

RAND EPRM SPECIAL SERIES
System Design for Complex Problems

April 27th and 28th, 2017

Part two of a special three-part seminar series on systems analysis and design

Hosted by the Center for Applied Network Analysis and System Science

Walter McClure, PhD

Chairman, Center for Policy Design

guest speaker



●1. Large System Architecture: *Toward a more systematic discipline for policy design and analysis of large social systems*

Friday, April 27, 2017, 12–1pm (PT) / 3-4pm (ET)

Santa Monica – m1474 (Pardee Rice Classroom) [HOST location] | m1250 (overflow)

Washington – w7401 | Pittsburgh – p4202 | Boston- b9037

Conference Line: (800) 747-5150, Access Code: 6904767#

Adobe Connect: <http://webmeeting.rand.org/networkanalysis>

2. Does the American Economy Need Redesign: *An example of LSA analysis*

Saturday, April 28, 2017, 12–1pm (PT)

Santa Monica – m1474 (Pardee Rice Classroom) | m1250 (overflow)

Large System Architecture:

Toward a more systematic discipline for policy design and analysis of large social systems

Walter McClure, chair, Center for Policy Design
presented at RAND Corp. System Analysis Methods Seminar Series, 27 Apr. 2017

Summary: Dr. McClure will outline a general theory and systematic methodology, Large System Architecture (LSA), for analyzing, designing and politically implementing policy to improve the performance of large social systems such as e.g. education, health care, the economy, etc. The product of LSA methods are “system redesign” policy strategies to align the structure and incentives of a large system with society’s goals for that system. He applies LSA methods to two example systems, the health care system and the economic system, to demonstrate LSA’s power to generate novel promising policy strategies largely missed by our current amalgam of policy analytic tools. Dr. McClure will pose LSA as possibly foundational to forming a discipline of policy analysis and action adequate to address increasingly complex large-scale challenges and opportunities.

Speaker: Walter McClure received a BA in philosophy and physics from Yale in 1959 and a PhD in theoretical physics from Florida State in 1967. In 1969 he switched from physics to health care reform policy. He worked at InterStudy under Paul Ellwood’s leadership from 1969 to 1981, at which time he left to start the Center for Policy Studies (now the Center for Policy Design). At InterStudy he worked with colleagues on the HMO strategy for health care reform, among other tasks drafting much of the Federal legislation. At the Center he developed Large System Architecture, which is a general theory of why organizations do what they do, and a set of methods to strategically redirect their behavior toward the goals society desires of them. With these methods he and his colleagues at the Center developed a health care system reform strategy to get better care for less, and developed a National Health Insurance proposal consonant with this strategy. The Center’s education leadership also developed leading public school system redesign strategies including a set of reforms known as public school choice, and most notably the process for creating chartered public schools.

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Hello to all of you here in San Diego and to our phone audience in Washington, Boston, Pittsburgh ... from coast to coast and all the ships at sea. I'm very delighted and honored to be with all of you. I have admired RAND seemingly forever, starting with Herman Kahn on thermonuclear war. And I've worked with and learned from some of your distinguished alumni like Alain Enthoven and Joe Newhouse. And so it's just very nice to be here and share ideas with you.

I hope to learn as much as I share. But full disclosure, I am here on a mission. I am a few months shy of 80 years old, and I have a half a lifetime of work, most of it unpublished for reasons I'll explain shortly, which I would like to share with you. Because what possibly better audience could I have for this stuff, the smartest folks in the field, powerful and connected. If you buy this stuff it might see the light of day and

be put to work. So I was pretty excited last night thinking of today. Your media folks might title this video “Sleepless in Santa Monica”.

So I come to your door like a raggedy itinerant peddler with my carpet bag full of shiny wares to show you, and hope that you will see the promise in this stuff. I know none of you have read the handouts because you are very busy people, and what I hope is to show you so much promise and possibility that you will be too busy not to read them when I'm finished.

Okay, so let's see what is the first thing I've got in my carpet bag? Ladies and gentlemen step right up, I have this handy dandy universal health care and coverage proposal. It's called *Informed Consumer Choice*. What with the hot debate over replacing Obamacare, what could be more timely? Except it dates from 1985 and was called “Buy Right” back then. From the moment I backed out of theoretical physics to do something I thought might be more useful for the country – we had enough natural science and we needed a lot more social engineering – and found myself unexpectedly in health care, all I wanted to do is figure out how can we have national health insurance with high quality care and coverage that won't eat us out of house and home.

I think I have an answer, and it's different than anything out there in the conventional health policy conversation. And so I hope you'll take a look at it. And if you like it, it needs some detail engineering, and most of all it needs a bill. And my outfit, the Center for Policy Design, doesn't presently have the budget or manpower to do that. So if you like what you see, please pile on. We'll need all the help we can get.

Second in my bag of tricks, I have a public education reform strategy. It's called *Public School Choice*. You may have heard of it, it was developed by my brilliant colleague Ted Kolderie, and it introduced to the nation the concept of chartered public schools – public schools chartered by the State to compete with district public schools, so that by parents exercising choice, good public schools, chartered or district, could draw students away from poor public schools, chartered or district, which could then be closed. This strategy too needs some refining, and particularly needs marketing. You probably have heard of charter schools...that's all off our boiler plate from the Center. That's where it came from.

I'll speak a little bit more about it in a moment, but the point I make now is that every special interest that can claw its way into a statehouse has twisted this strategy into its own hobby-horse, and in many states it has very little to do with what we recommended. Charter schools are public schools – not private, not profit, not religious, not for breaking teacher unions, not for resegregating schools – they are public schools chartered by the state Instead of districts. And after we have talked about the theory of policy design we use at the Center, I'll tell you why we came up with this particular education reform strategy.

Third, I have for you a start on a strategy to redesign the economy, which, given the stakes, is the most important thing I'm doing. One of the pleasures of nominal retirement is I don't have to confine my work to health care anymore, and can apply the Center's

theory and methods to other large systems. But if my analysis of the economy is correct, if we do not redesign this flawed economy, we're going to lose the Republic. I'm very serious. Read the handout, and we will spend tomorrow's lecture on it ... I mean it's too important to rely on just my own analysis. I desperately need peer review on this, so check me out. Also this is the first time I've public circulated anything or spoken on economic redesign, so this is an exclusive for you here.

I do not expect to even complete the design before I sink gracefully into senescence, and certainly not the implementation. But maybe I can get the diagnosis delineated clearly enough that we can see our way through to a new design and its implementation. So, graduate students, beyond the diagnosis that's your homework assignment for the next ten to fifty years. People say, "what, you think you can redesign the economy?" Why not? Adam Smith did. I'm just sitting at the feet of the master. As you can see, we make no small plans at the Center for Policy Design.

Finally, fourth, and the most important thing we'll talk about today is I want to share with you a very general formal theory and set of methods for analyzing, designing and implementing policy strategies to improve the performance of large systems – large systems like health care, like education, like the criminal justice system, like the finance industry, like the economy, and on and on. I call it Large System Architecture (LSA for short). It's a very general theory; I'm quite delighted with it. I understand that RAND is very aggressively looking for the next generation of policy analysis tools to deal with complex issues. And I'm thinking that this might be part of what you're looking for.

Everything I have pulled from my carpet bag today, and what makes each of them different than everything else you find in the conventional policy conversation on these issues, springs from this theory and methods. It is the best way we have found to think about policy strategy for large systems; we use it constantly at the Center and hope others may find it equally fruitful and improve on it.

Spoiler alert: I know there are a lot of card-carrying economists in the audience. And so I need to warn you that every non-economist I have shared this theory and methods with has found it a kind of revelation, an epiphany that makes them see the world differently and more clearly. But every economist I've shown it to finds it a big yawn ... nothing new here, we already know all this, we're already doing this. So one of the more important things in our discussion while I'm here is that you can persuade me that LSA is merely old wine in new bottles, and maybe not very new bottles at that, or I can persuade you that maybe LSA *is* new wine, not only new wine but very good wine. And you can help me make it better.

The only place I have written up this theory is the unpublished paper I've given you in the handouts. Unless you've been there, the paper has much more content than a casual reading may suggest. The subject really demands a book. But I don't think I'll live long enough to write that book, I got a lot of other stuff on my plate too.

I think people only grasp the full power of LSA by seeing how it's developed and applied in real cases. I'll try to touch on a bit of that today, but I can only do enough to whet

your appetite. Let me give you a quick example of how LSA jumps the track of conventional thinking. Two weeks ago the Opinion Section in the New York Sunday Times had an article by a very nice education professor lambasting Education Secretary Betsy DeVos for dismissing public schools as being too slow and difficult to reform and recommending more nimble schools like charters and vouchers and so on.

The professor's rebuttal consisted of describing this extraordinary school district in Tulsa, Union School District, which is doing everything you want a school district to do. It's in a high minority, low income neighborhood, and its schools and students are performing well above the national average on any metric you care to measure with, and on a per-student budget well below. It was a very informative article. Union sounds like the Finns: they put the kid first and the curriculum second. They've turned their schools into community centers, all-day hangouts essentially, they're even helping the parents get jobs. And every kid is known to somebody on the staff...their personal home situation, their progress in school, and so on. What more could you want from a public school district?

The good professor cites a few other exemplars in a few other states around the country. But he doesn't think to ask if I walk next door why aren't they doing the same thing in the next district? Why isn't all of Tulsa doing at least as good or better than this district which has been doing this for 20 years? The professor titled his article "What An Ordinary Public School Can Do". Perhaps a more apt title might be "What An Ordinary Public School Can Do, But Most Don't."

The same thing is true of Secretary DeVos. She says, well we've got to get these better, more nimble schools like charters, religious schools, and so on. Well maybe they can be more nimble. But there's no guarantee they will be. You have to hunt just as far to find one of these fantastic charters and religious schools as you do for one of these fantastic district schools. Both the professor and the Secretary see the problem as poor schools and the solution as better schools.

And that's where LSA thinking is so different. When you use the lens of LSA and see a large system like public education, or health care or whatever, where most of the organizations seem to be sub-performing on important goals, you don't ask what's the matter with the organizations. You ask what's the matter with the system.

Okay, because usually in large systems with problem performance, people don't ask this, they ask what's wrong with the organizations. What isn't obvious to most people is that organizations operate in a larger system, which I call a *macrosystem*, a large system that serves a definable purpose for society and consists of all the strongly interacting organizations and people necessary to accomplish that purpose.

When most people say health system or education system or criminal justice system, they aren't thinking like systems engineers. It's just the plural word they use for all doctors or all criminal justice institutions or all educators. They don't see the system in the technical sense, "system" is just a vernacular plural term they use for all organizations and people in the system. But when you start thinking about these large

systems as formal systems in the systems engineering sense, you suddenly realize what a large formidable system they are.

Every large system has all these very formal and informal rules of strong interaction that the organizations must obey. And most importantly, these systems place incentives on the organizations within them: if they follow the incentives they prosper, if they don't they suffer or even go out of business.

And that's the heart of Large System Architecture. It's a very obvious idea in retrospect. It's apparently a rather unobvious idea in prospect: it certainly took me some years to get there, and not many other policy designers seem to think this way yet.

My poster boy for ideas obvious in retrospect but not in prospect, is the arch. How many years did people build in stone before the arch was discovered? Maybe 3000? Once you see one its obvious. But until you see one, it's not obvious at all. The Egyptians built in stone for thousands of years and never found it. The Greeks never found it. The Mesoamericans and Incans never found it. The Romans finally saw it, and if you aren't an inheritor of the Romans, you still don't have the arch. This whole idea of macro-systems likewise seems to be unobvious to people. And somehow I fell into it by the way I got educated realizing the HMO strategy for health care system reform, of which I was one of the assistant architects, had failed. I now realize I was using LSA intuitively for several years to come up with a new strategy for health care reform ... the Informed Consumer Choice strategy I mentioned earlier. But once I finally saw how to formalize it explicitly, oh joy, it had nothing to do with health care per se, it applies generally to a broad class of macrosystems.

So the LSA idea is this: when you see some macrosystem where most of the organizations are not performing well on important objectives, don't start trying to treat the organizations or their bad performance directly. Look underneath at the structure of the macrosystem itself and the incentives it places on the organizations. It is this structure and its incentives that reward and drive the observed performance of the organizations. And almost always when most organizations are thriving by performing badly, the bad performance is due a deeper underlying cause: a flawed macrosystem structure and incentives enabling and rewarding the undesired performance. Think of the bad performance as symptoms and the unsound system structure and incentives as the diagnosis. And if you wish to cure the symptoms, you've got to address the diagnosis. Unless you cure the diagnosis, the symptoms will keep coming back no matter what you do. So policy must aim at correcting the unsound structure and incentives in those systems where most organizations are chronically performing poorly.

When you have a good system where most organizations are performing as society wishes, you will find that the underlying macrosystem structure and incentives are sound: they enable and reward the organizations for the desired performance. I mean we have some wonderful macrosystems. Look at the car industry, look at the computer industry. You can't make better cars and computers *that consumers want* for the money than they're doing today. It's extraordinary. (Of course many complain that cars should

among other things use less fossil fuel. But with current technology such cars cost more and perform less well, and without incentives Americans don't want them and they don't sell. In Europe high gas taxes give strong incentive for people to buy such cars and drive less, and these taxes can be used to maintain infrastructure.) Of course economists say we know all about that. Markets and all that. Adam Smith and his unseen hand, blah blah blah. Now look at macrosystems that aren't doing so good. Do people say Adam Smith and the "invisible hand". Not so much.

Take the health care system, for 50 years steadily eating up more and more extraordinary amounts of GNP and nothing stops it. And every time there's a statistical fluctuation where it doesn't go up quite as much as last year, there is much self-congratulation that some tinkering policy has contained cost. For example, there was a brief claim that the Affordable Health Care Act was containing cost. No it hasn't. And before that DRGs, a hospital payment reform was claimed to be containing cost. No it hasn't. The incentives haven't been changed. Cost will just keep marching up until we change those incentives. But do people blame the incentives? No, they say greedy doctors, for-profit insurers, unhealthy consumer lifestyles.

Okay, how about the finance industry? It crashes the economy, twice now and getting worse. How about education? It seems like our schools cannot educate a substantial number of our children adequately let alone well. And it's been happening for 50 years. So what's wrong? The finance industry is the result of 30 years of bad decisions eroding sound structure and incentives, very bad policy design ignoring unsound incentives. And education and health care we've been working on for 50 years and not curing the problems. Why? Because policies are aimed at symptom curing, not going after the diagnosis. They've consistently ignored correcting the unsound structure and incentives of these systems.

When I say the diagnosis is unsound structure and incentives, by unsound I mean they're not aligned with the goals that society wants for that system. And until we change that, nothing will change. It's just like medical care: when you symptom-cure, the symptoms keep coming back. Until you can figure out the diagnosis and address that, that's when you finally cure the illness.

Now the cure for an unsound system is system redesign: designing and implementing a new, sound structure with sound incentives for the system which enable and reward the performance society desires. Tinkering policies trying improve symptoms are easy but usually have little lasting effect. System redesign policy is very hard. But the logic says that's the cure. And so if you're politically unwilling to undertake it, prepare for another 50 years of seeing your GNP eaten up by medical care, and more collapses in your economy as this finance industry goes off on its next tear. So it's very obvious in retrospect now, what policy has to do to correct these malperforming macrosystems. LSA theory tells us that. We need to convey that to policymakers.

Just a couple other insight points. Notice what people ascribe the bad behavior of poorly performing systems to. It's not the system. On the left, they blame the people or organi-

zations in the system. They say the health care system's problems are due the greedy doctors and the for-profit insurance companies. In education it's, oh, those teachers are incompetent or lazy and we need to select and train them better, or oh, it's those teacher unions and so on. And left-oriented policies aim at government commanding the people and organizations to perform properly...make them straighten up and fly right. On the other side, you have the right saying, oh it's all that government interference that's making the problems. Right-oriented policies aim to get government out. They assume the system is fine, and it will work fine if they can just get the left to stop all this government meddling. They fail to recognize the system is unsound, and that only proper policy can make it sound. For example, they assume private markets are self-correcting, even though Adam Smith taught us they were not. Markets behave well only if government assures they have sound structure and incentives. The moment government doesn't do its job of keeping the structure and incentives of markets sound, they quickly become unsound, as Smith observed, and serve the interests of producers instead of the public.

So the right kind of government interference, maintain sound structure and incentives, is indispensable. The wrong kind of government interference is what the left wants to do: which is the moment that they see an industry performing poorly, they want the government to step in and use strong regulation to order the industry to perform as society desires. This is termed 'command and control' regulation. Well, we've known ever since Charles Schulz that that such command regulation never works nearly as well as its advocates hope or assume. And look at the reason: in a badly performing system the incentives reward the bad behavior and punish the desired behavior. So command regulation is trying to order organizations to behave in ways that the system punishes. And if organizations fight or evade the regulation successfully they prosper, and if they don't. they lose money or even go out of business. So they fight and evade, and there starts an endless cycle where government tries to strengthen its controls and micromanage, and organizations up their resistance and evasion, and you just add increasing red-tape, rigidity and expense without curing the problem behavior.

For example, government wants providers to be efficient, that means get good health results but earn less on each patient. Well, if every provider did that, 20-30% of them would be out of business, and the most efficient would be the first to go. They don't get any more patients; indeed patients don't know who they are, nor have any way to find out, nor have any incentive to switch to them if they did. So providers simply resist, tokenize and evade command regulation ordering them to be efficient. So such command regulation is trying to spit into the wind and it doesn't work. And so they lay on more command rules and more red tape. And now you're into exactly the kind of interference that conservatives rightly worry about, you stultify the system with red tape.

The current euphemism for government command and control in health care is 'single payer'. Well we've had a single payer system for 50 years. It's called Medicare, and it's the most inflationary program in the system (not that the unsound private market has done much better if at all). It's got an absolute lock on the senior market, which is 50

percent of medical care cost . What have they been doing with all this authority? ... trying to order a system against its incentives instead of trying to change those incentives.

And here's the conservatives and their policy is: get the government out. Read their proposals. Now health care is a terribly unsound market and violates all the structural conditions that economists have set up for sound markets. And you would hope we have learned from Adam Smith that unsound markets don't self-correct; the government has to correct them. That's why we have an FTC. Except it's made up of too many lawyers and they think they can sue their way to a sound market; markets have other structural problems than monopoly, and you can't fix them by suing, you have to legislate and enforce the necessary structural conditions. So by getting government out instead of legislating and enforcing the required market conditions, you leave the health care system in the same unsound cost-escalating mess it's been for 50 years. Now that's a poster-boy example of what happens when policy designers and policymakers don't realize that the diagnosis is the unsound system not the individual organizations and people.

I mean does anybody think that the car industry works, that the computer industry works, because of the virtue of auto executives? There's just as many greedy and profit-seeking people in those industries as any other. Okay? And yet those industries work well. So the point is, that in any large system of people you have just as many saints and sinners, just as many dunces and geniuses, just as many in health care as in the computer industry or the car industry or education, and in one system it all works well. And in another it doesn't. Why?

Because of the incentives. If the structure and incentives are aligned with the society's goals, then the right people do the right things for the right reasons and they prosper, and the wrong people do the right things for the wrong reason – it's the only way to prosper. But no matter their motives, right or wrong, they all do the right things or they're out of business. And that's why system redesign is the cure for chronically malperforming large systems.

The alternative to system redesign in these malperforming macrosystems is what we've been doing in policy for 50 years: symptom-curing, which the estimable Louis Butler satirically labeled 'omnibus tinkering'. So LSA tells us policy design for large systems comes down to omnibus tinkering versus system redesign.

Okay, so if all this is so wonderful – and I'll lay out the postulates and the methods of LSA in a moment – if it's all so wonderful, why isn't it published? And the answer is that in 1986 I ran into a little problem called major depression, and my wife, whose father had it, recognized it and wouldn't leave me and saved my life. And after some soap opera I was carried off against my will in a squad car to a psych ward, where three weeks of electroshock brought me back to sanity for a while.

Unfortunately it didn't hold very long. But for the six months to a year that it did, this theory got done. I mean I was brimming with optimism and energy and creativity. Maybe the electroshock is responsible but I don't recommend it. Ask me about it sometime.

At any rate so my life was saved by our medical profession, and not just from depression. I have had two major heart attacks, and in the second, my heart stopped on the table and I was brought back from death's door by very skilled dedicated people. Further, my oldest son was brought back from death's door in Hawaii. He had been wading in a stream, cut his toe and by next morning was virtually unconscious with this raging lethal tropical infection. We rushed him to the Kaiser Hospital in Hilo who saved his life. And my youngest son was born with an open palate, and with the help of some extraordinary surgery and speech therapy is now good as new; you'd never know. So I owe our health care system a lot. And so by addressing its problems, I'm trying to repay the favor, though the patient...that is, our health care system...isn't necessarily happy about it.

Well, how did I get going again? I started coming out of this 15-20 years later, in 2004 when they finally found an antidepressant that would work. It was many months before I realized it was working, because remission is just as insidious as onset. I mean I had nothing to be depressed about except that I had it ... just the wrong genes and a lot of stress, which is well-known to provoke it.

To underline the point about stress, I can tell you, trying to run a little nonprofit think tank with the incentives in health care and in the grantmaking community stacked against you is stressful. You've got to have ideas, you've got to sell the ideas to people who can act on them, you've got to manage a little organization, you've got to kiss a lot of well-meaning butts for money from people who don't understand what you are doing and want immediate results. I believe we need some system redesign in the nation's voluntary grantmaking system, but I won't take that out of my carpet bag today, maybe in tomorrow's seminar, because I'm sure RAND has the same problems.

I stayed away from any professional work for five years. Particularly my wife was on me, no pressure she said or you'll go right back into the pit again. So I became a champion fritterer for five years. In retrospect I realize I've been a moderate depressive all my life, and suddenly I found myself waking up happy. This must be the way normal people feel; I was amazed.

So how did I get back (maybe say relapse back) into professional work. Well, Tim McDonald, your fellow graduate student, showed up. He was an intern in the Center working on education for my colleague Ted Kolderie, and had started staffing our board meetings. I scarcely knew him from Adam. I didn't do any work then, I just chaired board meetings and signed checks, and hired a marvelous guy, Dan Loritz, a retired senior vice president of Hamline University to be our CEO, just trying to make it easier for the people doing the actual work. I told Dan the privilege of being the Center's CEO is now you get to raise your own money if you want any. Neither of us has stopped working

really, because we love what we do, we just don't bother getting paid. If you love it, that's part of the stress: you can never do enough. And now I no longer try.

So Tim comes up to me after one of these board meetings and says, what is this theory you keep talking about in board meetings, where can I read up on it? And I said, well I never wrote it down. He says, well how I can learn it. I say, let's have lunch. So after a couple of lunches Dan tells me he is reassigning Tim to me. He needs some broadening, Dan says; he knows education very well, and has written a book on it. Now you teach him large system architecture and health care so he learns about more than one system.

So Tim and I had lunch every week for two years. And I immediately put him to work because 80 percent of your job as a large system architect is implementation – design is only 20 percent -- and you learn implementation by doing it with a mentor. And if you're not teaching implementation here at Pardee, you better. Because very few academic policy schools are teaching policy analysis students how to implement. You don't learn implementation skills doing research, you learn them doing implementation.

I certainly didn't find the key idea of large system architecture myself, which is incentives. The importance of incentives I learned from my previous boss, Paul Ellwood. I found myself working, quite by happenstance, in health care policy research for Paul after I backed out of physics. It seemed to me the dullest of subjects. I can assure you nobody wants a used physicist, and Paul was the first guy who took a chance on me. So that's how I wound up in health care in 1969, not by aiming for it but because nobody else would take me. As it turns out, it has been far more fascinating than I ever expected, the perfect field for a hard-nosed theory guy, and LSA has been the climax.

Paul was the head of a very distinguished rehab hospital, the Sister Kennedy hospital in Minneapolis, and he had this high paid, well-respected job, but had started this health care policy research office on the side. The reason, he said, was the faster we get a kid through rehab the less money we make; that's a terrible incentive to be inefficient that we've got to somehow turn around. And what did he do: working with his little research group, he ginned up something we called the HMO strategy. The research literature showed that in prepaid group practice, the faster and cheaper you get patients back to health, the more the prepaid group practice earns. So Paul asks how can we stimulate these prepaid comprehensive care organization throughout the nation. So we started working on that. Now, I didn't learn a thing from Ellwood about research. He doesn't think like a researcher and has no training in research, he's a brilliant intuitive. What I really learned, and what's hard to get in academia, is how to find ideas, how to have ideas, and how to boldly put ideas into action.

There would be no Center for Policy Design if I had not seen Paul Ellwood walk away from his high-level job as hospital CEO, walk right off the plank, to turn our small policy research group into an independent little think tank called InterStudy. That is real risk-taking. And real dedication, to the larger and insecure mission of health care reform rather than the security, remuneration and prestige of running a conventional health

care institution. And that's the kind of thing I'm watching and learning from Paul. Are you graduate students in policy getting that training here at RAND? It's invaluable.

The HMO strategy attracted some extraordinary talent, like Alain Enthoven and Clark Havighurst. And so there we were, a doctor, a lawyer, an economist, and a theoretical physicist. We didn't have an Indian chief but that might have helped too. And the strategy caught the attention of Lewis Butler who was then Assistant Secretary for Planning and Evaluation of HEW, charged with policy development in general and coming up with a remedy for soaring Medicare costs in particular. Any of you who know Lew know what a sensational guy he is...a great mind and bulldog determination for the public interest. You don't hear about him because he doesn't demand credit for the many things he has made happen. And suddenly our little group is working for Lew, and I found myself in 1970 designing and drafting the HMO amendments for Medicare and later the HMO Assistance Act.

I thought I had thrown away, you know, five years of graduate education when I got out of physics. But in fact what I learned to do that most people don't, is: when you have a problem you've got to find a theory or you don't know what to fix. So I was riding on Paul Ellwood's theory that if you could stimulate HMOs to compete with fee-for-service, it would reverse the cost-raising incentives in the health care system. But by 1980 it was clear to me HMOs were going nowhere and having no impact: health care costs were marching right up. The HMO strategy was failing.

That's okay. I'm a theoretical physicist by training. I did a two-year stint in rocket science (really not as a real rocket scientist myself but as an assistant to them), and rocket scientists know that the first rocket on the pad blows up. (For comparison, if you're a large system architect working on designing a government, think Articles of Confederation.) And while the press goes into hysteria that American science is failing, the rocket scientists go back to work. The engineers expect it to blow up... you can't make a million parts work perfectly together the first time... so they go all over it, find out what failed, blow up a few more rockets along the way, and then we go to the moon. Same way in LSA. You can hope but not expect your first system redesign strategy to work. Then you go back to the drawing board and try again.

Okay, so now I've come up with this new handy dandy strategy, *Informed Consumer Choice*, that I think might take us to the moon ... a health care system redesign that might work, get everybody high-quality care and coverage at a cost the individual and the nation can afford. And I have a way of staging it so we don't load the whole United States on the rocketship and fire it off untried, okay. It's always a good thing in implementation to try to stage your implementation, and make your course corrections before you scale up, so you aren't experimenting with the whole country. Like every other strategy I've mentioned in my carpet bag today, it is a product of LSA theory and methods.

So, like Tim asked, what is this theory I keep mentioning. Before I get to the formal postulates and theorems, let me do some more insight building and talk a moment

about the fact that we know sound markets work not because of private or for-profit competitors, nor because of unseen fairies with invisible hands. Neither do other sound large systems that aren't markets. They all work, market and non-market alike, because there's a formal structure, a set of structural rules that create the right incentives.

Adam Smith's invisible hand isn't invisible at all; you can make it quite visible just by analyzing the structure and incentives of your system. And if they're aligned with the goals society desires of that system, we call it a sound system and you're in good shape. You can tell policymakers to protect that structure, you don't want that structure changed accidentally or intentionally. Every special interest will be trying to twist it to serve their own ends rather than the public good. Conversely, if the incentives are not aligned with goals, we call it an unsound system, and you've got to redesign its structure to produce the desired, properly aligned incentives.

But economists say what we know all about sound and unsound markets. But we are way beyond just markets, we are talking about a discipline for political economy that I believe larger than economics: Adam Smith's "science of the statesman" to design large systems that perform in the public interest as society desires. Let me give you some examples.

The federal government is not a market. Yet it is one of the most extraordinary large system architectural designs in history, with ingenious structure and incentives to prevent government from tyrannizing the majority, and the majority from tyrannizing the minority, and to produce laws responsive to the will of the governed. And you can credit the architects: our founding fathers.

Or take market economies. A market economy is not a market, it is an economic system. Only half of it is markets, the private sector. The other half is the public sector. And what most people don't seem to grasp is that at least half, and from the standpoint of the public wellbeing the most important half, of the wealth produced in a market economy (including the American economy) is produced by that public sector. In America you might not know that, due the perpetual deafening false propaganda that the public sector is a parasite. But if you have any doubts, read the handout piece on Adam Smith. The market economy is one of the finest examples of large system architecture in history. You can credit the architect, the extraordinary Mr. Smith, for that.

And so I am not the first large system architect in history, my stumbling efforts are dwarfed by these giants. I'm just the first one to think of himself that way, because I stumbled into a way to think about macrosystems generally. Like me working on health care, these guys were working on a specific system, on a design for a government or for an economy, and didn't think about the generality of it. Nor did I until much later, when I finally was able to formalize LSA theory. So I'm not the first or the best large system architect, I'm just the first to realize, hey there's a theory here that can help us all when we're engaged in trying to do this kind of large system redesign.

My last example is the basic research system. It's a particularly telling example because it's a fine piece of large system architecture and it doesn't use financial incentives much

at all. It uses cultural incentives. Scientists aren't working to get rich, even though many certainly deserve it from the standpoint of the wealth they create. It sometimes happens...think Craig Venter as one example. But most of us are in there for serving the public interest and our curiosity and all that, but very much also for stature ... show we're smarter than that other guy over there, make the bigger contribution. We're all trying to outsmart each other and we advance the field doing that. And in many ways the grantmaking process is working well: research money generally if hardly perfectly flows to the people who contribute most (as I mentioned earlier, we'll talk about the imperfectly part tomorrow), and dries up for people who don't contribute enough and they leave the field and do something else.

America leads the world in science and technology because we publically invested more in basic research than anybody else. But when we turned things like Bell Labs, and RAND, over to client money, that's the end of long term thinking and research. Clients don't want long term thinking. They want a solution; this little immediate problem of theirs right now. You can't do long-term analysis and research on client money. How are you going to do a long term thinking and research whose results and success you can't predict often for years, unless you have long-term core support?

Alright, enough about LSA as a discipline for political economy. Let's get to the actual formal theory. This theory is the mountain top of my career. Remember I'd been using this theory intuitively for years but specific to health care. And being a well-schooled hard science theoretician I've been trying to formalize it all this time. And the dog just wouldn't sit down. And then here I am six months out of electroshock. The first month I didn't even know what I did for a living or where. They had to lead me to our offices and give me my papers to read. I didn't remember or recognize it was my writing for a month (I must confess during that time I was very impressed by the author, say I humbly). Gradually it came back to me and I gained more energy and understanding. And suddenly the dog sits down. I see the basic postulates and am amazed: it has nothing specific to do with health care, it covers many macrosystems.

I'm ecstatic, you realize. I'm a theoretician, a real theoretician ... I have discovered a theory. So my cup ran over.

Here's the postulates and, like the sublime Charles Darwin and very much in debt to his example, they are qualitative, not quantitative. I'll take just a moment to chide those economists who keep chasing the siren song of physics with its quantitative predictions, and have been narrowing their field out of applicability to the real world. I am the last guy to disparage trying to be quantitative, but you mustn't sacrifice reality to do it. Realize that the greatest book in science history, *On The Origin Of Species*, didn't have a single formula. And the greatest policy analyst of the last century, Jean Monnet, father of the Common Market, never produced a formula. We could hardly do better than if we could teach our policy students to think as deeply as Monnet.

The formal theory comes in three easy postulates:

Postulate 1. All organizations operate in a larger system, called the macrosystem, whose structure and incentives they cannot alter by their own efforts alone.

Postulate 2. The structure of a macrosystem places various enabling and restrictive constraints as well as creates various incentives of varying strength on the organizations within it, some sufficient to cripple or kill the organizations that try to oppose them, and others that will lead them to prosper the more they adapt to follow those incentives.

Postulate 3. (and the one that gives us hope): While no organization by its own efforts can change a macrosystem, organizations or society can do that by collective action.

And if society isn't doing it by intelligent policy, remember every trade association is a large group of organizations using collective action to try to change their macrosystem in their favor. That's what they are all doing. So okay, Congress, forewarned is forearmed. Except sometimes it seems this Congress is trying to help them.

So that's it, that's the theory. See what I mean: dog just sat down, and not a word about health care. Applies far more broadly. Very obvious in retrospect, took a while to see it in prospect. And you can derive a lot of theorems from it useful for analysis and redesign of a problem system; you can find examples and applications in the handout piece on LSA.

The theory is not universal. The postulates are true by inspection, and for any large system that violates the postulates to some degree, to that degree the theory will not be valid; it will produce incorrect predictions for such systems. For example, any macrosystem with an organization that can alter that macrosystem by its own actions alone violates the first postulate, and LSA does not apply. However, it appears that quite a broad class of macrosystems do satisfy the LSA postulates rather well, and for all these LSA will be valid. And even when a problem macrosystem violates the postulates, you can sometimes come up with a redesign for the system that satisfies them and installs sound incentives.

Now I said at the outset that LSA is not only a theory but a set of methods for applying them to analysis, design and implementation of system redesign policy strategies. So here come the methods. They divide into two kinds, those for analysis and design, and those for implementation. I'll start with the analysis and design methods, and touch on implementation methods if I have time. But you can read an outline of them all in the handout on LSA.

The analysis and design methods are based on a very profound idea. It's not mine, I read it in a book in 1970 and it's stuck with me ever since. It was a wonderful book on the methods that were used by NASA for the moonshot. I wish I could remember the title, but it seems to have permanently left me, but I've been using many of those methods ever since. NASA did not invent new engineering technology, indeed the genius administrator, James Webb, ordered a freeze and declared they would go with

existing scientific and engineering technology. Webb saw their biggest problem as to bring it all together, the most massive domestic project in human history. To accomplish that, what NASA really invented, pioneered, was a whole new management technology: PERT charts, Delta estimation, etc. – which I have found very useful. And one of the most useful things I learned was the definition of a problem.

Think about the following crisp definition and compare it with the usual muddling way we usually think about what constitutes a problem. A problem is crisply defined in systems engineering as a discrepancy between performance and goals. And what makes that so profound for macrosystems is: until you've properly identified your goals, you don't know what your problems are! You see all these people talking about policy problems, and the list soon grows voluminous and incomprehensible. They haven't thought about what the goals are, nor agreed on goals, and usually there are folks in various parts of the system who have their own idea of the goals, very different than the public interest.

So you as a large system architect, it's your job to figure out proper goals for the system, indeed it's the first task on the list. If you don't know the goals, you don't know the problems. You can't proceed sensibly. You can't assess whether the system's performance is discrepant or not, nor can you diagnose why any discrepant performance arises if you don't know what it is. So the first task is to arrive at proper goals.

Let me list the three steps of how LSA analyzes a large system, then make a few comment on each:

1. Identify a complete set of goals for the system.
2. Assess the actual performance of the system on each of the goals.
3. Analyze the underlying system structure and incentives which drive the observed performance.

Once this analysis is complete, you know the actual problems of the system, all performance unacceptably discrepant from goals. You also know the faulty structure and incentives that drive this unacceptable performance. That is what will have to be altered and corrected by any proposed redesign for the system. Conversely, if the system is performing well on all goals, it also tells you the structure and incentives are sound, i.e., aligned with goals, and policy should protect this sound structure to assure the good performance is maintained, and not allow it to erode either by intention or inattention. Policy must maintain constant proper oversight of all large systems to protect and maintain structure and incentives that are sound, and redesign and correct them when unsound.

It may appear that these analytical tasks should be carried out in logical sequence, but I assure you in practice this is not so. They are constantly iterated, going back and forth, and slowly gaining insight and refining the results of each step. And it may take months to years, especially when you add in the fourth step: coming up with a sound redesign. The analysis does not tell you how to redesign the system to produce good performance; like all design, that is a matter of talent and experience. The analysis does tell you what the desired performance goals are, and what underlying unsound structure

and incentives must be altered, but you will have to invent the new sound structure with sound incentives yourself that will reward the desired performance.

I could talk a ton on each of those steps, but given our limited time let me make a couple key comments on each. The first step is goal setting. You must ask yourself:

What are a reasonably complete and proper set of goals for this system?

- a. what performance goals does the public want for this system, but also
- b. what goals should the public want if they are not to unknowingly undermine their general welfare.

I will begin with a very crucial point about goals. Then I'll give you a couple examples how bad it is when you don't get them complete or right. But bottom line, your first task as an architect is to help the public clarify what the goals of the system should be to improve the system's performance in the public interest and wellbeing.

Perhaps the most crucial point on goal setting is this: you as LSA architect have no power to decide the goals, you only have the power to propose. It's just like a house architect. He doesn't decide, the client decides. Similarly, if you're a large system architect, then those with the legitimate authority to decide ... your "clients" so to speak ... are the relevant elected and appointed officials. They are the ones who should and do decide. Now, you can help them by clarifying goals and clarifying what the problems are and clarifying what the structure and incentives are that need to be changed. You can then recommend what you think the goals should be, and tell them, that if they agree, you also have this handy dandy redesign strategy for them which you think will achieve these goals. And they can accept or reject your proposed goals and, independently, accept or reject your proposed redesign strategy, and/or send you back to the drawing board on any part of either. And that's why marketing is so important. You have to persuade them.

Now special interests in any large system hire marketing and propaganda geniuses often to misinform the public and distort proposals to their own advantage rather than the public interest, so LSA architects must develop the same skill if they wish to counter them successfully. I call this the rhetoric battle. Al Franken, our Democratic Senator from Minnesota made a crack about the Democrats poor skill at marketing: the Republican bumper sticker just says "no", our bumper sticker says "blah blah blah, to be continued on next bumper sticker". So LSA architects, like Democrats, have to become much better at marketing if we want to see our proposals accepted and implemented intact by both Republicans and Democrats.

All right let's talk about some examples of poor goal specification. The first is an example of the damage done by an incomplete set of goals. Medicare and Obamacare considered only the goals of (1.) high quality coverage and (2.) affordability to the individual. Neglected were the goals of (3.) quality of care and (4.) affordability to the nation. There was no mechanism to assess quality of care, nor was there a single incentive on either patient or provider for economy. In fact the incentives were the opposite, rewarding cost independent of quality ... i.e., rewarding provision of ever

more, and more expensive, medical services even if they had little or negative impact on health. As a consequence, “medical error” is now the third leading cause of death, and a bloated health care system is eating the nation out of house and home, depriving of funding all other social programs that would have substantially greater impact on improving the nation’s wellbeing, including its health, than more superfluous medical services.

Now because goals interact in any complicated system, it is usually difficult to tack on a major new goal after the fact. The entire system must usually be redesigned to accommodate any such new goals. For example, if you wish to double the payload of a rocket, you can’t just double the size of the rocket, it has to be redesigned; the same is true of macrosystems. Thus in 50 years Medicare has not been able to tack on either quality or cost control in any more than token fashion. The beneficiaries are happy with these programs because they get medical services freely and affordably, a veritable free lunch, and do not see their ever-ballooning true cost: namely, the damage it is doing the federal budget, lagging health levels, and other needed social programs much more valuable to health and wellbeing. It will likely prove politically difficult to redesign these programs because the free lunch must be replaced with an affordable but properly incented lunch, and voters do not like losing a free lunch. But it must be done if we are to end this disaster. It is this kind of damage that prompts LSA to start with a complete set of all the important goals for any given system.

My second example of bad goal specification concerns the consequences of misidentifying the proper goals. I’ll use the economy as my example macrosystem, so we’ll get a jump on tomorrow where I have promised to do an illustrative LSA analysis using the economy as my example. Okay, what are the goals for the economy? Now if you talk to the economists and the bankers who are managing our economy, they have a bunch of goals, and a bunch of tools ... fiscal and monetary policy ... to manipulate the economy to achieve those goals.

The goals include such performance objectives as: is GNP growing adequately; is inflation suitably low and under control; is unemployment suitably low and under control; are markets, particularly financial markets, suitably sound?

Okay, so if you ignore the era before the great crash of 2008, where it is clear the economy, particularly our financial markets, was grossly mismanaged, and you look at the era since the crash, then measuring against those goals our economic managers appear to be doing a slow but creditable job. That’s a notable achievement, good if not great. So everything would seem hunky-dory except for one thing: I contend those aren’t the real goals... maybe for some other country, but not the proper goals for the economy of the United States of America.

Here’s this complicated macrosystem to create and distribute wealth. What does society want, or what should society ...American society... want, of the economy. Well, the United States has a very clear statement of goals, and these goals are what fundamentally make us a great nation. I believe it the noblest, tersest, and most moral

expression of national goals in history. It's called the Preamble to the Constitution of the United States (although we must not overlook the goals at the beginning of the Declaration of Independence, too). And the two goals in the Preamble of relevance here are (1) to promote the general welfare and (2) to secure the blessings of liberty to ourselves and our posterity.

So now how are we doing on these, the real goals? When we measure our economic performance against those goals it is a totally different story. When you measure against the general welfare, we're not doing well at all. By virtually any measure used, it has been almost flat for several decades. And when you measure general liberty, by any number of qualitative measures it appears to be actually gradually declining. And if you then do your LSA analysis of the structure and incentives in our present economy, you find the structure and incentives are perverse, highly destructive of the general welfare and liberty without any natural or built-in check. If this flawed economy is not redesigned, the Republic is headed for disaster. I will elaborate on all this tomorrow, and you can also read about it in the handout tonight if you are as concerned as me and can't stand the suspense.

Okay, remember I have no power to decide, only to propose. So who besides me thinks these are the goals. Apparently very few managers of the economy. Apparently few think that the general welfare is a goal. They pay some attention to it, but apparently they don't think it a major priority, let alone *the* priority: one of the two Constitutionally-obligate priorities for the economy (and all other aspects of American life) to which all other non-Constitutional economic goals are subordinate. Had our economic managers treated raising the general welfare as the overriding Constitutionally-obligate economic priority that it is, we wouldn't have the current president.

How about the general liberty? I don't know a single manager of our economy concerned about managing the economy for liberty, do you? They all appear to think ...not my job. Well if we don't think about liberty and redesign this economy, we're going to lose it.

Now notice, you don't have to agree with me on these goals. I am a LSA architect, all we architects can do is propose, not decide. I have to persuade you these are the proper goals that we should worry about with our economy. And if they are, we desperately need to redesign it. If you disagree, if our elected officials disagree, I lose. Except unless you can show me where my analysis in tomorrow's seminar, or more fully in the hand-out, is wrong, I think America loses...disastrously. Which means I've got a marketing job on my hand. And I never give up.

Thanks. Oh and thanks for the Pardee ball cap. I did wear a coat and tie just as proof of age. But now to show you how hip I am [...puts on gift Pardee ball cap with brim backwards.] ■