave over time. The classic example of a model and its graphs for understanding a public interest problem is the *Limits to Growth*[11]. The book is built around its graphs. The third edition uses ten scenarios and thirty graphs to explain how a system dynamics model of the environmental/economic system behaves when various leverage points are pushed on with solutions. What people remember about the *Limits to Growth* is its stunning graphs. For the first time these graphs showed, in a convincing fashion, approximately what would happen if business as usual continued or various solutions were implemented.

This article takes a similar approach. Ten graphs (one for each scenario) are used to explain how the analysis model works. This is a generalized model so the graphs extend over an arbitrary period of time. The *Limits to Growth* graphs use 200 years. We have chosen 500 years, but this could just as well be 500 months, weeks, or days, depending on the particular problem. On these graphs most of the interesting behavior occurs in the first few hundred years. This is about how long it has historically taken civilization to address past DISMALL problems, like slavery, universal suffrage, civil rights, and conversion from autocracy to democracy beginning in the 18th century.

The article speaks in terms of politicians and their behavior to hold positions of power. From that perspective the graphs should have a short time scale. However, for a DISMAL problem the graphs should be interpreted as representing the entire system (often global) of politicians and its macro behavior over the period of time it takes to solve the problem. At that level of thinking long time scales of hundreds of years become appropriate.

THE RACE TO THE BOTTOM GRAPH

Our first graph appears in FIGURE 2. This shows how the race to the bottom loop behaves over time. The behavior is 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, articles, biased media outlets, 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. 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 to increase their power. Here are four of the most popular:

1 ~ 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.

2 ~ 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.

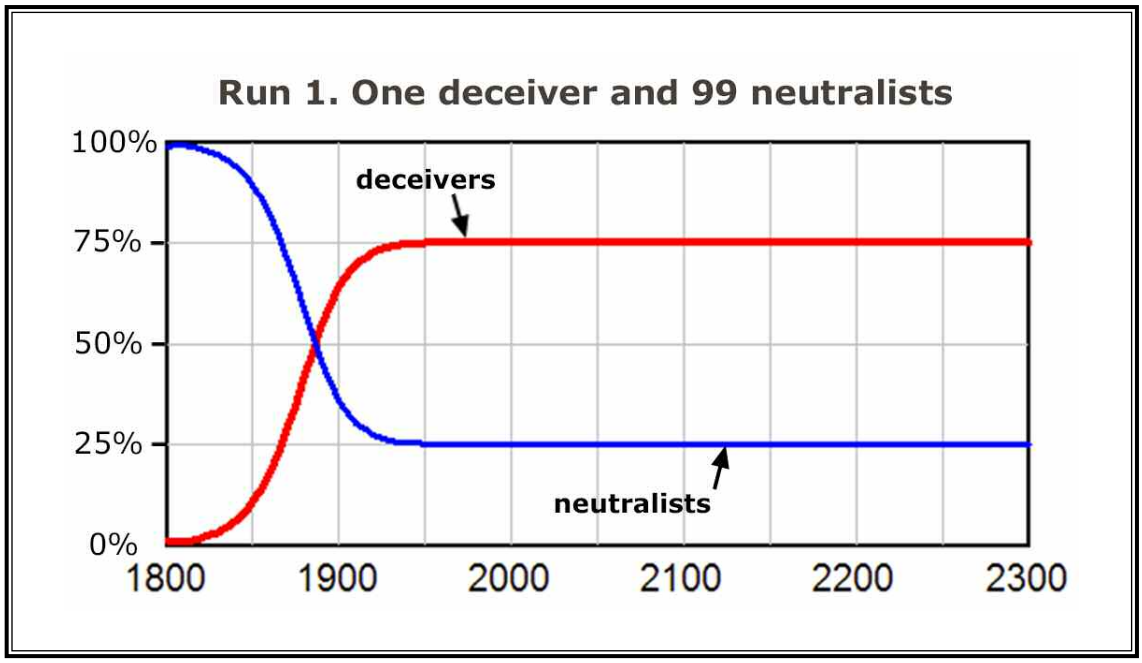


FIGURE 2 ~ Run 1. The simulation run begins with one deceiver and 99 neutralists. Over time the percentage of deceivers grows to 75% and stops. What keeps it from growing to 100% is the way deceived people can recover from their infection, after a *deception infection lifetime* of 20 years.

False enemies may be internal or external. Examples of internal false enemies are negative campaigning, the Salem witch trials, McCarthyism, Hitler's persecution of the Jews, and anti-Semitism and racism in general. A recent example of an external false enemy was George W Bush's painting of Saddam Hussein as evil incarnate, behind the 9/11 terrorist attack, and concealing weapons of mass destruction, which falsely justified the second Iraq war[12]. A current example is Vladimir Putin's unilateral creation of the Second Cold War, justified by "lies and conspiracy theories "[13].

3~ 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's very easy to push. Just use a few of the right trigger words (like "big" government, "radical" environmentalist, or axis of "evil"), 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.

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

The next time you see any of these strategies of deception, think of it as proof the Race to the Bottom among Politicians exists, and as proof that few politicians can escape the pressure to join the race to the bottom.

THE BASIC DUELING LOOPS

Opposing the race to the bottom is the race to the top. The two loops are joined together as shown in FIGURE 3. Because each loop competes for the same *Not Infected Neutralists*, they are "dueling loops"[14].

In the race to the top virtuous politicians compete for supporters on the basis of the truth (called *true memes* on the model) about what is best for all (how to optimize the common good). 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 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

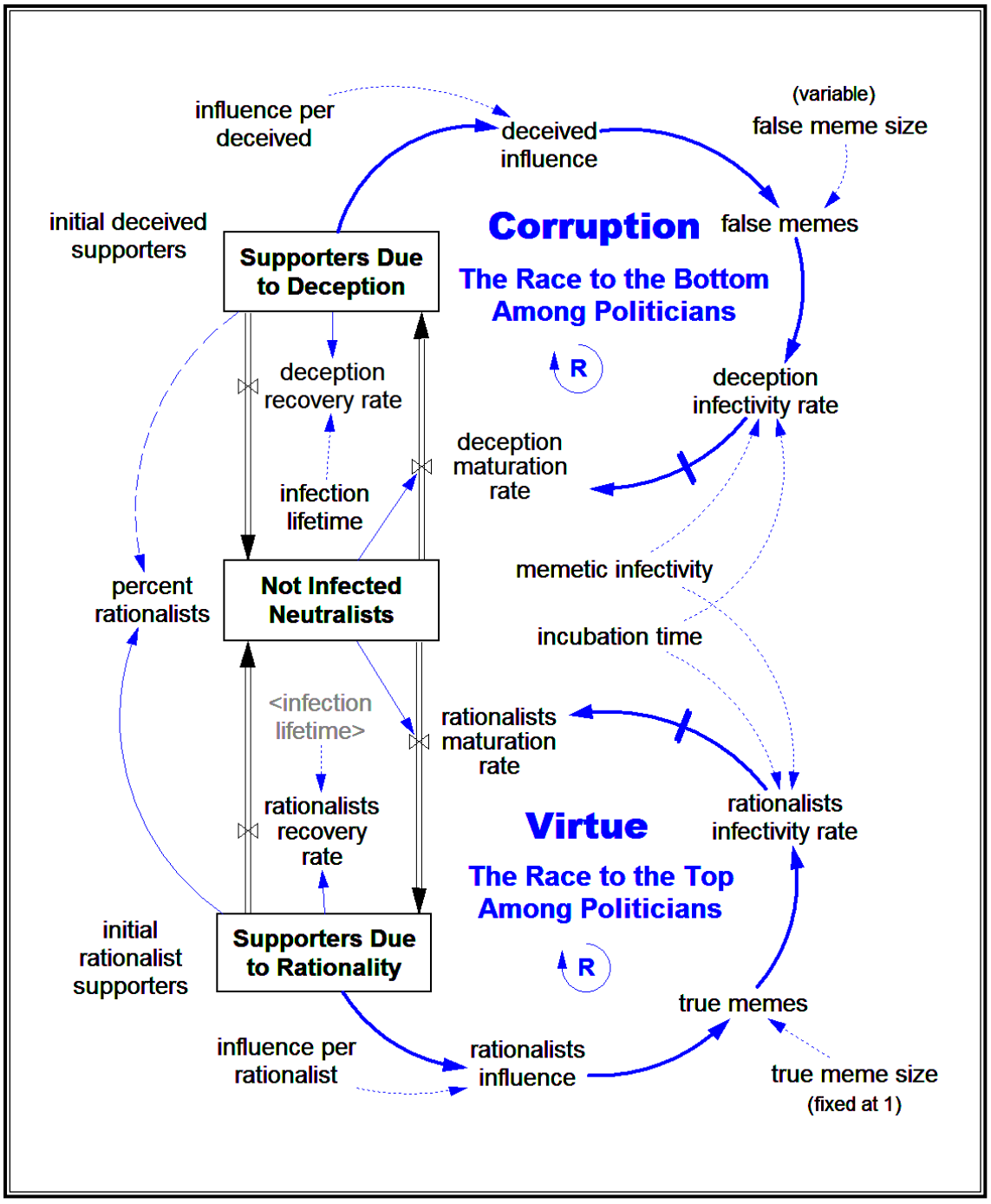
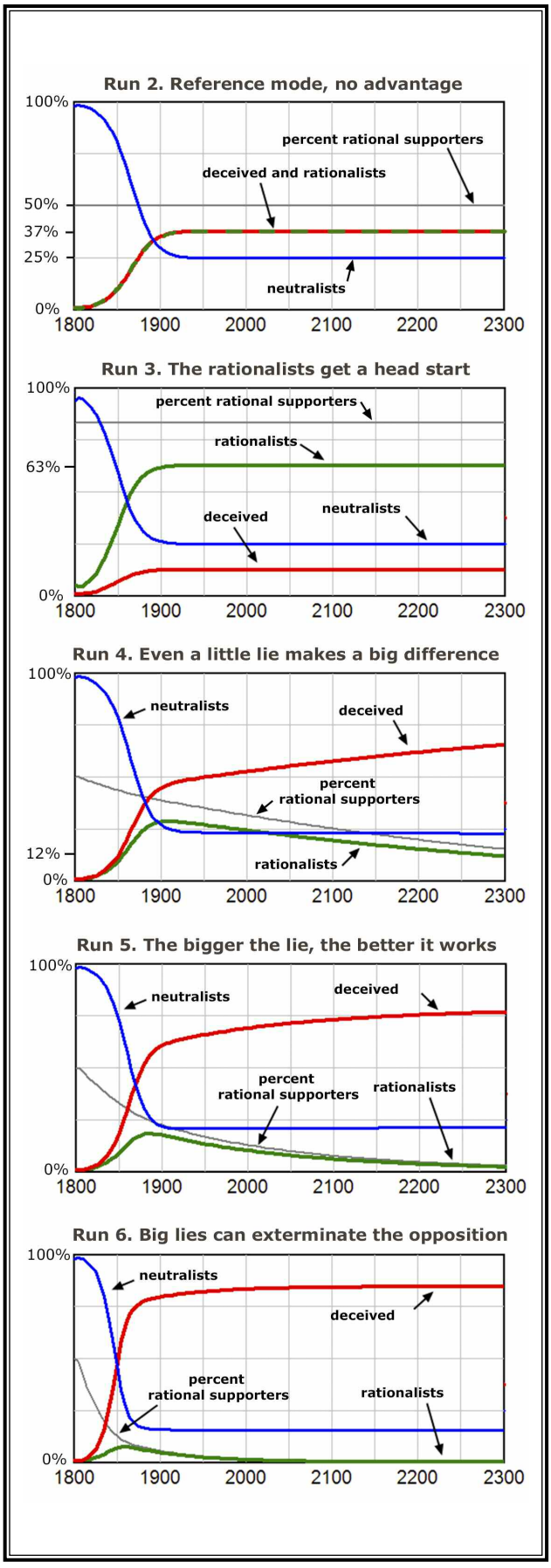


FIGURE 3 ~ The basic structure of the Dueling Loops of the Political Powerplace. There are many variations. This structure is the fundamental cause behind the behavior of all political systems, both ancient and modern. It explains the ubiquity of the left right political spectrum. More importantly, it explains why corruption is what dominates politics, no matter how hard society tries to stamp it out.

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 to inflate expectations of how well they can help particular supporters.

By examining how the basic dueling loops model behaves in the series of simulation runs shown in FIGURE 4, we can better understand why the political powerplace works the way it does.



In these runs, *true meme size* is fixed and always equals one. A *false meme size* of 1 contains no deception, while a *false meme size* of 1.1 contains 10% lies.

The graphs have four lines. *Percent rational supporters* equals rational supporters divided by (rational supporters plus deceived supporters). Deceived, neutralists, and rationalists equal the number of those types of social agents in the three stocks (boxes) on FIGURE 3. The total number of social agents always equals 100, so the number of each type is the same as its percent.

RUN 2 – In run 2 *false meme size* is 1 and the number of *initial deceived supporters and initial rationalist supporters* are both 1. Because neither loop has an advantage over the other loop, the result is both loops behave the same. Each loop attracts the same 37% of supporters, so the deceived graph line sits on top of the rationalists line. Percent rational supporters stays the same throughout the run at 50%.

RUN 3 – This shows what happens if we give one side a head start. *False meme size* remains 1. *Initial deceived supporters* is 1, while *initial rationalist supporters* are 5. This time the rationalists pull away and end up with 63% of supporters.

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 shows, the good guys get wiped out. At the end of the simulation run the rationalists are down to about 12%. A small advantage, if all else is equal, can over time lead to a large advantage.

In run 4, notice how slowly the lines for deceived and rationalists diverged for the first 50 years. What might happen if the bad guys 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 50 years for the deceived line to pull away from the rationalists. Now the rationalist line flattens out much faster. 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?

RUN 6 – Finally we see what happens if a corrupt politician decides to tell real whoppers, also known as "big lies." *False meme size* is 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 good guys 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. At the end of the simulation run there are no rationalists left in the system. They have been exterminated.

FIGURE 4 ~ Duelling loop simulation. Runs 2 to 6.

There is a limit to how big a lie can grow before it starts to make detection easy. In FIGURE 5 we will add the *effect of size of lie on detection* variable to the model, which imposes diminishing returns on the size of a lie.

This 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 a politician 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 button 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.* This finding completes SIP analysis substep 2.1: "Find the immediate cause of the subproblem symptoms in terms of the system's dominant feedback loops." This also explains why "Power corrupts and absolute power corrupts absolutely[15]." The reason is not so much that power itself corrupts, but that the surest means to power requires corruption.

Due to lack of analysis of the root causes of change resistance, problem solvers have long been intuitively attracted to the low leverage point of "more of the truth." On the Dueling Loops model this 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 solution adoption resistance (low change resistance), such as local pollution problems. But it fails on those with high change 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.

Substep 2.2 of the SIP analysis says: "Find the intermediate causes, low leverage points, and superficial (symptomatic) solutions." The intermediate cause of high change resistance is the universal fallacy that Growth Is Good[16], i.e. economic growth trumps all other priorities, including solving DISMALL problems. To combat that fallacy problem solvers use the low leverage point of "more of the truth" to promote superficial solutions as described above.

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 is "locked into a system" where he can only run faster and keep winning the race by increasing his corruption. This explains why the race to the bottom frequently runs to excess, causing its own demise and collapse.

This collapse ends a cycle as old as the first two politicians. A cycle ends when corruption/exploitation 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 political systems to keep ability to detect political deception permanently high[17].

THE ROOT CAUSE OF HIGH CHANGE RESISTANCE

Substep 2.3 of the SIP analysis says: "Find the root causes of the intermediate causes." This follows from the structure of the model. The root cause of high change resistance is the same as the root cause of why the race to the bottom is the dominant loop most of the time. The cause of loop dominance is *high political deception effectiveness*, which is the root cause. As long as this root cause force stays high the world's political systems will tend to favor solving problems that

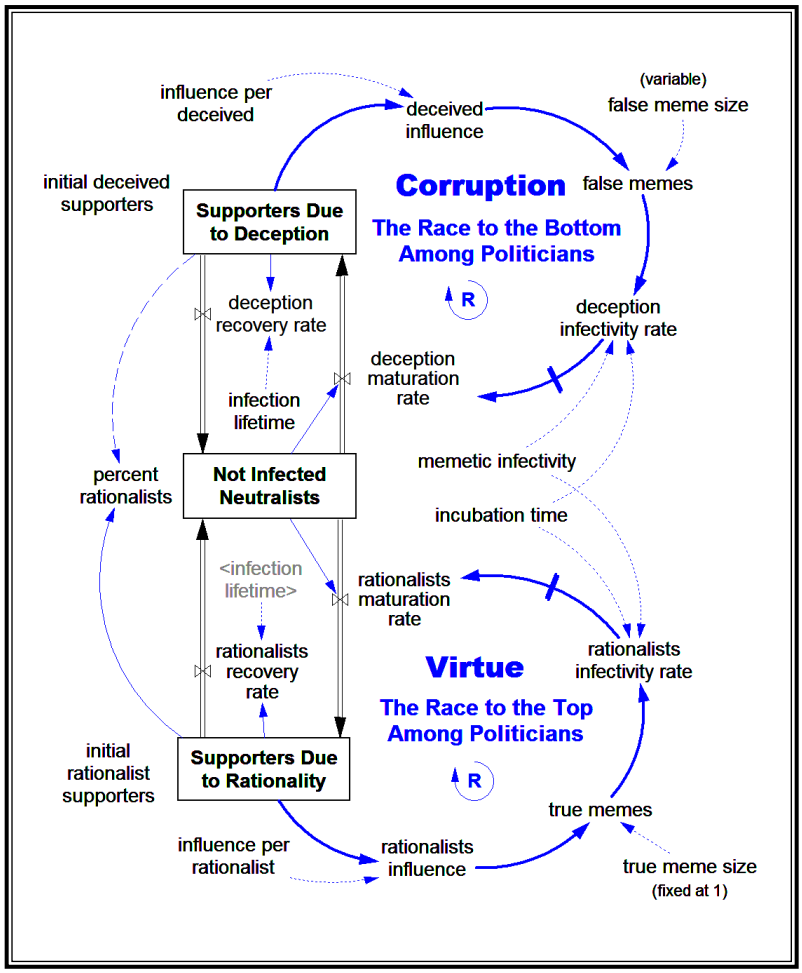


FIGURE 5 ~ The High Leverage Points of the Dueling Loops. The two high leverage points are underlined.

benefit powerful special interests (notably large corporations and their owners, the rich) and will resist solving problems whose solution would benefit the common good.

This is a significant finding. It confirms the prediction that root causes exist, which are not being addressed by popular solutions to DISMALL problems.

The next step in the process is to determine how to resolve the root cause.

THE HIGH LEVERAGE POINTS MODEL

A high leverage point is a place in a system's structure that when "pushed on" with solution elements resolves its connected root cause. Finding the high leverage points to resolve the root cause of high political deception effectiveness requires the expanded model of FIGURE 5. Here's how the model works:

We have extremely good news. There is a promising high leverage point in the human system that has not yet been tried. It is *general ability to detect political deception*. Pushing there appears to give problem solvers the greatest possible chance of overcoming resistance to systemic change.

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 deceived 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 the system to react correctly to deception, 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 Supporters Due to Deception, which is what the *supporter desertion due to repulsion* variable does, or to move from neutralists to 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 the *deception infectivity rate*.

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. 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 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 favors the race to the bottom.

But if problem solvers can raise ability to detect deception from low to high, most *false memes* will 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 *deception recovery rate* due to *supporter desertion due to repulsion*. The result is corruption 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.

Substep 2.4 of the SIP analysis says: "Find the feedback loops that should be dominant to resolve the root causes." The loop that should be dominant is clearly the You Can't Fool All of the People All of the Time loop. The more dominant that loop is, the less people are fooled and the more dominant the race to the top becomes. Transition to a permanent race to the top will usher in the equivalent of the Age of Reason in the electorate of nations[18]. Such a transition happened long ago to science, so it can be done. Imagine what it will be like when a similar transition happens to voters and hence entire nations.

Finally, substep 2.5 of the SIP analysis says: "Find the high leverage points to make those loops go dominant." There are two high leverage points, *repulsion to corruption* and *general ability to detect political deception*. Currently both are low, so let's examine in FIGURE 6 another series of simulation runs to see how these high leverage points behave.

The results show that at last we have the behavior in the model we would like to see in the real world, because *percent rational supporters* has risen to a blissful 100%. The destructive opposition is eliminated and virtuous politicians can now focus completely on society's proper priorities. If the model is correct, then raising *general ability to detect political deception* from low to high is all it takes to make the race to the top go dominant and solve the change resistance side of the problem. We won't get *percent rational supporters* to rise to 100% in the real world, but we can get it close enough.

In run 11, *repulsion to corruption* and *general ability to detect political deception* were both 20% and *percent rational supporters* leveled out at 20%. In run 12, raising *repulsion to corruption* to 80% caused *percent rational supporters* to rise from 20% to 59%, a 195% increase. But in run 14 raising *general ability to detect political deception* to 80% caused *percent rational supporters* to rise much more, from 20% to 100%, a 400% increase. Thus *general ability to detect political deception* has about twice the leverage of *repulsion to corruption* and is the highest leverage point.

ANALYSIS CONCLUSIONS

Given this analysis, three important conclusions about the environmental sustainability problem stand out:

1 ~ Popular solutions to overcoming change resistance push on the intuitively attractive but low leverage point of "more of the truth." This fails because it does nothing to resolve the root cause. This explains why problem solvers have been unable to solve the problem.

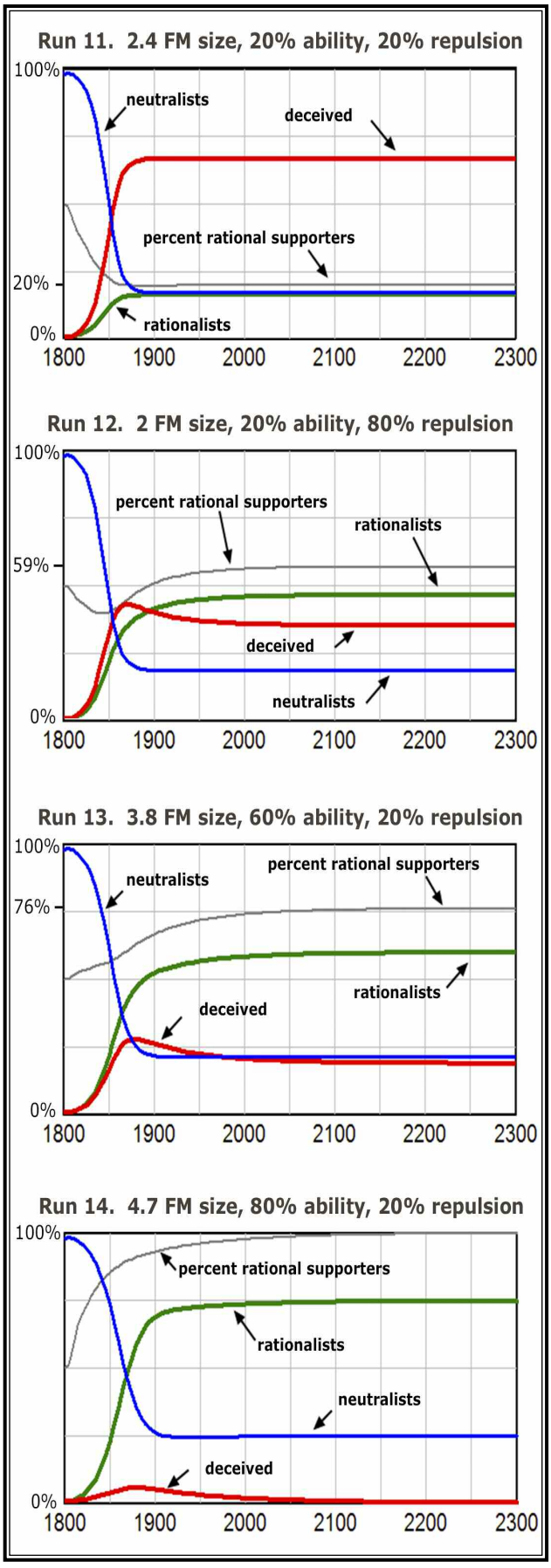
2 ~ The main root cause of successful change resistance is high political deception effectiveness.

3 ~ A suitable high leverage point for resolving the root cause is raising general ability to detect political deception.

Suppose environmentalists shifted their strategy to root cause analysis. They might come to similar conclusions. In particular, they might find that the high leverage point for overcoming systemic change resistance is raising general ability to detect political deception. We need to raise political truth literacy. This can be done with a variety of solution elements, such as the nine sample solution elements found in the SIP Solution Convergence step[19].

However, because of no clear conception of the Dueling Loops (or any shared valid model of the problem's root causes and their high leverage points), problem solvers are unable to focus their efforts and push on the correct high leverage points in unison. We are unable, as Helene Finidori wrote in this journal, to find "ways to coalesce rather than dilute the diversity of our efforts [...][20]."

This completes the SIP application example. The complete analysis found four subproblems, four main root causes, 12 sample solutions elements, and is available at Thwink.org[21]. The analysis presented here, with its one subproblem and one root cause, may appear simplistic or erroneous until the complete analysis is examined.



Three factors are adjusted in this simulation: *false meme size, general ability to detect political deception*, and *repulsion to corruption*. A *false meme size* of 1 means no falsehoods and equals a *true meme size* of 1. The truth cannot be inflated, so *true meme size* always equals 1. But *false meme size* can be inflated by deception, aka spin, disinformation, propaganda, and lies. For each particular level of *repulsion to corruption* and *general ability to detect political deception,* there is an optimum *false meme size*. In the real world this is set via trial and error by intelligent social agents. In the model it's set by trial and error by the experimenter.

RUN 11 – This represents approximately where we are today. Both high leverage points are low, at 20%. The smarter the agent, the faster and better it adapts to changing circumstances. Corrupt politicians, via trial and error, have adapted their deception strategies to the equivalent of a *false meme size* of 2.4. This is the optimum for these conditions. The result is corrupt politicians control the political system, which correlates with how well most nations have been able to solve DISMALL problems.

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 these conditions. It turns out to be 2. Will the result be good enough for the good guys to win or not?

No. The results show that even 80% *repulsion to corruption* is not good enough. The forces of good and evil are still so evenly matched that they would be totally unable to deal cooperatively and proactively with difficult problems like sustainability, because they would be too busy battling each other. Corrupt politicians and their deceived supporters would also be engaging in promoting too many wrong priorities for the right priority of environmental sustainability to emerge as a top priority.

RUN 13 – Here we rollback *repulsion to corruption* to 20% and raise *general ability to detect political deception* to 60%. The optimum *false meme size* is 3.8. Compared to run 12 the results show that ability to detect deception offers much higher leverage than *repulsion to corruption*. Therefore this is the high leverage point that problem solvers should be pushing on with their solutions.

There is, however, a problem with run 13. *Percent rational supporters* is 76%, which is probably about the bare minimum for a government to begin to put aside political squabbling and begin working on its backlog of problems. But 76% is still not high enough for nations to focus efficiently on highly demanding DISMALL problems, because solving these types of problems requires a nation's full attention and complete cooperation with other nations. We must do better.

RUN 14 – To see if we can achieve a high enough *percent rational supporters* 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 its optimum of 4.7.

FIGURE 6 ~ Duelling loop simulation introducing general ability to detect political deception. Runs 11 to 14.

GENERAL CONCLUSIONS

The prediction, that root causes exist which are not being addressed by popular solutions to DISMALL problems, was confirmed for the environmental sustainability problem.

Due to its mind-boggling complexity and devilish difficulty of solution, the environmental sustainability problem is the prototypical DISMALL problem. Therefore this confirmation may be expected of the entire class. If other DISMALL problems are subjected to a similar analysis, we can expect to find one or more root causes in each problem not being addressed by popular solutions.

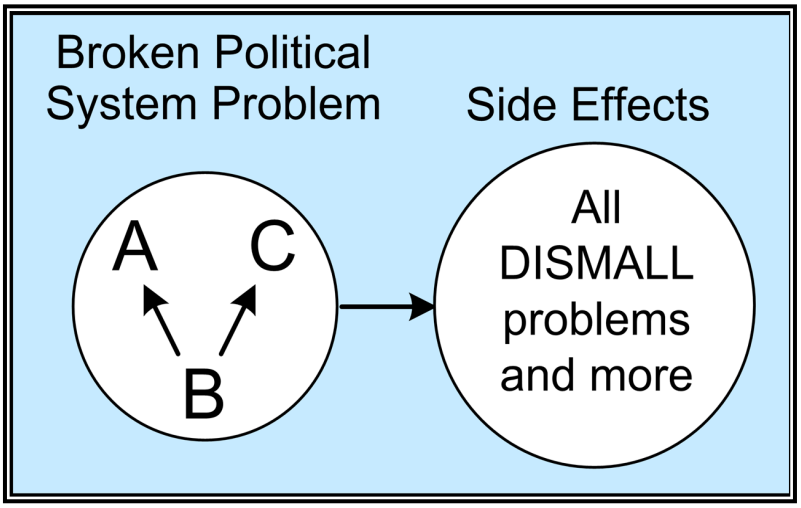


FIGURE 7 ~ The Broken Political System Problem and its side effects. A is the change resistance subproblem. Due to the Dueling Loops of the Political Powerplace, change resistance is presently so high that all DISMALL problems are insolvable.

Indeed, this is what the full SIP analysis found. The full analysis contains four subproblems: A, B, C, and D. Each was found to have a single main root cause. One subproblem (D) was the environmental sustainability problem. The other three subproblems (one of which is change resistance) combine to form "the broken political system problem." Symptoms (aka side effects) of the broken political system problem include the environmental sustainability problem, the other DISMALL problems, and more, as seen in FIGURE 7

This suggests a striking conclusion: The prediction holds for *all* DISMALL problems. All DISMALL problems are symptoms of "the broken political system problem," so they arise from its root causes. These root causes are largely unaddressed by popular solutions. That all DISMALL problems appear to be symptoms of a deeper problem was an unanticipated discovery with implications that may be of some interest.

The pattern of prediction confirmation for all DISMALL problems lends considerable support to our central hypothesis, that popular solutions for DISMALL problems are failing because they do not resolve root causes.

This hypothesis points to a new strategy that could work. If present solutions are failing because they do not resolve root causes, then future solutions can succeed if they shift to resolving specific root causes. This strategy has long worked for industry. It can thus work for DISMALL problems if a suitable process based on root cause analysis is employed.

DISMALL problems are solvable. If enough public interest activists adopt the new paradigm of root cause analysis, then systemic change is not a pipe dream but a forthcoming practical reality.

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[1] The Einstein quote is from the book by Vogt and Isaacs, page 1.

[2] We know from Newton's third law that for every action there is an equal and opposite reaction. Every effect has a cause and every cause has an effect. From this we can infer that all problems arise from their root causes, using the definition of root cause below:

[3] A root cause has three identifying characteristics: (This definition is from Harich 2010, with the definition of resolve added.)

1 ~ It is clearly a (or the) major cause of the symptoms.

2 ~ It has no worthwhile deeper cause. This allows you to stop asking why at some appropriate point in root cause analysis.

3 ~ It can be resolved. Resolve means changing a system's structure such that a root cause force no longer exists or is acceptably low, and the resolution introduces no new significant problems.

This definition allows numerous unproductive or pseudo root causes to be quickly eliminated.

The important thing is to not stop at intermediate causes. These are plausible and easily found. Working on resolving what are in fact intermediate causes looks productive and feels productive. Intermediate cause solutions, more accurately called symptomatic (or superficial) solutions, may even work for a while. But until the true root causes are resolved, powerful social agents will invariably find a way to delay, circumvent, block, weaken, or even rollback these solutions, because intermediate causes are symptoms of deeper causes. One must strike at the root.

[4] Liker 2004, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*. How vitally important a total process is to a company's problem solving success may be gleaned from the book's organization. The book presents each of the 14 principles in a chapter of its own. These are organized into three sections, with the largest containing 7 principles. The section is titled "*Section II. The Right Process Will Produce the Right Results."* This is the main point of the book and the secret to Toyota's success. It is also a principle that may be applied to DISMALL problems.

[5] For more on these terms see the glossary entry on Superficial Solution at Thwink.org. For the classic article on the importance of pushing on high instead of low leverage points (in the right direction) see *Leverage Points: Places to Intervene in a System* by Donella Meadows, available at < http://bit.ly/1Bl4Bxb >.

[6] That change resistance is the crux of the problem was addressed at length in Harich 2010, *Change Resistance as the Crux of the Environmental Sustainability Problem*.

[7] Let's examine why the two main strategies for gaining political supporters are truth versus falsehood and favoritism. In any form of government, historically there have been six methods for gaining supporters: force, bribery, patronage, falsehood, favoritism, and truth. In a democracy force and bribery are illegal. Patronage, the giving of jobs as rewards for support, is legal unless a merit system is present. However, in a political unit with a voting population of a million people for example, there would be only a few thousand patronage jobs available at the most. This is not nearly enough to sway the majority, so patronage is not a viable main strategy. This leaves the three main strategies of falsehood, favoritism, and truth.

Next let's examine why political systems have evolved into two main groups of supporters, where falsehood and favoritism are used by one group and truth is used by the other. A population group is either a minority (a special interest, aka vested interest) or a majority (a general interest, aka the common good). If helping a minority will make the majority worse off, as for example in tax cuts for the rich or corporations and countless cases of special treatment, then the only way the minority can convince the majority to support the minority position is favoritism or falsehood. On the other hand, a majority doesn't have to convince itself to support a majority position since it's already convinced. The truth needs no embellishment or spin. The plain truth will do, since a majority by definition already supports its own position.

Finally, here's why falsehood is used more than favoritism. Favoritism is the giving of favors (excluding jobs) as rewards for support, such as favorable treatment in new legislation or in interpretation or enforcement of existing law. However, favoritism is mostly a zero sum game. Giving something to one group takes away from that available to all. Tax cuts for some reduce the income for all. Weaker regulations and enforcement for some reduce the benefits of regulation and enforcement for all. In contrast, falsehoods are not a zero sum game. They are also considerably cheaper than favors, and can be manufactured and distributed almost instantly via the media. For these reasons falsehoods are preferred over favoritism for race to the bottom politicians.

[8] For an introduction to system dynamics and how to read system dynamics models like those in this paper see the glossary entry on System Dynamics at Thwink.org.

[9] The concept and word "meme" was created by Richard Dawkins in one of the classics of behavioral biology, *The Selfish Gene*, in 1976. See p. 192 of the 1999 edition.

[10] The word "satisficing" was coined by Herbert Simon in 1956. Combining the words satisfy and suffice, the word describes the method of decision making commonly used by people (including managers) in most decisions, even important ones. They satisfice with rough heuristics rather than use optimal decision making, which is so arduous it is seldom used.

[11] The three editions of the *Limits to Growth* were published in 1972, 1992, and 2004. The book has become the all time best seller in environmentalism, even more than *Silent Spring,* with somewhere over nine million copies sold. People are thirsting to understand how the environmental sustainability problem behaves at the global system level. The book provides that understanding.

[12] Prasad et. al. 2009, *There Must Be a Reason: Osama, Sadam, and Inferred Justification*. "One of the most curious aspects of the 2004 [US] presidential election was the strength and resilience of the belief among many Americans that Saddam Hussein was linked to the terrorist attacks of September 11. Scholars have suggested that this belief was the result of a campaign of false information and innuendo from the Bush administration."

[13] For example, *The Economist* reported that: "Yet for a few years after Mr. Putin came to power he built close relations with NATO. In his first two presidential terms, rising living standards helped buy acceptance of his monopoly on state power and reliance on ex-KGB men; now that the economy is shrinking, the threat of war is needed to legitimise his rule. […] At home Russian media, which are mostly state-controlled, churn out lies and conspiracy theories." The "threat of war" is created out of thin air by creating a false enemy using "lies and conspiracy theories."

[14] For an easy to follow video based introduction to the Dueling Loops model, please see The Dueling Loops Video Series at Thwink.org. This contains 12 videos averaging nine minutes each.

[15] Baron Acton 1887, *Historical Essays and Studies*. The exact quote is "Power tends to corrupt and absolute power corrupts absolutely."

[16] Why is Growth Is Good such a universal fallacy? Because economic growth benefits corporations by increasing potential sales, which increases potential profits. Large corporations essentially control the world's political systems, especially its democratic ones, as reported in works like *When Corporations Rule the World* by David Korten, *Supercapitalism* by Robert Reich, *Captive State: The Corporate Takeover of Britain* by George Monbiot, and *Suiting Themselves: How Corporations Drive the Global Agenda* by Sharon Beder. The corporate life form achieves political control by exploitation of the inherent advantage of The Race to the Bottom among Politicians. This requires tremendous amounts of deception, as documented in *Global Spin: The Corporate Assault on Environmentalism* by Sharon Beder and *A Century of Spin: How Public Relations Became the Cutting Edge of Corporate Power* by Dinan and Miller.

[17] The Dueling Loops are cyclic. See the complete Dueling Loops paper for an additional model showing this cyclic nature at <http://bit.ly/1EsxaZz>.

[18] Transition to a permanent Race to the Top among Politicians appears to be in its early stages in the European Union, a marvelous sign that it's possible. A strong education system gives Europeans truth literacy in their early years. Thereafter they are not as easily fooled as the rest of the world, on the average.

[19i] The nine sample solution elements for the change resistance subproblem may be found at <http://bit.ly/1PGWgQl>.

[20] Finidori 2014, *Collective Intelligence Is a Commons that Needs Protection and a Dedicated Language*: 79. Finidori went on to say on page 88 that "In particular we need to acquire capabilities to examine the dynamics that lock us into structures that are unfit and detrimental to the thrivability and renewal of the system through time." We could not agree more.

[21] The SIP analysis may be found at: www.thwink.org/sustain/analysis/index.htm.

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