ECONOMIC GARDENING

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Christian Gibbons

To Phil and Kent, Jim, Susan, Stephanie, Eric, Garth, and Mark.
Without them Economic Gardening would have been stillborn in my brain.

And to Diana, who has heard this for 30 years.

PART I
THE BACK STORY

PART II
AN AMATEUR'S OBSERVATIONS ON THE ECONOMY

CHAPTER 1 SAVING WAKITA

Economic Gardening is building a nurturing environment for local entrepreneurs, and in particular those second stage emerging growth companies that export innovation.

You can quit reading now because that is my thirty years' worth of experience condensed into a single sentence. I'll expand on virtually every aspect of that sentence and yet, when we get to the end, it will still come down to those exact same sentiments.

I have never considered myself to be an economic developer. I didn't set out to do that, and I hardly ever associate with the people in the profession. I don't belong to the professional associations, don't go to the conferences, and hold no professional certifications.

What I have done since I was 16 years old was to think about how to save my hometown.

Wakita, Oklahoma, a wheat farming community in north central Oklahoma, is my hometown. You may know of it if you saw the movie Twister – it's "Aunt Meg's" hometown that gets destroyed by an F4 tornado at the end of the movie. Like so many of the communities in that stretch of Great Plains, it has been in a century-long decline. It was established shortly after the Cherokee Strip Land Run in 1893 when one hundred thousand people (including a couple of my great grandfathers) spurred their horses across the prairies to claim 160 acres of land for their own by the simple act of driving a stake in the ground. Wakita's population never exceeded 500 people, but the surrounding wheat farms were dense with families.

Wakita only has one distinguishing fact in this story: it happened to be the center of the universe. I don't mean figuratively, I mean actually. The greased pivot point was out there on Main Street. Dallas and Kansas City and Denver were in near orbit. New York and L.A. were in a far orbit. Paris and Beijing were barely visible from the center of the universe. Mars and Venice were small specks of light, and other stars were just smudges in the Milky Way you could see at night—but clearly circling Wakita.

So, in 1957, it bothered me a little bit that the physical center of the universe seemed to be struggling. Something wasn't quite right—like a small rip in the fabric of the universe. As it turned out, my hometown was dying.

This made no sense to me because all through my childhood, it had been nothing but a thriving place. My dad came home from serving in the navy in the South Pacific in 1946, and I was born in 1947—on the leading edge of the massive baby boom generation. During all my early years in Wakita, there were kids everywhere. The town was busy, the stores full of people, the school bulged at its seams, the athletic teams won, and the future always seemed bright and full of prospect.

That first little rip started with this seminal event: somewhere in all that hyper-activity of the baby boom, the movie theater closed. I was pretty young and have no recollection whatsoever of the actual day it closed. But shortly after that, the drugstore, where the sophisticated among us

ordered vanilla cokes and the unsophisticated carved their initials in the wooden booths in back, also closed. As I think back, the variety store, one of the grocery stores, both barber shops, two of three restaurants, the auto parts store, both gas stations, the produce store, the farm implement dealer, the liquor store, and the mortuary must have closed sometime after I left -- because they are no longer there today.

If you think this story has a Hollywood ending, it doesn't. I didn't save my hometown; I didn't even try. Wakita today has shrunk to a couple of hundred people, some of whom I still know. The farms that dotted every quarter section after the opening of the Cherokee Strip have been consolidated into massive operations controlled by the few remaining large-scale farmers. The farmhouses are gone with a real wind. Many of the farm roads are nearly abandoned, just tracks where the farm machines use it a few times a year.

This is the scar that runs through my life—it no longer hurts, but it never goes away. It is also the start of the story that ends in Economic Gardening.

Let's go back and fill in the rest of the story.

Besides wheat farming, there were two little industries on Main Street: Adams Hardfacing and Victor, which made hardfacing rod. Hard facing was an interesting technology invented in Wakita by an entrepreneur named W.E. Adams. Hardfacing addressed a peculiarly agricultural need in which a plow share slowly wears down and becomes blunt, making it more difficult to pull through the soil.

Hardfacing is a process of applying a metal composition called studite to the bottom edge of a plow share so that it not only slows down the wear but also continuously sharpens itself as it does wear. At the Adams Hardfacing Company, studite was melted onto plow shares and across the street the Victor Company produced the studite rods needed for that process.

I worked one summer for Adams Hardfacing selling the treated plowshares to implement dealers throughout Oklahoma and Kansas. I brought checks back to Wakita, so I could get paid and then go down to the drugstore to buy a plain coke. I'm sure Monk Guthrie, the owner of the drug store, took that money from the coke and bought groceries across the street at Loop's IGA. Mr. Loop went next door to Bonnie Tammen's barbershop and got a haircut. Bonnie went back across the street to buy aspirin at Guthrie's Drug and Monk deposited that day's profits in the bank on the next block, who then lent it to the farmers.

All this seemed like it could go on forever, moving the dollars back and forth across Main Street. Except that Mr. Loop bought a new car from Detroit, and Monk bought carpet from Dalton, Georgia, and some of our money left town. We didn't worry though, because the farmers who had been financed by the bank harvested their wheat each summer, selling it to flour mills across the country, and money came pouring back into town. It was like a bathtub in which the water was money. As long as the faucet ran faster than the drain, we were fine.

I think the reason economics always seemed so simple to me was that at this small scale it was so visible -- I could follow money from the moment I brought it into town (selling W. E. Adams'

innovation) and watch it move up and down the three blocks of Main Street. Here's what befuddled me: Why did that collapse? Why couldn't that happily go on forever?

Somewhere around my sophomore year in high school, I started clipping economic development articles, especially about the construction of the Port of Catoosa in Tulsa. You may think it a little strange (or a lot strange) that Oklahoma has a port, but the political power of Oklahoma Senator Robert Kerr and Arkansas Senator John McClellan had the drowsy Arkansas River dredged from the Mississippi River to Tulsa to enable barges to reach that prairie city. I was fascinated by the fact that a few humans could set in motion such a huge project that would affect the economic future of an area. It all seemed so progressive and oriented toward a better future.

In my senior year, there was a stunning economic development event in Wakita that made the pages of TIME magazine. The University of Oklahoma Medical School announced a statewide competition for a pilot project in rural health. The university was convinced that if you could combine a clinic, a pharmacy, hospital beds, a nursing home, and an apartment wing into one facility, you could improve the health care in small communities.

Incredibly, Wakita won the competition over 180 other communities. The Wakita Herald screamed in "second-coming" font type: **ITS OURS!** Later, TIME Magazine ran an article on the innovative future of rural health care mentioning Wakita's Community Health Center.

The Community Health Center Corporation was formed, and I took the $800 I had earned that summer and bought shares, the only high school student who did so. The center was built and the governor of Oklahoma, Dewey Bartlett, came to town to help dedicate the facility. Enthused by it all, I wrote him a follow-up letter naively asking if the State of Oklahoma would help our little town get a company to locate here. I got a form letter back and then never heard from him again. Looking back, it all seems so symbolic: I was dejected at my first amateurish efforts at recruiting while standing in front of something the entrepreneurs of Wakita had built for themselves.

After I graduated, I left for college but was always interested in how my little hometown was doing. As it turned out, it wasn't doing well. From that high-water mark, the community continued to slide. Farmers gave up, sold out and left. One by one, the retail stores on Main Street went under. The veterans who came home from WWII grew old and retired. Wakita High School graduates became bankers, doctors, lawyers for major corporations, Air Force Academy graduates, commanders of navy ships, and even the personal secretary for Laura Bush—but not in Wakita.

It was a heartache that Hal Ketchum would capture in four lines of the song "Small Town, Saturday Night":

> *Bobby told Lucy, the world ain't round*
> *Drops off sharp at the edge of town*
> *Lucy you know the world must be flat*
> *Cause when people leave town, they never come back*

There would be one last hurrah for my tiny hometown. In 1994, Steven Spielberg announced that he was filming a new movie to be called Twister, and he had selected Wakita to be "destroyed" by an F4 tornado at the end of the movie. For those who saw the movie, you will recall that the storm chasing team made a stop at Aunt Meg's house in Wakita to eat monstrous steaks and ruminate about what an F5 tornado was like ("the finger of God!"). The conversation is interrupted by the TV weatherman warning of a tornado outbreak, and the team races out of town with the helicopter shot pulling up toward the water tower painted with the words "Wakita."

The film crew was in town for over a year fixing up buildings and constructing sets, including the interior of Aunt Meg's house. Hollywood had come to the Great Plains to capture the spectacle of mile wide tornadoes erupting when warm, moist Gulf air slides up over cold Canadian air. The annual spring event of my childhood had become a blockbuster movie with the opening scene shot a couple of miles from my parent's home.

Eventually Helen Hunt, Bill Paxton, Phillip Seymour Hoffman, the cameramen, and the construction crews left, and Wakita continued its downward slide. The school closed in 2011 because there weren't enough students. The older residents keep their houses and lawns up, but the downtown has vacant, shoddy buildings reminiscent of The Last Picture Show. The last members of the Greatest Generation gather at the dwindling coffee club each morning before they move on—one by one—to the Community Health Center I invested in so many years ago. Poverty abounds.

Like many others, I also left and never lived there again. I didn't have a clear idea about a career when I left high school, and I never intended to be an economic developer, but this question never left my head: Why do some towns grow, and some towns die? Why have the powerhouses of the early-twentieth century like Akron, Buffalo, Flint, St. Louis, and Cleveland lost population and economic might? Why is Denver growing and Dayton dying?

How do you save Wakita?

CHAPTER 2 A LONG AND WINDING TALE

Leadville, 1982

The actual seeds of Economic Gardening were planted in my mind in Leadville, Colorado in the early 1980s. At the time I was working in that community as a consultant after massive layoffs at the nearby Climax molybdenum mine. The community was interested in attracting new industry to town to offset an unemployment rate that was approaching forty percent.

Understand that Leadville is above 10,000 feet in elevation and experiences winter conditions for much of the year. It was, perhaps, the extreme bleakness of the situation that set me on a different course of thinking. During my tenure there, I met two miners who had invented a resin bolt to keep the steel mats up overhead in the mine. A mechanical bolt does not touch the rock in all places on its circumference. A resin bolt consists of two liquids which, when combined, become extra hard—but even more important make one hundred percent contact with the rock.

After the meeting, several things occurred to me. First, even in isolated Leadville, there were unique skills and knowledge that were marketable. Here were two guys who knew the mining industry extremely well and had invented something that would be very useful. Second, I thought about how many mines there were in the world that could use a resin bolt—a potentially huge market. Third, I started thinking, wouldn't it be more productive if the community shifted its focus from trying to attract companies to a pretty harsh (albeit beautiful) environment and instead concentrated on growing local companies which had specialized expertise? The people most likely to live in and love Leadville were the people who grew up there.

I never got very far with that newly developed idea in Leadville, but the concept never left my head. About five years later, the opportunity to try out the idea rose again—this time in Littleton.

Littleton, 1987

In 1987, I was hired as the director of economic development for Littleton. This was the era when the Berlin Wall came down and the USSR was collapsing. There was much talk about a "peace dividend" that would accrue to the nation as we shifted from defense spending to domestic spending. The only problem was that Littleton's major employer was Martin Marietta, a defense contractor, which proceeded to lay off nearly half of their 15,000 employees in the area. There was nearly a million square feet of vacant retail, industrial, and office space. Downtown vacancies were approaching thirty percent.

As great a corporate citizen as Martin Marietta was, the Littleton City Council expressed concern about having our future being dictated by out-of-state corporations and directed staff "to work with local businesses to develop good jobs." We never got much more direction than that.

By way of background, Littleton is a Denver suburb. It was founded by a New Hampshire surveyor by the name of Richard Little who came west to lay out irrigation ditches among other

things. Littleton is nearly as old as Denver, being established in 1872 as an agricultural town 12 miles across the plains from Denver, serving gold miners who flooded into the area. It remained a small town with a population of 3,300 as late as 1950. In 1955, the Glen L. Martin company set up a missile manufacturing plant in the shadows of the Rocky Mountains, and many of the well-educated, well-paid, *real* rocket scientists lived in the nearest community – Littleton. The population boomed to over 26,000 during the next two decades as the community benefited from being an outer edge suburb with a premier school system and many community amenities. Today, the outward surge of metro area growth has long since passed Littleton. and it is an older, inner ring suburb.

But in the late 1980s, the community was facing one of its worst economic crises in its hundred-year history. For me, it was a perfect alignment of the stars—an idea I had been nurturing for five years crossing paths with a community with a stated need to grow local entrepreneurs.

If the following story seems rather hodge-podge and disconnected as it unfolds, that's because it was. Economic Gardening did not spring from the earth, fully formed in a nice tight theory-and-practice package. It was more the product of lots of trials and errors and blind alleys and screw ups. We spent two decades plopping pieces of clay onto our emerging work, hoping some of it would stick. To tell you the truth, a lot of the effort fell to the floor where it remains dried and buried by time and fading memories.

This then, is that long and winding story. Economic Gardening became integrated, coherent, and polished at the end, but in 1987, my boss Jim Woods (who eventually became Littleton City Manager) and I stood on the front end as enthusiastic economic nerds totally unprepared for what we were about to undertake. About the only thing we did right was to start looking for the smartest people in economics that we could find.

People Smarter Than Us

The first, and perhaps most influential people we met were Phil Burgess and Kent Briggs who were at the Center for the New West, a Denver think tank. Jim and I had been banging around ideas on how to create jobs locally, and I happened to hear Phil Burgess give a speech about how economic developers were always swinging for home runs when in fact baseball (and economic development) consists mostly of bunts and singles. Phil said, economic developers spend all their time hunting for companies in other communities, when instead they should stay at home and help their local companies grow. They should do less "economic hunting" and more "economic gardening." Hence the term. I did not coin it, Phil Burgess did.

I came back to the office and said "Jim, we could have given that speech. He said everything we believe in." We called Phil to request an appointment, went down a few days later, and an hour into our meeting agreed that we would serve as a test bed for Phil's "economic gardening" idea, if Phil and Kent would open the doors to some influential people. Over the next decade, they kept that promise in spades.

The first couple of meetings they hosted were with David Birch, the MIT professor who had written *Job Creation in America: How Our Smallest Companies Put the Most People to Work* in 1987. Birch had the idea to actually look at Dun & Bradstreet data to see where jobs came from. He came to the conclusion that small businesses produced about two thirds of all the jobs in the country. His work came under attack from several directions, but the second refinement produced an even more startling fact: It was actually a small group of companies (which he called gazelles) that were producing a great share of the jobs. The exact number has varied around 10% over the years, but the point to be made is that there is a substantial 80/20 rule at work. Birch coined the term "gazelles" to describe these nimble, fast growing companies, a term which has since come into widespread usage. This small percentage number turned out to be true for Littleton and seems to be generally true for most communities, with company towns being the obvious exception.

At the time, small businesses were the sweethearts of the political world and indeed we had sold our own program under that banner. However, as the data started to show, it wasn't all small businesses that were driving job creation, but rather a few fast-growing businesses (small companies that would soon be large companies), we got out of the small versus large debate. The real issue was about scaling.

One of the first tenets of Economic Gardening fell into place. It's not about *small businesses* per se, it's about *growing* businesses.

Paul Romer may be one of the least recognized names in the general public, but there is a broad belief in the economics world that he will receive a Nobel Prize for his work in endogenous growth theory. That's an expensive term for a simple idea: ideas drive economies.

Paul was fairly influential in the economics world by the time we found him in the early 1990s, but I think he took our call for one reason: His father, Roy Romer, was governor of Colorado and that's where we were calling from. Paul is a world class math whiz, but he has a way of converting formulas into simple ideas. "Economic growth occurs whenever people take resources and rearrange them in ways that are more valuable. Economic growth springs from better recipes, not just from more cooking," he said.

Got it. Plank two in the Economic Gardening platform: It's about *ideas* and *innovation*.

We could only wrangle an evening meal with Brian Arthur, but his Irish rebel reputation had proceeded him. Brian was convinced that economics had isolated areas of "increasing returns." Even people who have never had an economics course generally know that the rule is "decreasing returns." The more you put in, the less you get out-- and arguing the reverse has all the makings of a short academic career. And yet one had to explain this conundrum: Good basketball players go to Duke because they win. Duke wins because good basketball players go there. Where is the decreasing returns part of that?

Brian spent a lot of time thinking about this issue and recognized there are two elements at play: path dependence (amplifications of small differences are a disproportionate cause of later circumstances) and lock in (a technology is dominant, not because its low cost or good

performance but because switching costs are high.) Plank three in Economic Gardening: *increasing returns.*

There was other significant work going on at that time which we read but were not able to talk to the authors. AnnaLee Saxenian decided that the cooperative nature of Silicon Valley led to a more vibrant economy than the independent and self-sufficient culture of Route 128 in Boston. We always called this the "hot tub effect" in which employees from competitive companies in California would share a hot tub and competitive secrets in the hot tub in the evening. Plank four: *Networks, cooperation and open* source were important.

In 1990, Harvard's Michael Porter wrote "The Competitive Advantage of Nations" and launched his industry cluster research which indicated that localized industry clusters outperform the competition scattered across the country, because the intense competition drives innovation and the spread of knowledge. His work around competitive advantage describes how companies choose to be either lower cost or differentiated relative to rivals which led to plank five: core strategy is going to be either *lowest cost or differentiation*.

The World in 1990

By 1990 we had a foundation of eclectic ideas in place and were convinced that Economic Gardening was a better approach for Littleton (and perhaps many other communities) than "economic hunting." We intended to grow our own jobs through entrepreneurial activity instead of recruiting them. We were convinced that while the recruiting coups drew major newspaper headlines, they were actually a minor part of job creation in most local economies. Later research documented that 5% or less of an area's employment can be attributed to recruited companies.

Further, we had a sense that successful recruitment programs existed primarily in those areas that were attracting new businesses anyway, regardless of whether they had an economic development program. For every successful recruiter who represented a hot office/industrial park in a major metropolitan area, there were a hundred economic developers in rural areas, inner cities, small towns, and dying communities who struggled without much real success at attracting a new company to their town.

There was another, darker side of recruiting that also bothered us. If an outlying area was successful at attracting a new industry, it seemed to be a certain type of business activity: the branch plant of industries that competed primarily on low price and thus needed low cost factors of production. Rural towns with cheap land, free buildings, tax abatements, and especially low wage labor would "win" these relocating businesses. Our experience indicated that these types of expansions stayed around as long as costs stayed low. If the standard of living started to rise, the company pulled up stakes and headed for locations where the costs were even lower, often Second and Third World countries.

Much of the work of Greg LeRoy and the Good Jobs First organization documenting the uses and abuses of incentives did not exist at this time. There was, however, common but not

publicly discussed knowledge within the profession that many of the metro economic development agencies did not have sustained success. Communities the size of Littleton might record a single relocation every two or three years averaging about 40 employees. The Denver area had also suffered a series of embarrassing recruiting fiascos including the Coleman outdoor gear company which relocated from Wichita and then moved back to Wichita. First Data relocated from Atlanta to Denver and then went back to Atlanta receiving incentives going both directions. Gerry Baby Products received substantial incentives and then closed down the plant. There was black humor at the time that the recruiting profession was mostly smoke and mirrors, and both of those were rented.

This was the world then when we proposed another approach to economic development: building the economy from the inside out, relying primarily on entrepreneurs. We knew it wouldn't be glamorous work nor would we get 40-point-type headlines. But we sensed that if we could develop a solid alternative model, even if it took years to implement, we would make a valuable contribution to Littleton and maybe other communities all across the country and maybe even around the world.

The Book of Mistakes

We have often joked that the Book of Mistakes we made was a two-volume set. In those early years, we had lots of intellectual support, lots of passion, and very little idea of what would work. It was a pretty lonely time because there were few peers to talk to and very little in the professional literature to guide us. None of the economic development professionals were interested in leaving the world of recruiting trips to California, Superbowl suites and the Paris Air Show to work on jobs a few at a time. So, we charged off into the unknown alone and clueless.

In a reflection of my youth and naiveté at the time, I was convinced that if we could bring first class assistance to any of the local businesses, we could turn them all into fast growing companies. During this time period, we were experimenting with a number of approaches including a full blown, year-long 13-part seminar series to bring state-of-the-art business practices to Littleton companies with a focus on innovation. We offered this programming for four years trying to make dramatic differences in the revenues and employment levels of our target companies. Our goal was to make them all high-performance growth companies. We assumed that if we could expose local businesspeople to these "best practices," we could develop superior businesspeople.

It was mostly a waste of time. Anyone who has ever dealt with trying to make superstars out of small businesspeople knows the truth of this statement. After a couple of years of miserable failure in trying to create high performance companies, we lowered our sights. At one of the lowest points in the program, we discussed whether we should just try to move distressed companies to a stable category. We continued to be puzzled why a few companies grew at sky-rocket rates while most languished with low or no growth. We were neither adding value nor understanding the peculiar world of growth companies.

Looking back, I can easily see why our approach at that time failed—it was focused on Stage 1 companies (1-10 employees) instead of the Stage 2. There was no understanding of leadership temperament. There were no sophisticated tools for market research and competitor intelligence, and there was no understanding of biological systems—all vital components of our program today. After several years of running the seminars, we had little to show for it other than some good will and friendships. There were very few new jobs, only modest increases in income, and not much in the way of new tax revenues. We considered ourselves prophets in the wilderness, but we weren't. We were just lost in the wilderness.

We had confirmed our amateur status and the folly of enthusiasm over knowledge. We teetered on the edge of failure. The only thing that saved our theory on Economic Gardening was the fact that the world was about to go through an historic explosion in knowledge and technology.

CHAPTER 3 THE CAMBRIAN EXPLOSION

I debated about the title for this chapter for some time. Every student of environmental science is introduced to the Cambrian Explosion, that period about 540 million years ago when a surprising variety of animals suddenly arrive on the evolutionary scene. For 3.5 billion years there were only simple celled organisms, and then something happened to cause a burst of evolutionary innovation.

Looking back over our program from a twenty-year perspective, I could easily see the inflection point where Economic Gardening changed from a primitive effort at helping small businesses to a rich intellectual understanding of entrepreneurial processes. The sophisticated ideas and tools flooded in over a short period of time, and drastically altered the direction in which we were going. It was our own little Cambrian Explosion, and two people were the gateways to all that information: Stephanie Neumann and Garth Johnston.

Stephanie and her Magic Databases

During this "lost in the wilderness period," I happened to be in Bemis Library, Littleton's 1960's ode to Modern architecture. Stephanie Neumann was a reference librarian at the time, and I noticed her working with two large, three-ring binders filled with blue colored sheets as she searched for codes and terms and then entered them into the computer. A crude dot matrix printer crisscrossed the paper printing line by noisy, laborious line. A ream of sprocket driven paper crept out of the machine and folded itself back and forth in a box on the floor in an ever-growing pile. I scanned undecipherable codes and references, and occasional buried articles.

I was curious as to what she was doing and spent the next several days and weeks peppering her with questions about where she got the information, what the system she was using and how did she do it? She explained that each one of the several hundred blue sheets outlined a search methodology for an individual commercial database service.

As I scanned through the blue sheets I saw literally hundreds of titles: Medline, Aerospace, Aluminum Industry Abstracts, American Banker Financial Publications, Bioengineering abstracts—more than five hundred in all—and with each title there was a list of all the publications that fed that database: New York Times, BusinessWeek, Aerospace Weekly, New England Journal of Medicine and so forth. It seemed like the entire published world was captured by her system.

It finally occurred to me that she was tapping into a huge universe of information but delivering only highly pertinent articles. I remember one of the librarians saying that if a 7th grader had to find out the height of the Statue of Liberty, databases would win the race over searches in the card shelves and book stacks by a wide margin. While the speed aspect was impressive, using that kind of power for 7th grade questions seemed a little wasteful.

I asked Stephanie if she could research some business questions for me and she agreed. We were both pretty green with the system and the equipment. The printers at the time fed out continuous feed paper and when you finished, you tore off each page at the perforation and pinched off the edges. I remember occasions when the paper slipped the cogs and slanted off to one side, the printer head still merrily spitting out words and sentences that headed off the page and into obscurity.

As we both learned more about the system, the questions became more sophisticated and the answers more to the point. I asked for tables of market information, and Stephanie would dive into her blue sheets like a medieval wizard concocting a magic brew, and out would come the data.

I became a constant visitor in Stephanie's office with business questions mostly to feel out the scope and depth of what these commercial databases could do. At the time, there was no Internet and the amazing stream of business-related articles was breathtaking. The hit rate was in the 60-80% range, but as Stephanie honed her skill it approached 90%. Stephanie became a great partner, just as engrossed as me by the depth of the database services and extremely diligent about improving her search skills. We sat side by side bouncing ideas off each other and watching information fold back and forth on the floor, excited by our growing sense of power.

In those early years, we were mostly about exploration. Could we find D&B financial statements on companies? Could we find potable water rates in Jakarta, Indonesia (an actual question we were asked)? Could we spot trends and patterns? As it turned out, by simply putting in key industry words, out would come a series of articles from both known and obscure publications scattered over time and geography. When we laid them side by side, patterns would emerge. A story in Portland three months ago sat next to a story in Oklahoma City last month and a story from Orlando yesterday—all talking about the same emerging phenomena. Amazing.

John Naisbitt had published Megatrends a decade earlier using the same basic methodology, but he had a large staff of people who physically cut articles from piles of newspapers from across the country. His crew would code the article, measure the length and then decide about some big trend that was emerging.

We were doing the same thing but doing it on the fly with a staff of two. We didn't even have to search for the theme of the article or code it—it came out in nice neat order just by entering a term. My mind was racing about the possibilities. Could we develop a software program that would analyze and summarize the articles? Could we just eventually turn on the computer and have it produce sophisticated industry trend reports? At one point, Stephanie and I even entertained the idea of setting up a company to produce trend reports. We hired a programmer to grab the database reports and automatically format them. I had a logo drawn up for a company called American Intelligence with the idea that we would sell the service to private sector companies. We didn't get our private effort off the ground, but Economic Gardening was becoming very scientific in its approach to data gathering.

Working with Stephanie in those early years was stimulating. I think we both felt we were on the verge of something big, and I learned the value of organization and discipline by watching

her daily work habits. I realized that by combining my sense of possibilities with her ability to get work out the door we had become a very productive duo. I asked my boss if the library could "lend" her to the Business/Industry Affairs Department, and eventually I hired her as a BIA staff member.

In the midst of all the failures, dead-ends and discouragement of those early years, we finally had a glimmer of light. We could add real value to a company—market information, competitor intelligence, industry trends, and answers to difficult business questions.

We had entered *information* heaven. Shortly we were about to enter *idea* heaven.

Garth Johnston and the Colorado Issues Network

The only good thing about starting the program in the early 1990s was that it was a period of great intellectual ferment that proved to be extremely valuable to us. The way we found out about any of this was through the Colorado Issues Network (CIN), a futurist group in Denver created by Garth Johnston. Garth is gone now, but virtually every major cutting-edge idea we incorporated into Economic Gardening came to us through the Colorado Issues Network.

The CIN was full of intellectually curious people from all walks of life. I couldn't help but think that this is how the American ex-patriots living in Paris in the 1920s must have lived (without the Eiffel Tower in the background). We met in coffee houses and student hangouts and the agenda was always about something coming out of the fog of the future. We joked that the Issues Network was a group of people who didn't roll their eyes when any of us talked. We were the kind of people that could kill a party if you invited more than two of us, but when we met as a group it was a room full of mental electricity.

Three of the biggest ideas that we heard in our clandestine sessions (recorded on my time sheet as professional seminars) were ARPANET, temperament and complexity. ARPANET was the precursor to the Internet. Temperament is the study of preferences in personality with the largest and oldest system being Myers-Briggs. Complexity (or more formally Complex Adaptive Systems) was focused on the patterns that emerged in biological systems. All of these became bedrock elements of Economic Gardening.

ARPANET

ARPA was the Advanced Research Projects Agency of the Department of Defense and their "net" connected key universities and research facilities so they could share documents and information. When we found it, ARPANET had just been renamed Internet and had been opened up to other users, although there was heated debate about whether it should be used for personal or commercial purposes. MIT's handbook for use of the Internet at the time specifically stated:

> *Sending electronic mail over the ARPANet for commercial profit or political purposes is both anti-social and illegal. By sending such messages, you can offend many people, and it is possible to get MIT in serious trouble with the Government agencies which manage the ARPANet.*

Our first hands-on experience came in a demo of the Colorado SuperNet, an early state sponsored version of the Internet. We had become fairly skilled in using the commercial database services, and it was a short leap to see the potential of this new Internet. Here were even more sources of info buried in some of the best universities in the country (Harvard, Stanford, MIT, UCLA), and we had access to (some) of it.

In those days, the Internet was pretty clunky to use—I remember that we went through training one summer to download a photo that involved 24 separate Unix commands. While we were struggling with Unix, the World Wide Web exploded onto the scene. All of a sudden, the debate about whether it was for research and academics or for the larger world was buried in the tsunami of business and personal uses. Even more importantly, our ability to find strategic information for our business clients expanded exponentially.

CHAPTER 4 THE HANDBOOK FOR HUMANS

I cannot remember the exact moment that I was introduced to temperament, but I can remember with crystal clarity its impact. Garth Johnston had a session on the 70-year-old work of Carl Jung which had been refined and made practical by the mother daughter team of Katharine Briggs and Isabel Briggs Myers. Later David Keirsey wrote a little book called "Please Understand Me" that expanded on the work of Myers Briggs. I remember clearly filling out the temperament sorter (it's not a test, there is no right or wrong answer) and then reading his short description of the odd name they had given my temperament:

> *Rationals in general are the problem-solving temperament, particularly if the problem has to do with the many complex systems that make up the world around us. Rationals might tackle problems in organic systems such as plants and animals, or in mechanical systems such as railroads and computers, or in social systems such as families and companies and governments. But whatever systems fire their curiosity, Rationals will analyze them to understand how they work, so they can figure out how to make them work better.*
>
> In *working with problems, Rationals try to find solutions that have application in the real world, but they are even more interested in the abstract concepts involved, the fundamental principles or natural laws that underlie the particular case. And they are completely pragmatic about their ways and means of achieving their ends. Rationals don't care about being politically correct. They are interested in the most efficient solutions possible and will listen to anyone who has something useful to teach them, while disregarding any authority or customary procedure that wastes time and resources.*

Below that temperament description was a breakout of four different types of Rationals. My answers indicated a preference for introversion, intuition, thinking, perceiving or INTP for short. The description continued:

> *INTP Architects need not be thought of as only interested in drawing blueprints for buildings or roads or bridges. They are the master designers of all kinds of theoretical systems, including school curricula, corporate strategies, and new technologies. For Architects, the world exists primarily to be analyzed, understood, explained - and re-designed. What is important for Architects is that they grasp fundamental principles and natural laws, and that their designs are elegant, that is, efficient and coherent.*
>
> *INTPs exhibit the greatest precision in thought and language of all the types: they tend to see distinctions and inconsistencies in thought and language instantaneously. This type is found in only 1 percent of the population and therefore is not encountered as frequently as some of the other types. Authority derived from office, position, or wide acceptance does not impress INTPs. Only statements that are logical and coherent carry weight. Possessing a desire to understand the universe, an INTP is constantly looking for natural law.*

I haven't included the other stuff about INTPs being nerdy and socially inept (not to mention terrible dancers) but this was my reaction: How could this person whom I had never met know so much about me? I don't mean where I was born and who my family was, but rather the inner workings of my brain and my outlook on the world.

I had never really thought of myself in those exact terms (and even today probably wouldn't use those words) but the pattern fit nicely. Looking back on my wandering professional career I could never quite understand why I didn't have a clean professional trajectory--love law, go to law school, start as an associate lawyer, become a senior partner in the law firm, retire as a wealthy lawyer.

It was only then I came to understand that it wasn't a *profession* per se that was particularly interesting, it was the understanding of underlying principles that was driving me. If it were big, complex, not well understood, and in particular social, then it usually caught my attention. So, it was *problems* that were of interest to me – wealth and poverty, war and peace, justice and criminality, governance and policy, temperament and conflict, competition and cooperation, economies, the life and death of towns—all of these were eternal sources of fascination to me. If somebody else had already figured it out, I was off to the next quest for understanding.

It made for a rather stutter-step professional career in which I was unable to articulate any clear direction or life goals to my parents. Instead, I started out as:

--- a journalism major (oh, oh, reporting on all the new stuff going on...yes!)
--- shifted to an education major (oh, oh, understand the deep underlying mechanisms of learning styles and then change a big, unwieldy system that was getting farther and farther behind the curve...I could do that!)
--- got a Master of Urban Planning (I could figure out the big forces at work in urban areas and manipulate them to create exciting cities…that was surely within my omniscient powers.)
--- worked for big governmental agencies (I could solve governmental inefficiency with startling clear insight into dysfunctional processes. Or maybe not)
--- started my own firm working in Main Street projects (I could create nostalgic downtowns that would put Disney to shame. All I had to do was get retailers to quit whining and complaining and just wash their front display windows once a year. Hmmm…next.)
--- hired on with a small Colorado town trying to change the focus of economic development from business attraction to local growth. (Ok, back on track)
--- was still thinking about a potential career path in my mid-50's.

At each mile post, I was mostly interested in tearing down some big social system in which I was working, understanding its core principles and then re-assembling it in a clean and elegant fashion. As it turned out, not a lot of organizations had that in any of their job descriptions. Nor was I particularly successful at tearing down and rebuilding systems at most stages of my life. But here's the point: it was quintessentially me and some old guy in California nailed it without ever meeting me.

Preferences

What made temperament so immediately fascinating were the core building blocks of preferences. Like handedness (I prefer to use my right hand), we apparently are born with other preferences, such as:

- Whether we like to interact with people or prefer solitude
- Whether we prefer control or freedom.
- Whether we are oriented toward things or people.
- Whether we think conceptually or concretely

You may recognize your own preferences in this table summarized from David Keirsey's work:

Extraversion (75%)	**Introversion (25%)**
Energized by people	*Energized by solitude*
Social	Private
External	Internal
Interaction	Concentration
Many shallow relationships	Few deep relationships
Sensing (75%)	**Intuitive (25%)**
Concrete	*Conceptual*
Established	New
Experience	Imagination
Details	Big picture
Past	Future
Actual	Possible
Thinking (50%) (2/3 male)	**Feeling (50%) (2/3 female)**
Things	*People*
Impersonal	Personal
Independent	Interdependent
Competitive	Cooperative
Principles	Values
Cool	Warm
Judging (50%)	**Perceiving (50%)**
Control	*Freedom*
Plan	Adapt
Absolutes	Relative
Decided	Options open
Time sensitive	Time blind
Serious	Playful

What snagged me was that the whole system wasn't based on a value system (this preference is good and right, that one is bad and wrong), but rather our preferences may be strengths in some situations and weaknesses in other. My preference for introversion might be a strength in scientific analysis but a weakness at a party.

The other appealing aspect of preferences is that it did not describe tight little boxes in which people had no choice, their lives prescribed by single ways of operating—it was only preferences. Right-handed people can certainly learn to do left-handed things. It's done all the time. Introverted Richard Nixon held one of the most public positions in the world.

These 16 combinations of preferences have been consolidated into four temperaments by David Keirsey. Interestingly, these same four personality descriptions occur in history from the time of the Greeks until this day. The names of the personalities change, but the orientations don't.

GUARDIAN (SJ)	ARTISAN (SP)
• **Traditionalist** • Responsibility • Accountability • Duty • Wants a place • Membership • Serving is most important	• **Action oriented** • Spontaneous, impulsive • Freedom • Excitation • Grace • Negotiator • Doing is most important
RATIONAL (NT)	IDEALIST (NF)
• **Intellectual** • Wants to know why • Knowledge • Power over nature • Visionary • Knowing is most important	• **Make the world better** • Meaning and significance • Guide others • Catalyst • Wants to grow • Becoming is most important

Once I got a handle on the four ranges of preferences and the essence of temperaments, I began typing everyone I knew: my parents, my sister, my kids, my co-workers, my friends, politicians, movie stars, historical figures, religious figures and people who weren't even real like Santa Claus. My initial forays were somewhat clumsy and overreaching. It took a number of years before I developed some fine tuning that could separate natural preferences from managed preferences. But it was fun; it brought great clarity to the actions and intentions of people.

Because my other great passion was entrepreneurial activity, I immediately started using it to explain what was happening in business. The first big question was whether entrepreneurs were made or born. The economic development literature was rife with the discussion with most writers coming down on the side of "made." This, after all, was America and anyone could be

president, and anyone could build a business empire (although the historical data indicated otherwise).

I began to move toward the opposite conclusion when I read a study from the Center for Application of Psychological Type that found a strong correlation between growth companies and two CEO temperament types. In Myers-Briggs terminology, these were the Sensing-Thinking-Judging (STJ) and, even more important, the Intuitive-Thinking-Judging (NTJ) (think Bill Gates, Steve Jobs, Richard Branson, Elon Musk etc.) These two temperament types headed up large companies at rates far beyond their statistical presence in the population. The two temperaments represented about twenty-six percent of the total population but accounted for approximately seventy-five percent of the leadership in a study of the Inc. 500 fastest growing companies. That seemed to explain a lot.

If we are talking about someone who starts and grows small businesses (retail, service, professional), I think the "made" argument holds some water. It is certainly possible to teach the basics of business and hire a good team that can grow a small business to some degree. However, if we are talking about enterprise builders—those who create large companies employing hundreds or thousands of people—then I side with those who contend they are "born."

Historically, the ultra-wealthy "captains of industry" (Rockefeller, Ford, Carnegie, Gates) have been extremely rare. If it were possible to "make" enterprise builders, one would think that there would be a full and growing pipeline of such individuals because there are certainly plenty of business assistance organizations in this country whose job it is to help small businesses grow.

The reality is, however, that enterprise builders are as rare as superstar pro athletes and for the same reason. Complexity science argues that biological systems will create power laws in which a very few individuals will be extremely rich and very few will be superstar pro athletes, while the great majority will be scattered out on a long tail with lesser talent and lesser amounts of money.

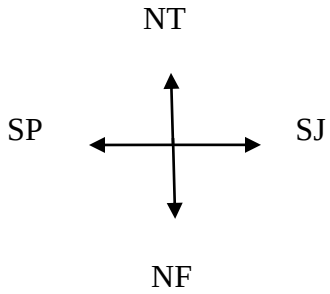
In trying to understand why we weren't having any more success than we were in creating high growth companies, we always came back to the same fact: Temperament is not very amenable to change, at least over short periods of time. For those of you proficient in Myers-Briggs temperament styles, you will recognize the difficulty in getting action-oriented Artisans (SP) to be good bookkeepers or introverted Guardians (SJ) to be salespeople. Try to get a Rational (NT) away from their precious ideas and actually produce something or get an Idealist (NF) to deal with the non-human factors of business (finances for example).

This discovery of the impact of temperament put an end to our seminar and training program. It appeared to us that no matter what we did, we could not affect the growth rates of businesses much beyond what the temperament types and a few other factors determine. Most temperament types will remain in low or no growth businesses and a small proportion of temperament types will drive most of the high growth companies.

Uses of Temperament

There are other practical uses of temperament in business. If you say that temperament acts like a filter—letting us see certain things easily and acting in certain ways—then it gives us a framework for understanding the people aspects of business (for example the effectiveness of employees in their jobs, being able to evaluate all factors in the management team, figuring out what customer satisfaction is, communicating with and influencing people in marketing). Let's start with the basic idea that the four temperaments are in essence four points of view and examine why that might be important.

Four Points of View
If we think of four temperaments as four different ways of seeing the world, then we could draw a diagram represented by four arrows pointing out in a north/south/east/west direction.



For any given person, we can see clearly in the direction of our temperament. For me, an NT, big picture / strategy / deep insight into problems comes easy. I can naturally see in that direction. I also have some general sense of what is going on to the right and left of me although it is a little fuzzier than seeing straight ahead. Then there is the direction directly behind me that I have no idea what those people are talking about. They can see a world that I cannot.

It does not matter which direction we are pointing—that description is always true: seeing ahead clearly, having a fuzzy view off to each side, and not being able to see behind us. What quickly becomes obvious is that having a missing temperament on the team is having a missing viewpoint. Whether that viewpoint is important in the success of the business is another question but a ship which has people that can only see off the bow, port and starboard sides will not have information about the stern.

I have no idea why all four temperaments have survived for thousands of years, but there is a message in the fact that they did. They must have served a purpose. Nature must have found some use for them. If only tactical action and brute strength were important for survival, then the other three temperaments should have died out along the way. But they didn't.

Temperaments which favored the development of organizations also survived as did temperaments favoring big picture strategy and temperaments favoring diplomacy. Furthermore, they didn't survive each as a distinct and separate tribe; they survived as parts of every tribe. Even among warrior tribes, there are caregivers and camp makers and wise men.

So, arguing which temperament is "right" makes little sense. It would be like arguing that only the strong survive, which is not true because the well-organized also survive. As do the cooperative. And the strategic. What's more, having a mixture of each is even better. Nature had run a 4-billion-year beta test on this concept and worked out a practical formula. It occurred to us that maybe we should pay attention to it in trying to help *businesses* survive and thrive.

There is another interesting thing about temperament in that it allows you to evaluate advice you are getting. In all those years that I worked with Stephanie, she hardly ever believed that anything new coming out of the future was going to be useful. If we were talking about the future, I learned to discount her views significantly because that was a view that was to her back. On the other hand, if I went off on some flight of fancy and she started telling me about all the real and concrete issues we were going to run into, I learned to listen because that was a direction I couldn't see and was a direction she could see clearly.

At one point or another, I have had several staff people who were strong Feelers. I was virtually tone deaf to the emotional state of our office, and I came to rely on one of the Feeler employees to tell me what was going on. You may think I'm a Philistine when it comes to these matters, and I may well be, but it is also a clear example of temperament filters operating and offsetting those shortcomings by recognizing and trusting those who can see in that direction.

Right Slotting

Temperament also has a crucial role to play in employee performance and the reason is this: the preferences we are born with may or may not match up with the job requirements. The easiest to understand is putting an introverted person in an extroverted job (say receptionist or sales). Most managers would intuitively recognize that as a silly mistake and yet they make that exact same mistake with the other preferences.

What about the situation where a freedom-oriented person is put in a job requiring exacting attention to detail, rules and structure (a perceiving preference in an accounting job)? What about putting an idea generating Intuitive preference on an auto assembly line to complete the same job over and over all day long?

A good way to think of our preferences is to compare it to our preference for handedness. I am right-handed. (Before I go any further, let me apologize to the lefties of the world. I need to make this point about preference, and if I stop to adjust the example for left-handed people at every step, this chapter is going be long and excruciating). So, as I was saying, I was born with a preference for my right hand. Can I use my left hand? Certainly. It is not as skillful, and it is somewhat energy draining for me, especially if I use it solely for a long period of time, but it is possible. Will I ever be as skillful with my left hand as my right? I doubt it, but if you give me enough time—say 20 years or so—I can probably get decent with my left hand.

So, what happens if you put me in a left-handed job? I'll probably struggle, and I certainly won't do as well as all my left-handed co-workers. Traditional management would then begin the blame/change/fire routine. My supervisor would call me and blame me. He would tell me what

a bad job I was doing and that I wasn't going to get a raise. In fact, I was going on probation until my performance improved. The company has my best interests at heart, so they are going to send me to left-handed training to improve my performance.

When I return, I am still right-handed with a couple weeks of left-handed training. Exasperated that they wasted so much money on me, the company fires me and starts the process to hire a new person. They place ads, sort down resumes, call people in for interviews with various staff members, negotiate a package, pay for relocation expenses, go through the onboarding process and wait a few months before the new person is effective. All of this is expensive, but the new person's resume, schooling, and experience are excellent, so it's worth the money. Since no one bothered to ask, another right-handed person is hired and starts to work. They have now completed the entire cycle of blame-change-fire that cost the company a lot of money, irritated almost everyone involved in the process, and will most likely repeat itself.

Getting effective teams is analogous to coaching. If you coached football and had a big, strong, but slower and less agile player, a coach would not put him in the backfield and then criticize him for his weaknesses. Those weaknesses are only manifest by the job to be done. Change the job and the same characteristics become a strength. The mis-slotted failure in the backfield might well be an All-American lineman.

The point I am making here is that one use of temperament is in right slotting. It is about matching up the requirements of the job with the preferences of the employee. It shifts the discussion from moral statements of their worth (is she good or bad) to making a match between job requirements and preferences. Does education / training / experience / talent still matter? Of course, they do, but a mis-slotted talented person will languish, whereas a right slotted average person will perform quite well. It may sound a little simplistic, but you might never ask about preferences for social v. solitary, concrete v conceptual, personal v. impersonal, freedom v. control. And yet those are the very characteristics that have a lot to do with the performance in the job.

I often point to our own team in Littleton as a case in point about right slotting. No one had a pedigree or was educated at an elite Eastern school, and yet we won three national awards for our Economic Gardening program because we had people in the right slots. They were doing what they loved to do and contributed ideas and suggestions regularly which made us better. None of this is to argue that temperament alone is the sole factor in success nor that right-handed people can't do a left-handed job, but rather that people who are using their preferences tend to be happy and productive in their jobs.

CEO and Management

I have already mentioned that there is a dated study that shows 75% of all the CEO's of the Inc. 500 are one of two preference combinations, STJ and NTJ. Obviously neither of these are a temperament per se but they both share the TJ preferences, which are called the "executive function" in Myers Briggs literature. The thinking (logical) and judging (control) preferences are two valuable traits in business, so it is not shocking that these show up regularly as CEOs.

One of the successful executive models we have seen regularly is a management team with different strengths. The CEO might be a Rational and full of ideas, but also has Guardian CFO for the financial realities. The Artisan shop floor supervisor is invited in for the practical aspect of actually producing the idea, and the HR Idealist brings the employee development aspect to the table. We have been on a number of phone calls where the culture of deferring to strengths is apparent – the CEO will ask the CFO or the shop floor supervisor for an opinion ("Anne you see that more often than I do, what do you think?"). These are the well-run companies that can see off all four sides of the ship.

I want to make a point here about types and jobs. The Center for the Application of Psychological Type has developed an Atlas of Type Tables showing which of the 16 types tend to hold which kind of job. Two things jump out at you from these tables. First, every temperament type holds every job type. This invalidates the "deterministic" argument. You can't say that only certain types can do certain jobs. The table shows that all types can do all jobs. They may be doing things left-handed, but they have obviously learned and succeeded at doing that. We are not constrained by our temperaments.

Second, there is always a percentage concentration in a few types. This makes some logical sense, because the other option would be to have a uniform distribution through all temperament types and thus the world would be singularly flat and boring. The 80/20 clumpiness rule in nature would be invalidated and replaced by the uniform rule. There is very little in Nature that is not clumpy.

Communications

Temperament plays a powerful role in communication. Because temperament is a filter, it influences the way we think and the language we use. The ability to influence is embedded in the ability to translate into someone else's temperament language. For example, a core value with Guardians is safety and security and proposing massive or quick change is not likely to resonate. Guardians are slower to change because change has inherent risk in it: we are going to a place that we've never been before and we have no idea whether it is safe or not. Using language that includes risk, unknown, deviation from standard procedures is not likely to gain an audience for a new idea.

If temperament is analogous to a language, then we can think of the major temperaments as being like English and Spanish. If you want to influence someone in Mexico, it does little good to speak passionately in English. It helps a lot to speak Spanish. Because INTPs are only about 1% of the population, I often think of my temperament language as something akin to being from Andorra. Few people have heard of it, no one has ever been there and certainly no one speaks Andorran. INTPs spend all our lives learning other people's languages because no one can communicate with us in our own language (Nerdish).

Think about this: Any two-person communication is running through two temperament filters – the speaker and the listener. Much like light waves being bent as they pass through glass or water, conversations are bent and colored according the person they pass through. To get a clear understanding of the conversation you must account for both filters.

Even more complex, think about someone reporting a conversation with a third party. Now you have three sets of filters you have to take into account. You may recognize the basic concepts of the conversation, but it will have taken on added colorations and tonality from each person who passes it on. It may have a personal slant added by a Feeler or the element of being right or wrong added by a Judger or depersonalized by a Thinker or some of the details may have dropped out when it passed through the Perceiver.

In my younger days, I had a strong Guardian boss who endured my constant barging into his office with the newest ideas and technology (always presented in my Intuitive language of possibilities). In his world of high responsibility and great consequence of error, this is what I sounded like: "Boss, we could try something that nobody has ever done before, and we have no idea of whether it is going to work or blow up in your face plus there is a possibility that 1) we could get sued, 2) we could really upset all our employees, 3) costs could spiral out of control, and 4) it could be career ending for both you and me."

My boss would then check with people he trusted (I wasn't on that list), including his attorney (a strong Guardian whose entire job was to take risk out of every action we undertook) and his finance director (a strong Guardian whose job was to ensure we didn't spend money foolishly) as well as other people who had his level of great responsibility (e.g. city managers of the northern suburbs of similar size and make up). So, while I was babbling in enthusiastic Rational language, he concluded in Guardian language that I was an unhinged lunatic and he would excuse himself after listening for the required polite amount of time.

After nearly a decade, I finally learned that if I was going to have any influence in my boss's world, I needed to speak his language. His checklist was going to include:

1) What do I know about this (experience)?
2) How safe is it? (security)
3) Who do I trust to advise me (legitimacy)

So, I set out on my first big experiment in translating. I had seen GIS maps and in my Intuitive way could make conceptual leaps into the future about all the valuable ways we could use them. I wanted to hire a GIS expert. I also knew that because my boss had to have a number of experiences to create the "mental files" against which he could judge the issue, this wasn't going to happen quickly. I set a year deadline for building those files. Every time I could find a GIS article or GIS link, I would send it to him —"Boss, this is kind of interesting." I also knew that he looked to other suburban jurisdictions as one of his touch points, so any time I could find a GIS connection, I would mention it to him: "Boss, I just learned that Jefferson County has a department of 6 GIS people." Or "Boss, I was talking with the Arvada GIS department…."

Finally, I had to address the security issue. Luckily, ESRI the major GIS supplier in the world does a lot of business with the federal government. I was able to obtain GIS maps related to security issues of the country and send them up with small notes about the interesting work the federal government was doing with GIS.

At the end of the year, speaking Guardian language (which was very energy draining for me), I made my request to hire a GIS staff person. For many years, I kept my boss's note: "I'm not sure how much we will use this, but I am going to approve it." In the years following, I got approval for:

- Introducing the Internet. "Boss, I was just looking at a stock report that our 401 K managers (legitimacy) posted on the Internet." My boss finally looked at the Internet several years after I told him about it when he began checking how his retirement fund was doing.
- Hosting an Internet website ("Boss, what do you think about having a community collaborative set up a Littleton web page?"). As long as it wasn't the City of Littleton, his safety item got checked off. For a number of years, we didn't have our own website; we used the Littleton collaborative website. Once the northern suburbs started developing their own, we got approval for a City of Littleton website.
- A digital camera ("Boss, our camera is on the fritz. I'd like to buy the new Mavica. We can keep the photos on our computer. Boss: Why would we do that? Can't they be stolen?" Me: We can document pictures of buildings in town. Who would want those photos? (reduce security issue)" Me: The Public Works Director and I have agreed to share the camera (reduce expense):" Boss: "If we use it ten times in a year, I'll be surprised." (We shot nearly a hundred shots for the Public Works department that first week.)
- Microsoft Windows ("Boss, can we buy the new Windows version of Microsoft?" Boss: "All our people are trained in WordPerfect. Why would we change?" Me: "Microsoft is the big company in the business (legitimacy). We won't be dependent on a smaller, single purpose software company anymore. They don't return our calls when we have problems." (Reduced risk. Move in the direction of higher security and reliability.)

Lest my boss come off looking as the bad guy, let me reinforce that for every time I could see a conceptual future, he saved my rear end because I couldn't nail a specific, concrete detail in some important aspect of the proposal. I have not listed all the bad ideas I had.

Customer Service

At this point, it would probably not surprise you that we believe good customer service is also a function of temperament outlook. Should a bank instruct their tellers to take time and talk about the grandchildren with customers or should they process transactions quickly and with a smile? The answer, of course, is yes, do both. You probably had a reaction to one of the two option presented above. If you are a Feeler, it's likely the warm, friendly conversation was appealing. If you are a Thinker, the quick and efficient transaction is the way to do business. The Thinkers in the "grandchildren line" are probably fidgeting and looking at their watches while the Feelers are not only listening but anxiously waiting to tell their own grandchildren stories.

Every time my wife (a Feeler) and I (a Thinker) go to a lawyer, the first 20 minutes are spent in pleasantries about family and work. I'm thinking we are being billed $220/hour for that conversation, and she's thinking "this lawyer is really good." The same is true for the doctor, the banker, and the checker at the grocery store. Depending upon whether there is personal conversation or a quick and efficient transaction, one of us will consider it good customer service and the other will consider it poor.

There is a high-rise active retirement center in Littleton that asked us to help them with marketing. They had a number of planned activities for this group ranging from group tours to active living social events, but they were having difficulty getting people to respond to their "active living" marketing. During the interview with the managing company we asked what kinds of people were currently living there. "Oh, we have teachers and policemen and a couple of people from the military."

If you are skilled in temperament, you would recognize these as professions in which Guardians are heavily represented. As it turned out, the attractiveness of the retirement complex was not the active living component but rather the secure exterior doors backed up by a receptionist who monitored the door, backed by keyed elevators which were backed up by keyed apartment doors. This was a secure residence which could be locked and left under watchful eye while the resident lived their active lives traveling around the country. This is an example of where customer satisfaction was directly tied to a single temperament.

As you can see, temperament adds some sophistication to the question of "what is good customer service?" because it means different things to different temperaments. Introverts and thinkers might prefer a quick transaction. Extroverts and feelers might value extended human interaction. Rationals probably would like more information and data whereas Guardians may like reassurance about the safety as determined by a legitimate authority. The Idealists might like to know how you support the community and charities. The Artisans might participate in a motorcycle ride to raise that money.

Temperament, as it turned out, had an immediate and practical uses in our work.

CHAPTER 5 COMPLEX ADAPTIVE SYSTEMS

In the early 1990s, the Colorado Issues Network sent out an agenda for the next meeting: *Complex Adaptive Systems (CAS)*. Complexity, as it was known for short, had originated at the Santa Fe Institute (SFI) in New Mexico in 1984, when Citibank funded a number of Los Alamos scientists (the A-bomb folks) to set up a multidisciplinary research institute to study complex adaptive systems, including biological and social systems.

Hmm, biological and social systems.

When I was in college, I was a social studies major--a species far down the academic food chain. The hard sciences majors shook their heads at the fact that our majors were called social *sciences*. "How can you have a science when you can't predict anything?" they wondered in mild amusement. "You don't have laws; you don't have answers; you just have descriptions and not very good ones at that."

That stung mostly because it was true. Social scientists couldn't predict diddly squat. The economists couldn't tell you what the economy was going to do. The sociologist couldn't tell you when wars were going to break out. The psychologist couldn't predict who was going to be a criminal nor solve mental illness. The historians could barely agree on the facts much less the meaning of history. The political scientists couldn't agree if liberal or conservative principles were better for the country nor could they forecast which political party would be in power in ten years, much less a hundred years.

Indeed, there were no laws in social science. We couldn't make predictions, we didn't have formulas, we didn't have outcomes and we didn't have answers. We just had eternal debates—the kind that went deep into the night in college dorms but never got resolved.

The hard science graduates went on to their well-paying careers in engineering, technology, and medicine and my colleagues went on to their low-paying careers in education, politics and social work. However, all of us soon faced the same inexplicable problems raging in society: a war in Vietnam, stagflation in the economy, the fear of irrational crime, education systems failing, retirement funds disappearing in crashing stock markets, failing marriages, depression, suicides, our kids on drugs, a politically divided country dangerously plunging from one extreme to the next, weather systems ever more erratic---issue after issue with biological roots. Social sciences and biological systems, as it turned out, were important to everybody and now the Santa Fe Institute was starting to bring a disciplined mathematical approach to understanding them.

This, then, is the story of the new science called Complexity as it unfolded to us in those early years—wave after wave of new ideas and concepts which were so foreign at first but eventually became the bedrock ideas undergirding Economic Gardening.

At the time, I had already read the best-selling book Chaos by James Gleick. I looked at the illustrations of fractals (which looked more like drug-addled artwork from the 1960's) and tried to understand the implications of systems that appeared to be randomly chaotic, but in truth held

hidden order in the chaos. The world learned that the flap of a butterfly's wings in Brazil could set off a tornado in Texas because sensitive dependence on initial conditions could vastly change outcomes. I tried to absorb new language like Lorenz attractors, Mandelbrot Sets and figure out the implication for businesses. It felt like Alice in Wonderland, and I was about to walk away from all of it.

The galvanizing book for me was Mitchell Waldrop's Complexity: The Emerging Science at the Edge of Order and Chaos. Waldrop's intriguing quasi-novel about the founding of the Santa Fe Institute followed the intertwined lives of a cast of characters that were as unknown as the Saturday Night Live crew taking the stage for the first time: John Holland, Brian Arthur, Stuart Kauffman, Chris Langton, Doyne Farmer, and Per Bak. Today they are legends in Santa Fe Institute history.

After reading Waldrop's book, I signed up for the SFI newsletter and began attending the High Altitude Thinking conference every year in Santa Fe and the Complexity conference at MIT in Boston. It was, by far, the most intellectually stimulating time in my life. I could barely keep up with the stream of new concepts which came tumbling out of the Institutes research: edge of chaos, punctuated equilibrium, increasing returns, self-organization, emergence, fitness landscapes, tipping points, and critical states.

As I slowly started to absorb what they were talking about, I could see these new principles in everyday operation. We had been trying to make sense of business through a mechanical lens and as it turned out business consisted both of mechanical systems *and* biological systems. Economic development, economies, companies, customers, and employees were all complex adaptive systems operating by a different set of rules than I thought they were. Complexity theory was like a light being turned on in a room full of stuff. Almost immediately it started explaining all the things we kept bumping into—all the parts of our world that didn't make sense using mechanical rules.

Let me corral and introduce all these new ideas as we learned them before I explain how they became the foundation principles for Economic Gardening.

Mechanical vs. Biological Systems

The Santa Fe Institute folks called their focus of study "complex adaptive systems" but if you think about it, anything that is complex and adaptive is in essence alive -- biological: economies, ant colonies, stock markets, immune systems, urban patterns, outbreaks of disease, outbreaks of war. And yes, business ecologies.

The great scientific discoveries of the 16th and 17th centuries about physics and chemistry (the non-living side of the universe) had created strong mental models which were mechanical in nature. After the laws of physics and chemistry were discovered, humans invented one mechanical device after another in which known inputs produced known outputs in a very predictable and controllable fashion. This mechanical mindset that things were controllable and predictable tended to color how we saw biological entities like organizations and economies.

The Santa Fe Institute, however, saw something different. They saw a biological world in which each living thing was constantly adapting to all of the other things (living and otherwise), all tied together by innumerable feedback loops. They saw a complex world churning about in constant turmoil which was both unpredictable and uncontrollable, and even more disturbingly, it was constantly producing new things. It was becoming clear that there were two distinct systems with different rule sets: mechanical systems and biological systems.

Here's the single biggest difference between mechanical systems and biological systems. Mechanical systems are coherent, predictable, and known. They are governed by a universal set of laws which describe relationships and predict outcomes. If you add 1 + 1 you will get an answer of 2. If you combine two hydrogens with one oxygen under certain conditions, you will get water. Every time. Forever. In other words, mechanical systems get to "answers" (a predetermined point). If you don't end up in that place, you have made a mistake.

Here's a short way of saying it: In mechanical systems, the same input through the same process gets you the same output. You put aluminum into the machine and a can pops out. You never get a car door or a squirrel. The same engineering formula that made a bridge stand up in Roman times will make a bridge stand up today. The accounting books that balanced in the Middle Ages will balance today. You can count on the outcome being the same every time. Thus, our tendency was to think *everything* had a known outcome and thus could be controlled and predicted. Most seven-year old children would laugh at that, but urban planners were developing comprehensive plans for cities and the USSR was developing twenty-year plans for their economy (I always wondered if those plans called out the collapse of their nation).

In biological systems, on the other hand, the game is about fitness testing (finding a good design for a given environment). In short, surviving by adapting to new situations. Yesterday's "right" answer may not be tomorrow's right answer. Just because your high-powered offense won all your games last year doesn't mean that the competition's defensive coach didn't spend all winter figuring out how to stop it this year. Just because the rabbit developed a camouflage doesn't mean that the coyote won't counter with a better sense of smell. In short, biology is constantly putting new designs together and testing them for survivability in changing environments. Biology at its core is about novelty; it is about newness. It is about arrangements and emergent properties we haven't seen before.

Think about that simple concept: "We haven't seen this before." It's the sentence that destroys "answers" and predictability. What would an engineer do if you told him "We don't know what this number does. It's entirely new. Sometimes you can add it, and sometimes you can't. It's doing some other things we've never seen before." You can't plan in that environment; you can only try adaptations.

Any parent can tell you that two children raised in the exact same home under the exact same conditions can turn out very different. Any employee can tell you that the organization chart has less to do with how things get done in an organization than the relationships between people. Who goes to lunch with whom? Who is competing for advancement with whom? Who is dating whom? Who hates whom? And yet business managers and economists still talk as if organizations and economies were machines (rev up the economy, steer the organization) and not

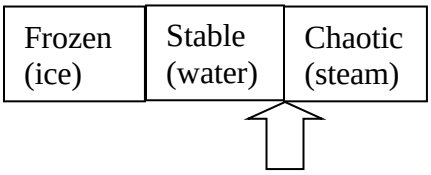
living, biological things. Revving up a rainforest or steering a wolf pack would sound ridiculous, but well-educated people keep making those inappropriate analogies for economies and companies. It took Nobel Laureate scientists to show us that unpredictability in companies and economies is a signature of living things.

Layer by deeper layer, the inner workings of business started to make more sense to us. To be sure, businesses had mechanical components like the factory floor, engineering calculations, and double entry accounting. But they also had biological systems involving the management, the employees, and the customers. What was becoming clear was that managers get into trouble when they try to apply the rules of one system to problems of the other system. The most common mistake was using *mechanical* rules in a *biological* system and assuming the future would look like the past. Where in the five-year plan did it account for the plane flying through the corporate offices in the World Trade Center? Where in the retirement plan was the gut-wrenching stock market crash that wiped out a lifetime of earnings in weeks? We call them aberrations, but they are, in fact, signatures of biological systems.

Edge of Chaos

Although based on complex mathematical calculations using massive computer power, complexity science produced some handy rules of thumb for everyday use. One of the most colorful was "edge of chaos."

This term describes the fine line between stability and chaos where survival is most likely to take place. As a way to think about these regimes, consider what form H2O takes in each. In the frozen regime, it would be ice. In the stable regime, it would be water. In the chaotic regime, it would be steam.



Organizations and economies also operate in these three regimes. In the frozen regime, no information gets transferred and no activity takes place, so it is impossible to adapt. In the chaotic regime, information and change takes place so fast that nothing is stable enough to retain its identity. In the stable regime, there is a regular rhythm of activity in which identity is retained, but adaptation to changing conditions is slow. While humans may favor stability, nature favors the line between stability and chaos (edge of chaos) because it is here that constant adaptation goes on which allows an organism to survive over the long run. I suppose they could have called it edge of stability, but that doesn't sound very sexy.

Once we understood this idea, we could see it operating in Littleton's business world. We had very stable companies on Main Street which just could not adjust to a fast-changing world. Walmart's rapid innovations were destroying our smaller retailers. Our high growth companies, on the other hand, were innovating quickly. They sensed the changes going on and responded

rapidly. Sometimes they would fall into complete chaos, but most often they would ride the very edge of chaos like a seasoned surfer.

We came to equate the edge of chaos with lots of changes and experimentation and lots of little mistakes. It seemed like the mistakes that accompanied the process of innovation were like earthquakes: if you don't have lots of little changes, you end up with a big one. We read a study out of Dallas that indicated the most vibrant economies (in terms of producing jobs and wealth) had the highest rate of business startups *and* business closures.

We started looking for other reality checks. The big companies of the 1970's like GM and IBM appeared to us to be in very stable regimes with minimal change or innovation. They, in effect, were headed toward big adjustments because of their very stability. They had lost contact with the chaotic edge and had quit adapting. People with entirely different ideas about cars and computers produced products that were a better fit for a changing environment (the raucous din of a vibrant marketplace operating at the edge of chaos). At the economy level, the Great Plains appeared to be a situation of great stability with minimum innovation and minimum adjustment. The Great Plains were also dying economically. The USSR appeared to be a frozen regime that had not allowed adjustments for over 70 years, and then one day it collapsed in one big adjustment.

It also occurred to us that temperaments in organizations are also much like the regimes. Guardians are stable tending toward frozen ice, while Intuitives are change oriented tending toward chaotic like fire. Organizations that adapt and survive over the long run are neither ice nor fire, they are both. Intuitives provide the ideas and push change. The Guardians provide the stability and the order that allow ideas to be sorted out and come to fruition—chaos and stability in tension with each other locked in the same system. Fire *and* ice.

While nature has found that quivering boundary between little change and all change to be the most promising for survival (enough change to adapt but not so much as to lose identity), there is a tradeoff for living on that fault line. Systems at the edge of chaos tend to collapse on a regular basis. It shows up in another Complexity concept called Punctuated Equilibrium.

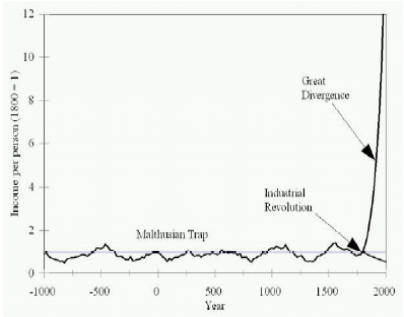
Punctuated Equilibrium

Biological systems poised at the edge of chaos display something known as "punctuated equilibrium." In layman's language it means that things go along fine for a while and then the bottom drops out. In evolutionary history, punctuated equilibrium shows up regularly as some species dominate for long periods of time, and then they virtually disappear suddenly and a new set of players jockey for space sorting out winning and losing designs until a new equilibrium is established. In economies, some technologies dominate for decades—maybe even centuries—and then disappear virtually overnight

Punctuated equilibrium also has the characteristic that when changes do occur, they occur in successive waves for a period of time until the new order settles in. Consider the movie industry that had been relatively stable for 70 years and then along came videos as another way to view a

"play." This was followed in quick succession by the independent video store, the Blockbuster national chain, ordering through Netflix mail, Redbox automated delivery, and then streaming video. In each case, the changes were short lived as more waves of innovation followed.

Punctuated equilibrium does not have the linear proportions of mechanical systems (turn the knob half-way and the volume goes up half-way—graphing as a straight line rising at a 45% angle). Rather punctuated equilibrium crawls along the horizontal axis over long periods of time building up steam, but not making much progress until it hits a critical mass and then suddenly it turns vertical in a quick swooping motion. The pattern is what many people would recognize as a tipping point.



I have often thought about how to visualize why things are stable for a period of time and then undergo massive changes all of sudden. While I was working in Leadville, I read a book about a number of miners who slept in a drafty log cabin at expensive rates and considered it a good deal to get out of the bitterly cold wind of the high Rockies. In that cabin, they were body to body, each finding some position that was comfortable as possible on the dirt floor. Night came on and stability settled in as everyone fell asleep. But soon, a single person had to shift and that change in position put an elbow or knee into someone else who then had to readjust. That one small change in one corner of the room spread out across the entire floor as each miner shifted to try to find a new comfortable position.

The final readjusted sleeping pattern might happen quickly, or as more often happened, the changes rippled out across the floor and back again several times before everyone could fall back into some temporary equilibrium. If we were to graph movement on the cabin floor there would be a long period of stability when everyone was asleep punctuated by massive movement as everyone readjusted to the new reality. An economy that has stable supplier relationships and stable market demand would graph much the same. There wouldn't be much movement until a key supplier relationship changed (say the entry of China), and then the company that lost business would either go looking for other opportunities or go out of business. This in turn would cascade into the massive change in relationships we have seen in the industrial Midwest.

In punctuated equilibrium, the environment shifts from stable to volatile over a short period of time. Traditionally, a business might think "oh no, our stable (read good) environment is about to go chaotic (read bad)." Using complexity principles, however, there is another way to view this: The established order is dying, but opportunity is rising in the new world, and the focus should be on rapid innovation to find good designs for the new coming equilibrium. There will

be a period where new designs will work for short periods of time and then even newer designs will be required as we move quickly from one environment to the next. When equilibrium settles back in, the need for rapid innovation will slow down.

Sub-Critical, Critical and Super-Critical States

It might be easier to understand why systems at the edge of chaos collapse unexpectedly with unsettling regularity if we use the analogy put forth by Per Bak, a Danish physicist at the Santa Fe Institute. Bak developed the concept of sub-critical, critical, and super-critical states and conceived of a simple way of thinking about them using a sand pile. If you were to drop grains of sand one at a time on the ground, a small pile would build up. For a long time that pile would be in a *sub-critical* state—that is, a small cause (another grain of sand) would produce a small effect (a minor disturbance in the sand pile). A forest in the winter snow is in a sub-critical state. A small cause, like dropping a match, would have a small effect.

If you continued to drop these grains of sand, the angle of the pile would become steeper with occasional landslides. If you were very careful you might even push the pile into an angle that would look unsustainable—way too steep to stay that way. The next grain of sand would cause a massive landslide as the angle worked back toward something sustainable. The sand pile in this latter description is in a *super-critical* state. That is, a small cause (single grain of sand) almost always creates a big effect (a massive landslide). During a hot, dry summer the forest is in a super-critical state and a small cause like dropping a match almost always causes a big effect—a major forest fire.

One can think of historical events that were in a super-critical state and a small cause had a big effect:

- The assassination of Archduke Ferdinand by a 19-year old Serb that set off WWI with 37 million casualties
- A single unknown shot at Lexington green that caused the nervous British troops to fire and kill 7 Americans and start the American Revolution
- The Black Friday collapse of the stock market in 1929 for no apparent reason that set off 13 years of the Great Depression

More recently, examine this quote from TIME magazine about the Arab Spring in 2011:

> *"Even those who have watched this generation come of age is hard pressed to explain its sudden empowerment. 'These young people accomplished more for the Middle East struggle in a few weeks than their parents did in 30 years,' says Hassan Nafaa, a professor at Cairo University."*

What had been building was a great cohort of educated but powerless youth connected by social media, and all it took was a single street vendor that set fire to himself in Tunisia to ignite revolutions all throughout the Middle East.

In each case, the effects were all out of proportion to the small event that precipitated the drastic result. The point is, in super-critical states we know there has been a long history of growing conditions that will ensure big results from small events.

Most importantly for our work, however, is the state between the two called a *critical* state. In a critical state, a small cause might have a small effect, *or* it might have a big effect—you don't ever really know. The next small grain of sand may just set there, or it may launch a cascade down the side of the sand pile. What's more, the size of these effects displays a power law. In other words, the biggest landslide will be rare. The second biggest landslide size will be half as large but twice as likely. The smallest size landslide will be very common.

It is this *critical* state that describes the downside of operating at the edge of chaos. Poised between the stability of a sub-critical state and the chaos of a super-critical state, life has sought refuge in the dicey zone between the two, because it is the place most favorable for survival (change with the environment, but not so fast as to lose identity). Unfortunately, this precarious position is prone to collapse at unexpected times and for no apparent reason. It is not the event – not this particular grain of sand – that is of importance but rather the critical state of the system.

Increasing Returns

Economist Brian Arthur has spent much of his life's work documenting the existence of increasing returns (as opposed to the classical idea of decreasing returns). Arthur's contention is "increasing returns are the tendency for that which is ahead to get further ahead, for that which loses advantage to lose further advantage. If a product or a company or a technology—one of many competing in a market—gets ahead by chance or clever strategy, increasing returns can magnify this advantage, and the product or company or technology can go on to lock in the market."

Good basketball players go to Duke because Duke wins, and Duke wins because good players go there. Top students go to Harvard because it is a top school, and Harvard is a top school because top students go there. People use Microsoft operating systems because it has the most software written for it—which is because most people use it. Companies move to growing urban areas because of the large specialized labor pool, which is there because of the growing number of companies.

Think for a moment about how advantage is considered in classical economics: The better product, idea or process will win out in the long run. If the first mover has a poorer solution, they will be driven from the market by better alternatives (e.g. Netscape losing out to Google).

In an increasing returns situation, however, that is not always the case if three conditions are met: initial advantage, network effects, and switching barriers. Initial advantage does not have to be strong if competition is light. You simply have to be first with an advantage, but to maintain that advantage you need the reinforcing loop of network effects. Network effects means that the value of the network depends upon the number of people in the network. The more participants,

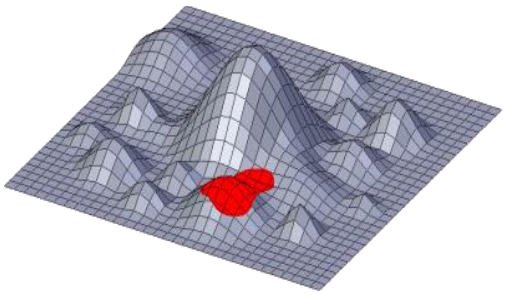
the more value to each participant (think of phones or faxes or Facebook). Microsoft was able to build a strong network of users even though most observers felt they had the weaker product. VHS tapes overwhelmed the technically superior Beta by building their network faster (more VHS machines meant a bigger demand for VHS tapes which demanded more VHS machines).

The second factor that might keep you from switching is the amount of investment you have in your first choice. Once a number of people make a significant investment in participating in the network (install software, learn instructions, develop files built on that software, build up contact lists, etc.), changing all of that to join a new network outweighs the benefits of the new network. Switching costs are high.

If the network effects continue to get stronger (more people at this party than that one) and the barriers to switching get stronger (financial, emotional, hassle, political, technical) then the product achieves something Arthur called "lock in." In other words, it is home free if the current conditions prevail. The need to market aggressively is overshadowed by increasing returns. People are joining/buying/participating because network effects are strong. and they stay strong because barriers to switching are high. Arthur has astutely noted that increasing returns is heavily affected by "path dependence" meaning that given a different set of circumstances or timing on the front end, the result could be entirely different the next time.

Innovation on a Fitness Landscape

Scientists use this term "fitness landscape" to illustrate how nature goes about its fundamental mission of exploring for good designs fit for a given environment. A fitness landscape is simply a diagram that consists of small squares, each one representing a design. The better the design, the higher that square sits on the landscape. A "hill" represents a number of designs that are related but have slight variations. Improved variations represent climbing the hill, and the top of the hill represents the design most fit given that local environment.



Conversely, a "valley" represents a poor design – one not likely to survive in this environment. So, the question becomes, how does nature explore that landscape when you can't see the hills or valleys? The answer is that nature uses a combination of exploitation and exploration. Exploitation is simply discovering a hill and then exploring small steps in each direction. Designs which improve fitness (think survivability for species or sales for products) move you up the hill. One can think of exploitation as small scale improvements on a basic design, such as goes on in the automobile industry—doing what we do, better.

Nature also occasionally takes a long jump out into the unknown looking for even higher hills—exploration. The problem, of course, is that it may land in a valley. Which is why nature doesn't place all its chips on any given bet. It places a lot of bets, most of them on short moves and a few on long moves, and then it doubles down on the winners and crossbreeds them.

In our current environment, Nature has bets on all kinds of plants from palm trees to poison ivy, on birds and sharks, on humans and viruses as well as cockroaches and molds. Some bets like the shark have had tremendously long, successful runs. Some like the dinosaurs had long runs and then ended suddenly. When the environment changed, the lowly small mammals turned out to be the better design. When the environment changes again, who knows if that design will still be the best?

Fitness landscapes drive home the singular point that there is no "answer" in biology; there are only designs that are fit for an environment, and when that environment changes, the designs need to change. It is a fundamentally different way of thinking than mechanical systems which do have "answers" (known outcomes).

Emergence

Emergence is a characteristic of Complex Adaptive Systems in which properties, heretofore never seen, emerge from novel designs. These properties are not found in the component parts. One cannot find the properties of a cell in its component atoms or molecules. One cannot find the properties an organ—say a liver—in a liver cell. One cannot find the properties of a human being in its organs. There is no "Chris" in my liver. It is the inter-connections coming together to create a new design that allows for the emergence of those new properties. You put a heart and a liver and a brain and some skin and bones together and you get something new – not just the sum of those parts. You get a living, thinking, loving, hating, irritated, inquisitive design fit for this environment. We have no idea, however, what awaits us in the future.

You can see, of course, why the basic laws of a mechanical system no longer apply when you have novelty and its emergent properties. You cannot predict novelty – new combinations—and you cannot predict the emergence of new properties. The definition of novelty is that we have never seen it before. This is not to say that planning is not an appropriate task for businesses, but rather understand that planning is more appropriate for the mechanical systems in business and not the biological. Markets shift, tastes vary, technologies change, people come and go, organizations spring up and die, foreign policies evolve, wars erupt and about the best we can do is to try and spot the future coming out of the fog.

Biological entities operate at the edge of chaos in order to explore the fitness landscape looking for good designs for the current environment (also known as survival) -- and so should businesses.

Self-Organization

There is a related principle in complexity science called self-organization. Scientists now know that nature runs large scale operations, and it does it rather well, but *without anyone in control!* There is no CEO in the ant den, and there is no chair of the board making decisions in beehives. No squadron leader barks flight orders to a flock of geese. Ants and bees and geese operate on simple, local sets of instructions with short feedback loops and out of this…order emerges. The work of the ant den and the beehive gets done with no one in control. The flock of geese maintains its shape, identity, and function with no one in charge.

Most large business organizations (and some remaining socialist economies), on the other hand, work on a command-and-control model. The problem long identified with large command-and-control structures is that the cost of coordination and communication (the coefficient of organizational drag) eventually outweighs any benefits of specialization and economies of scale, and the organization becomes less and less responsive to the environment. Self-organization, on the other hand, is a little more chaotic, but it is also more robust, more redundant, and more likely to survive.

What this means in a real sense is that the larger an organization gets, the less command-and-control responds to changes in the environment. In our everyday work, we could see that the organization of small growth companies was different than large, stable companies. These "gazelles" seemed to "just do it" and yet it all came together. Large, stable companies "just ordered it" and put into motion large numbers of meetings, committees and reports being generated.

Kaizen, the Japanese method of continuous improvement, is at its heart a self-organization approach to problem solving. Instead of decisions coming down from the boss, problems are identified and resolved by the people onsite. Just as individual self-interest drives the bigger economy to become more innovative and more efficient, the same job level self-interest in an organization will explore the best designs and processes that ultimately benefit the bigger organization.

Systems Thinking

A sister field of Complexity Science is Systems Thinking. Donella Meadows, in her book "Thinking in Systems: A Primer" described the science simply and elegantly.

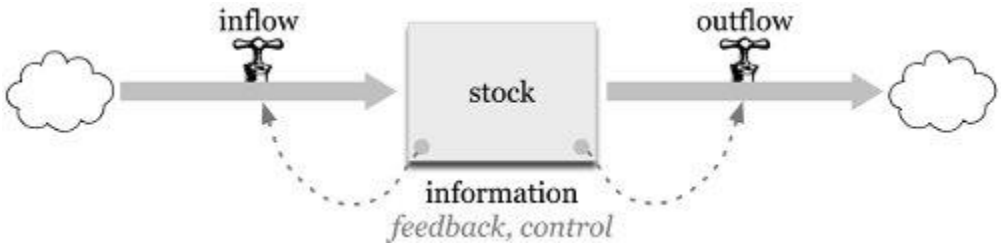
> "*Systems are an interconnected set of elements that is coherently organized in a way that achieves something. If you look at that definition closely for a minute, you can see that a system must consist of three kinds of things: elements, interconnections and a function or purpose.*
>
> *For example, the elements of your digestive system include teeth, enzymes, stomach, and intestines. They are interrelated through the physical flow of food, and through an elegant set of regulating chemical signals. The function of this system is to break down*

food into its basic nutrients and to transfer those nutrients into the bloodstream (another system), while discarding unusable wastes.

You can understand the relative importance of a system's elements, interconnections, and purposes by imagining them changed one by one. Changing elements usually has the least effect on the system. Your body replaces most of its cells every few weeks, but it goes on being your body. The university has a constant flow of students and a slower flow of professors and administrators, but it is still a university.

To ask whether elements, interconnections, or purposes are most important in a system is to ask an un-systemic question. All are essential. All interact. All have their roles. But the least obvious part of the system, its function or purpose, is often the most crucial determinant of the system's behavior. Interconnections are also critically important. Changing relationships usually changes system behavior. The elements, the parts of systems we are most likely to notice, are often (not always) least important in defining the unique characteristics of the system."

The basic elements of systems thinking are called stocks and flows. A simple way of thinking about a stock is a bathtub-- a place where something accumulates. Flows are movements – in this case the water going into and out of the tub. There are also valves or faucets that control the movement of flows as well as feedback loops that take information from one element to control another element. A toilet has a float valve that rises and drops with the water level. When it drops to a certain point, it sends information to the in-valve to turn on more water.



Some basic tenets of Systems Thinking:

- Systems are composed of inter-connected parts**.** A change to any part or connection affects the entire system (unintended circumstances).
- System behavior is more dependent on connections than parts. To change a system's gross behavior, change its structure.
- System behavior in biology is an emergent phenomenon. It is not predictable at a fine scale.
- Feedback loops control a system's dynamic behavior, not the parts**.**

While there are many lessons to be learned from systems thinking, four are of particular importance:

1. If you don't understand the system, you will most likely make things worse.
2. Systems, because they are highly interrelated, have unintended consequences. It is difficult to adjust one element without affecting the other connected elements, many of them making counter adjustments to maintain stasis.
3. Systems have leverage points where a small cause can have a large effect. Finding these leverage points is more important than exerting more pressure.
4. Relationship changes are more important than element changes. If one football coach can appeal every referee decision (changed relationship), that will change the system outcomes much more than changing the coach (changed element).

There are several practical uses of systems thinking in EG:

Leverage
The concept of leverage has proven to be very robust in thinking about business problems. Does a single sale result in a single deliverable or does it result in multiple deliverables (say to all the franchises or chain stores from a corporate office purchase) or repeated deliverables (restocked every three months) or continued maintenance or replacement or upgrade? Is marketing aimed at one potential customer at a time or can you present at a conference or trade show where a number of targeted customers have gathered (watering hole)?

Event versus Systems Behavior
There is a strong tendency among humans to be event oriented because events are immediate and can be easily sensed. Addressing events rarely solves problems in systems. In a classic Systems Thinking illustration called the beer game, the brewery hits capacity and can only deliver 80% of each order. In the next round, each retailer adjusts his order up by 20% hoping to offset the 80% delivery rate. This puts even more pressure on the brewery which makes a major decision to expand. At the retail level, orders are now being fulfilled 100% and so the retailer drops his order from 120% of his real need to 100% of his real need. What the brewery thought was a 20% growth was actually individual retailers who only saw an event and adjusted their behavior accordingly, which only made the systems problem worse.

All trends are composed of a series of events, but an event does not make a trend. The tendency in reacting toward a single bad event is to attack the apparent problem directly when the answer is usually upstream in the system. Poor employee performance is often less about the actual event than the upstream system of how that employee's strengths and weaknesses got matched with this job. Firing the employee just perpetuates the blame/change/fire routine common in large organizations. Further, reacting to an event isolated from the system is likely to lead to unintended consequences. Developing standard operating procedure to deal with a single instance of poor employee performance will affect all employees and all circumstances—and you will get a variety of individual employee reactions (do it in secret, do it another way, use it as a threat against another, look for another job, etc.)

*Reinforcing and Balancing Loops***.**
Systems have reinforcing and balancing feedback loops. A reinforcing loop is another way of describing Brian Arthur's "increasing returns" principle: winners tend to keep winning. There is always an opportunity for creating a reinforcing loop in unconsolidated markets (many small players). As further discussed in Network Economics below, becoming the hub is central to the idea.

Network Theory

There is a branch of Complexity Science that extends into the world of networks, which has its own set of rules. Modern network theory was developed by people like Duncan Watts, Steven Strogatz, and Albert-Laszlo Barabasi.

While there are a number of network styles, it is the "aristocratic" networks that have formed and persisted in nature over millions of years that are of particular interest to us. Aristocratic networks look like hubs and spokes that reflect the 80/20 power laws we have come to expect in nature (20% of the elements are responsible for 80% of the outcomes and the remaining 80% of the elements are responsible for the remaining 20% of the outcomes). So, in aristocratic networks, a few hubs have many connections and most hubs have few connections. We see this power law in Internet, Facebook, and Twitter sites where Justin Bieber has 80 million followers and you and I don't.

Another key factor in network theory is something known as weak links. Networks tend to cluster because we tend to run with the same people most of the time. It might be people at work or people in our neighborhood or a professional network. Thus, knowledge is fairly bounded in our circles by what we all know and tell each other. Our political opinions, our religious convictions, our professional outlook, our cultural predilections, our knowledge of the world are all reinforced by the fact that we run in relatively small groups of people, many of whom are homogeneous. However, one of our members may know someone across the country and that "weak link" to another information source improves the knowledge flow in our small group. Think of the Midwesterner who has a cousin in California, and she is always the first to bring cool fads and language into town.

Those long distance, weak links are also the reason that the Six Degrees of Kevin Bacon game works. (In the game, you must connect any movie star to Kevin Bacon by linking co-stars in a movie to other stars in other movies until one of them co-stars with Kevin Bacon.) Weak links allow us to jump long distances to make a connection. If a person in California were trying to connect to the Queen of England, but he had to link to someone in the next town who knew someone in the town after that and on and on…it might take hundreds of links to work from the West Coast to the Queen. However, if that person knows someone in New York who knows someone in London, we are halfway there in two links. Now he just needs his English contact to know the florist for the royal family and he's there – in four links.

It is not surprising then that Network Theory contends that innovations increase as networks increase. The more weak-links you are exposed to in a network, the more ideas you are exposed to. Connections matter.

Networks have other interesting aspects:

- Networks increase in value as more people join (a telephone or fax network of two people has less value to the users than a network of millions).
- The value of a network grows as the value is shared. Apple let's app developers use their network in exchange for a percentage of their sales. App developers get the value of Apple's huge delivery network, something they could never achieve on their own. Apple, on the other hand, owns a network that is much larger and more valuable than they could have created on their own.
- Network *nodes* grow through increasing returns. The larger they grow, the larger they are likely to grow. Think of the conference breakout room analogy. As you go down the hall trying to decide which breakout presentation to attend you see a room on the right with seven people and a room on the left with 35 people. You make a heuristic decision that 35 people must know something you don't, and you join them -- making the crowd 36 for the next person coming down the hall. Increasing returns has kicked in.
- The dominance of a node is best challenged when the environment changes. The buggy whip node was most vulnerable with the invention of the car. The manufacturing nodes of the Northeast lost dominance with the rise of coal/iron ore/steel in the Midwest.

Here's the important take away for businesses. Pulling away from competitors early on has a much higher probability of establishing increasing returns and lock-in than later in the game. The objective is to become the hub for information, for conversation with peers, for sharing the network with those who complement your core technology, for sponsoring conferences and shows, and pushing your brand to become the generic name (Coke, Kleenex) and standard.

All of this is a possibility when technology is new or when markets are unconsolidated. This latter is important in that some industries have been around a long time but have a large number of small players with no one having a dominant share. Even though the technology may be old there is still no increasing returns working. Think of small hardware stores which had been around for a hundred years before Home Depot and Lowe's became the dominant hubs.

Change and Stability

Clearly all these new characteristics of biological systems were distinctly different from the mechanical system rules we were used to, but what did it matter? Was there any practical use for them in everyday business?

It came to me one night in bed. Of course! The game is about stability and change. What Nature worked out was the *formula for finding* the design fit for in any given environment—how much

change do you need and how much stability. The reality is that all industries go through change; the only difference is *rate* of change. Some industries are very stable for long periods of time. They typically are consolidated into usually two or three major players who have great barriers to entry (complex supply chains, extensive distribution networks, massive marketing budgets, big capital investments in infrastructure). In stable environments:

- The company objectives are *exploiting* the current market.
- The operating principles are loss aversion, expense control, efficient execution.
- The management structure hierarchal and rigid.
- The dominant management temperament is Guardian.

As long as the environment remained stable, these factors (temperament, management style, company objectives) succeeded. Over the long run, however, all industries change. It may be over decades or even over centuries (paper was stable for a couple of millennia until electronic communication came along), but they do eventually change.

Even more important, change in biological systems *does not happen smoothly*. It comes quickly and in chaotic waves before it settles down again, and we now know why. Biological entities work themselves toward the edge of chaos where they are in a critical state—namely small causes might create small effects or they might create big effects. Those big effects record as punctuated equilibrium. For a long period of time, things are stable and just this one tiny little thing happens, and all chaos breaks loose. The world reshuffles until new relationships are formed and things settle down again.

During this reshuffling period, companies are now faced with rapid rates of change and all the rules change. If the company is in a volatile market:

- The company objectives are exploration of new markets, creating new top line revenue)
- The operating principles are rapid exploration of the fitness landscape – find new products and markets quickly to stay ahead of competitors
- The management structure is flat with visionary leadership
- The dominant temperaments are the Intuitives

Month after month, all of these new concepts spinning out of the new sciences inundated our little four-person department. Obviously, each branch of the science has much more depth than the short descriptions provided here. What is important is that they were turning on the lights in the dark room of biological systems, and we could see all those things that we had been bumping into in the business environment in Littleton. These new systems resonated with what we were seeing on the ground and made a lot more sense than our old thinking about businesses.

CHAPTER 6 WE ACQUIRE MORE SOPHISTICATED TOOLS

The tool set we used did not develop as fast as the intellectual foundation for Economic Gardening. For a number of years, our primary tool was database researching. It was powerful, practical, expensive, and clunky. Subscriptions to each service ran in the thousands of dollars, and our total budget exceeded $80,000. Database searching was our first break from standard business assistance being offered by everyone else at the time. It opened a world of sophisticated information around markets and competitor intelligence and industry trends. Large corporations had their own librarians (known as Special Librarians in the library world) that conducted similar types of research, but we were able to bring that sophistication down to smaller growth companies. Stage 2 companies usually didn't have the budget to either buy the databases or hire the librarians and often didn't even know this resource existed.

From this one tool beginning we made a commitment to find the best tools available at the corporate level and bring them down to the small growth company. Over the next two decades we added Geographic Information Systems, Search Engine Optimization, Digital Marketing, Social Media, Listening Posts, Network Mapping and OSINT (open source intelligence).

Geographic Information Systems

About a decade into our Economic Gardening effort, I became aware of Geographic Information Systems (GIS). GIS is putting data on computerized maps. Every election season, there is a national map that shows each county in red or blue indicating it voted Republican or Democratic--that is GIS software at work, albeit a simple example. In its business form, GIS is no different than putting pins in a map to show the location of customers, but it has many more sophisticated uses. It can plot competitor densities, identify the best location for a store, determine the most efficient sales routes, and show the demographics, lifestyles and sales of consumer products by neighborhoods.

It is clearly a powerful tool. In my early professional years, I used to do market analysis studies for which I would charge $30,000 and take 6 months to complete. GIS has better data than I was ever able to get my hand on, can generate better looking maps, and can do it in a matter of hours, not months. It is a dream tool for a market researcher.

I finally bought the coveted software and began experimenting with it. I had no training and little time to learn it, so it set on my computer for a couple of years, both powerful and impotent because I could not get a map to come out of it. In my defense, I will argue that it is still a clunky software with obscure language and operating procedures that produces beautiful, intuitive maps.

In 1999, a young man named Eric Ervin had been working as an intern with the Planning Department when I learned that he had a degree minor in GIS. I caught him in the hallway and asked if he could make a map come out of my software. He could, and I hired him away from the planners in the year 2000.

Eric had a sixth sense about how to use GIS to make it both pleasant to the eye and intuitively display information. His work drew rave reviews and the quality of our tools started to match the quality of our scientific principles. There was a period where a lot of the work was repetitive, producing the same demographic, lifestyle, and consumer expenditure information for each business. At first Eric would play with different color schemes, but eventually he grew bored and began to wander afield looking for exotic databases on the Internet. It was the best thing that he could do. The information became richer, and the maps more interesting. Our work was as high quality and professional as the national consultants using the same tools.

Internet Marketing

In 1998 Google was founded with the basic idea that it could help you search the Internet and find the most relevant material about the subject you were looking for. To evaluate a site, it would look at the number of inbound links from other sites and the density of your search words on the site. It would then rank sites and present them in the most relevant order. That simple idea spawned a flood of new businesses, one of which was Search Engine Optimization (SEO). If Google was looking for certain things that would raise your ranking in the displayed pages, then there were plenty of computer nerds who knew how to do that – or more formally how to "optimize your site for the search engines."

In the early 2000's that idea spread out of California and across the nation as SEO specialists hung out shingles to help businesses play the game. Eric, ever cognizant of cutting-edge technology, gave us early notice so we hired a firm out of the Bay Area called Net Results to teach us Google's algorithms. Ron Blaise, its owner, had the classic Silicon Valley persona – nerdy, shirt tail hanging out, brilliant, and early expert in search engine optimization. With his guidance, we were once again on the bleeding edge of technology.

We learned, for example, that using Flash (which makes things move) on the front page would prohibit Google from getting into the site to index it. In essence, the site was blind to Google, no matter how much money you spent on it. Simply knowing that fact and getting Flash off the front page would immediately increase the visibility of the site and usually sales.

Even more intriguing, we learned about the shadow games that had emerged. Google was working on the premise that if a lot of other sites pointed toward a given site, then those other sites were in effect voting that the recipient site was most relevant. That premise then initiated a "white hat / black hat" war that continues to this day. White hat programmers tried to respect the Google rules while black hat programmers tried to get around them. Black hat programmers reasoned that if Google was counting the number of inbound links, they would encourage reciprocal links (you point toward my site and I'll point toward your site, and we'll both go up in Google rankings). They also built "link farms" -- dummy addresses on massive servers that would point to a site giving the appearance of a lot of inbound links.

Google immediately began a counter offensive in which reciprocal links would actually downgrade your site and linkfarms would get you banished from the universe. Black hats struck back by repeating the keyword terms to increase the likelihood of relevance and Google said if

you do that, it is not real relevance and we will discount you. And on and on, white hat versus black hat, move and counter move, tit for tat.

If we learned anything about search engine optimization during this period, it was that it is a fast-moving world between the Google folks and the huge black hat army trying to bend the odds in their favor. As more and more businesses became sophisticated about SEO, it was also apparent that it was logically impossible for everyone to be on the front page of a search. Our attention shifted to paid advertising.

Most people are aware that the top of a Google page is paid advertising, while the main body of the page is "organic" meaning that Google thinks these are the most relevant websites about the search term you put in. The paid advertising shows up based on an auction to purchase the search term. Anyone can bid on the term, so it has become an excellent place to advertise. If somebody types in "thermoforming plastics" in their Google search and you happen to sell thermoforming plastics, that searcher is probably someone with whom you want to talk. Once they click on your ad, you owe Google the amount you bid to be in first place and the individual goes to your website — highly targeted (they are looking for thermoforming plastics) and highly qualified (they are looking for it today). It doesn't get much better. Now you just have to convince them you are the best of all the choices they have.

Google Ads, the paid advertising service, offered numerous free tools that helped a business develop an effective ad. Google could tell you how many people searched on your term in the last month. What's more, they could tell you that when people searched on that term they also searched on these other related terms. Google could estimate what the term was going to cost the business if they bid on it and from that information what an entire campaign might cost including the number of people likely to view your website. The business had the ability to control the amount of money they wanted to spend in any given day, to control the time of day the ad becomes visible, and to control what parts of the country that would see the ad.

Google AdWords was very effective marketing provided the company had a tight profile of who it is looking for as well as an effective website. For the first time in history, a business had a real time picture of supply and demand. We used AdWords extensively for companies in our Economic Gardening program and could sometimes jump sales by double digits in a few months.

Social Media

Much later in the history of our program, social media made its appearance. Its quick growth made it industry buzz for a number of years. Initially there was a land rush to be on Facebook and Twitter and LinkedIn with companies collecting "likes" and "followers" as if they were gold nuggets lying on the landscape. There were some business-to-consumer success stories, but it was harder to make a business-to-business case (increase income or decrease expenses) for this activity. As with many new technologies, the ultimate value had not yet been established.

Facebook and Twitter quickly developed strong 80/20 rules and remained very social in nature. Movie stars had millions of followers, the popular kids in high school had hundreds, and the

great majority of the world had a handful. Some business to consumer companies in which relationships were as important as the product were able to use social media to build community among the users.

Picking out real value in all the commotion was tedious work, but we did find useful elements particularly in LinkedIn. This professional network is commonly thought of as a resume posting and searching site, but it has strong (if less visible) aspect to it: groups. Thousands of discussion groups sprang up on LinkedIn around virtually every arcane subject you think of. Obviously having a room full of very select people was an attractive marketing thought.

The initial instinct of sales and marketing people was to join these groups and start pitching wares. Those groups quickly took on the feel of a Chamber of Commerce networking event: everyone passing out business cards —a marketplace of all sellers and no buyers – "spray and pray" in its crudest form.

Some groups became actual discussions with a give and take of information. Like Twitter, Facebook, and listservs, 80/20 rules quickly developed. A few posted a lot, and most were lurkers, reading on occasions and deleting a lot.

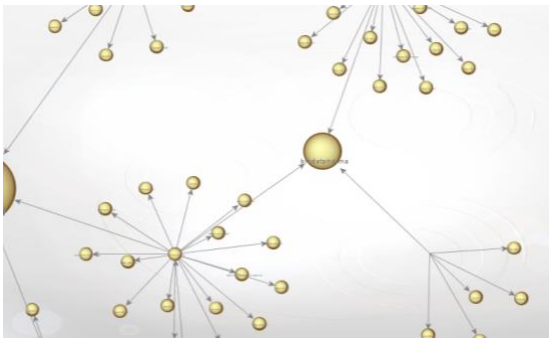
Our approach to LinkedIn groups and Twitter was to focus on the "thought leadership" aspect for innovation companies. Being a source of leading-edge ideas without a hard sell has some validity to it. Even more important was the idea of being the hub in unconsolidated industries. While it is a key strategic objective, becoming the central hub is no mean feat. It requires attention and energy and an instinct for writing and discovering. Not all temperaments are good at that, however those that are have been able to move in the direction of increasing returns (positive feedback loops).

As social media spread throughout the population, we developed a more mature understanding of its unfolding value. Beyond the instinct to use it for marketing we began to see it was also valuable for market research. It led us to add two more tools: listening posts and network mapping. We started to realize that chatter on Twitter, Facebook, and LinkedIn was actually big data and primary research. Instead of a focus group of twelve people giving us insight into issues (albeit statistically invalid) we could now listen in on a running stream of customer feedback.

Network Mapping

While there is a tendency to see the world as individual points (Christian Gibbons is an older white male living in Colorado making Social Security income), in reality the basic building blocks of the biological world is networks. Knowing that I run econ-dev@googlegroups.com as center of discussion about Economic Gardening for 1,000 people is much more useful. The power of being able to visualize networks was brought home to me, of course, by Eric Ervin. Eric always reminded me of the trapper who showed up at the fort now and then, casually mentioning a river or mountain range no one knew existed. He was constantly on the frontier bringing back titillating hints of new worlds.

This time, Eric found software from South Africa called Maltego which could diagram with startling clarity any electronic network (websites, Twitter, Facebook, etc.). You could visually spot the major hubs because it was a map of nodes and connecting lines. Those with the most connections were displayed as the largest dots.



Being able to see the networks people were in gave us several insights. If you were selling, you could see entrance points for personal introductions. You could also see how strong competitor positions were by the number and activity of their links to their probable customer. If you were doing research, you could see who the experts were on any subject matter. If most people were connected to a university professor studying some industry phenomena and many of the graduates of that program were also interconnected, that tells you a lot about where you should be. As the saying goes, if you want to be in film, you need to get to Hollywood. If you want to deal with the orthopedics industry, you need to get to Warsaw, Indiana.

Listening Posts

The next tool Eric developed was a listening post. The idea of a listening post is to monitor the publication of information about a subject. Google Alerts, of course, will catch any item on the Internet that has the term you specify. The problem is that it catches any item on the Internet that has the term you specify---good, bad or indifferent. Having a million hits on an item is not very useful, even if the first one is supposed to be the most relevant.

Eric made two improvements over Google alerts. First, he improved the signal to noise ratio. By eliminating a lot of the garbage, the remaining results were pretty much on target. Second, Eric curated the sources. Billy Bob's Bedroom Blog got eliminated and the Harvard Business Review was included. The net result was a continual stream of high-quality information and customer chatter about changes going on in an industry.

Listening posts proved useful for monitoring customer chatter, spotting industry changes and trends and monitoring competitors.

CHAPTER 7 AN IDEA TAKES ROOT

By the year 2000, we had finally reached a stage where we had a much more polished program with a pretty decent beta test. Our premises had not changed much from the start: we could grow an economy locally by focusing on a narrow band of early stage growth companies – the gazelles or Stage 2 companies as we came to call them. We felt that information to make strategic decisions was our most valuable contribution and appropriate for a public agency. We had the full scope of the New Sciences from which to develop rules for biological systems as opposed to rules for mechanical systems. We had acquired some of the best of high-end corporate level tools: database research, GIS, new media marketing, social media, network mapping, listening posts. We were firing on all 8 cylinders and getting great outcomes.

Something even more important was happening. The idea of supporting entrepreneurship as an alternative economic development approach was growing in the profession. Articles began to appear. Other types of entrepreneur programs started up. Respected professionals were talking about it at conferences and writing papers. Academics were including the idea in their curricula. Economic Gardening was being mentioned in university classrooms and students were contacting us for help on papers.

National Conferences

During this same time period, it seemed time to host a professional conference to share thoughts and ideas with the small band of people who were following our work. Eighteen people showed up in the community room of Littleton City Hall for a day for our first conference. No catered food, no hotel arrangements, no conference banners. Just early adopters interested in a nascent idea.

The following years we met in interesting "local color" locales (plaza at Santa Fe; a winery in California; industrial buildings in Fairfield, Iowa; a hunting lodge in Georgia, a ranch in Steamboat Springs, Colorado; a fort in South Dakota; a ferry terminal in Washington). In those early years the conferences were fairly informal affairs with somewhat of a rural flavor to them. Rural communities were some of the first attracted to the idea of growing your own given their poor outcomes in recruiting businesses. We never drew more than 30 some folks those first seven years but the ability to talk and share made the quality high.

In 2011 the conference changed character. Interest levels were growing, and the attendance shot up to 80 and then 120 and 180. We moved into hotels, the planning took longer, the agendas became more complex and the audience more urban. Conference were held in Orlando, Florida and then Grand Rapids, Michigan and Kansas City, Missouri.

Growing Interest Around the Country and Around the World

By the start of the new millennium, a number of communities (including Lake Elsinore, San Bernardino and Chico California; Santa Fe New Mexico; Lancaster County Pennsylvania; Steamboat Springs Colorado; and the State of Wyoming; and the had investigated the idea and were experimenting with Economic Gardening.

"Econ-dev," which had been our Internet listserv about Economic Gardening since the early 1990's, changed from our singular observations to a full discussion of entrepreneurial activity by a number of talented people. Over 300 practitioners, consultants, academics, media members, politicians and students in twenty some countries were monitoring the site (As of 2019, it is over 1,000).

Institutions began to take notice as well. Littleton's program won the National League of Cities national award for innovation in 1998 and was cited for innovation by the U.S. Economic Development Administration, and the University of Minnesota. Stories about Economic Gardening appeared in Governing magazine, BusinessWeek, Nation's Weekly, Business Expansion Journal, Stanford Social Innovations Review, and ICMA as well as an interview by National Public Radio.

The idea eventually spread internationally. Early on, we conducted a video conference with officials from Northdown Borough, Northern Ireland. As the screen came up, we could see the group in a large medieval hall with high timbers overhead. They were meeting late at night in order to talk to us early in the morning. Somehow the idea had seeped beyond our borders. Over the next several years we started hosting visitors from overseas including Australia, New Zealand, and Norway. In turn, I was invited to speak to communities all up the coast of Norway including Kirkenes above the Arctic Circle. I talked with folks in Auckland and Christchurch, New Zealand. I flew into Sudbury, Canada in a January blizzard. I was invited to speak in Sydney, Port McQuarie, Cowra, and Shellharbor, Australia. Later I went back to New South Wales for two weeks, driving nervously on the left-hand side from Bega to Eden to Merimbula, Moruya, and Nowra. The European Innovation Council was interested in the approach, so we journeyed to Trent, Italy where the presentation was translated into six languages on the fly. Economic Gardening was represented on a panel at the Americas Competitiveness Conference with high level officials from governments throughout North, South and Central America.

During this time, Takashi Yamamoto of Kyoto University in Japan introduced himself to me. He had taken an interest in the idea and started traveling all the way from Japan a number of times to take the training and attend conferences. Takashi actually wrote the very first Economic Gardening book, albeit in Japanese. He asked if I would write the forward and I did so happily but could not read it when the book was published in Japanese. Takashi continued to advocate for Economic Gardening throughout his country, and we subsequently hosted three different delegations from Japan who were familiar with his work. The Japanese version of Fortune magazine had Economic Gardening on its cover.

Mark Lange

It was at that point that I started thinking about potential partners that could help me scale the program: Kauffman Foundation, Center for Rural Entrepreneurship, Small Business Administration, Kellogg Foundation and others. Out of the blue, I got an email from Mark Lange, executive director of the Lowe Foundation, small family foundation, inviting me to come to their campus in southwest Michigan to explain my program. It was apparent that we had common interests, but over the next few months Mark and I had trouble developing a common language. He had not seen the program operating, and I was doing a poor job of describing all the deep principles on which it was built. We were both getting frustrated, so finally we decided to invite four businesses from the deep South to go through a short version of an engagement. I had our researchers actually do the work virtually and display it on a screen in Mark's conference room. Mark could see the process. It clicked with him and solidified an important relationship for getting the national program back on course.

Breckenridge Summit

There were three distinct phases the program went through over the years. In the first phase, we were entirely alone. There were no models, no theory, no colleagues, and no path to follow. We were making it up out of whole cloth. We tried a number of things, many of which didn't work, but we continued to read voraciously. Thank goodness, the mistake and learning phase was conducted out of the public view.

In the second phase, other communities started to make inquiries about the program. Over the years, the contacts exceeded 800. We were happy to explain what we were doing, but I felt no responsibility for the success of other programs. I provided an overview, but I didn't give detailed instructions about how we worked, and so each community would go back home and start up what it thought was best. Sometimes these were feeble efforts with no financial commitment that died shortly thereafter. Sometimes they were just a continuation of the business assistance programs that they were already running. Sometimes they were bizarre and unrecognizable.

It was during this period that I started to realize that Economic Gardening had become a brand and that brand management was going to be important. The term had "gone wild" on me and was being applied to all sorts of activities, some of which had no relationship to what we were doing. I became concerned that if these projects failed, it would reflect upon the concept. Given the wide variety of things being touted as Economic Gardening, there was a good chance many would fail. The key elements of focusing on Stage 2 emerging growth companies and their strategic issues, using corporate level tools and theories grounded in Complexity Science were not being incorporated in many of these programs. Fidelity to our original program was not there.

All of this led to the third phase which began with the "Breckenridge summit." We hosted about a dozen well respected people from around the country at the Breckenridge, Colorado ski area in

the fall of 2009 where we spent two days discussing the issues that faced the program. Out of the Breckenridge summit, several conclusions began to crystalize.

First, I had to clearly differentiate the value of Economic Gardening vis a vis recruiting, but even more importantly I had to differentiate it from business assistance. Second, I had to figure out a way to keep every ephemeral idea from dragging the concept this way and that, but at the same time not be so dogmatic that the idea couldn't change to accommodate changing circumstances. This latter worried me a lot. We got into a discussion about whether a tech council in Baltimore was doing Economic Gardening. The argument was made that if Economic Gardening was about helping entrepreneurs then the Baltimore project helped entrepreneurs. "Yes," I countered, "and so do incubators and tech transfer programs, but they weren't what we were doing in Littleton." It was clear to me that people bought into the idea of an entrepreneurial approach, but not the details.

Over the next several weeks I wrestled with the charges that Economic Gardening can't only be what Chris Gibbons thinks it is – it will be sealed off from other good ideas. At the same time, it can't be changed by the slightest breeze of every new opinion regardless of its merit. It was starting to feel like Edge of Chaos to me – how to maintain enough stability so that you are who you were yesterday, but at the same time change enough to stay alive in a changing environment. What was the right tension setting between the two?

Once I framed the problem in Complexity terms (tension of opposites, not absolutes), the solutions came easily: *Open source* and *best practices*. We could ensure that the program would maintain its well tested vitality and still not lock it into stone. The idea of having an *open source* program that could receive ideas and improvements from a multitude of people was appealing. We are collectively smarter than any individual and tapping into a national network of brains would ensure the idea would continue to evolve as newer tools and research came to the table.

The flip side concern was that it would be diluted by every consulting fad that came along, or even worse, drift back into the old ideas of past practices, and then lose its moorings in deep scientific research. Best practices seemed to be a good solution If a new tool or new concept came along and a number of practitioners who were versed in the primary program thought these new additions were good, then they would be accepted into the practice. It meant I would give up control over ultimate content, but somewhere down the road I was going to give up control anyway.

Ideas would enter the program like baseball players--starting at A ball, moving up through AAA ball and then to the big leagues. Some ideas would move slowly, some quickly, and some not at all. But the sheer weight of the practitioner community would serve as a good screening mechanism. In some cases, they would find even better ideas than I had (as painful as those thoughts were) so it seemed best to concentrate more on principles rather than practices. They had to be principles and theories that weren't a flavor of the month consulting idea, but rather would be so fundamental that if we were to come back in a hundred years or a thousand years, they would still hold.

The other thing that came out of the Breckenridge summit was the need for a clear distinction between Economic Gardening and garden variety business assistance. After many trial runs, I decided it boiled down to four things:

- The focus on Stage 2 entrepreneurial growth companies
- The focus on strategic issues
- The use of New Science principles
- The use of sophisticated corporate level tools

Our focus on Stage 2 "gazelles" had been constant from the beginning. David Birch's work had convinced us of that.

The strategic focus was designed in at the front, but we moved in that direction by the evolutionary pressure of looking for fundamentals in business. There are probably 125 things you could do to assist businesses, but many of these were small-effect items down the "long tail." They were daily operational in nature--keeping books, buying insurance, and succession plans. These were the kinds of things where you could make mistakes that might dent up your business, but it probably wouldn't take it under. The issues that concerned us were big strategic, front-end issues that were fundamental to success. If you didn't get them, you would not survive. If you didn't get core strategy or markets identified or sales leads or building a team right, you wouldn't make it. There were some other major issues of finance and labor force that were also important, but there were numerous organizations set up to deal with them.

The use of New Sciences is probably our biggest barrier to entry. They are not known to most people, and they are not easy to understand. It takes a thorough grounding and some comfort with math to incorporate them into daily use. I suspect it will be a major difference between us and the ordinary business assistance program from many years to come.

The tools, of course, are constantly changing, and our only defense is to incorporate newer tools as soon as we can vet them. Open Source Intelligence is the current frontier for us. Reference work is relatively easy, but intelligence work requires diligence, patience, and a sense for patterns. Few people have a natural proclivity for it nor an interest in developing the capability.

The Fidelity Issue

The question of how to ensure high-fidelity programs had several discussion points. First, did we have the checklist for what high fidelity looked like? Second, could we train and certify people in the principles we were using? Finally, was there a way to put a pilot project together so a local community could get a sense of the program without taking major risks?

Mark Lange kept telling me that unless we could get the 20 years' experience that was in my head onto paper so others could learn it, the program would never scale. As simple as that sounds, it took me the better part of two years to put that into a coherent presentation. A number of people over the years have commented on my ability to simplify and get to the heart of a problem. At first, I thought that everyone thought that way and there was nothing unusual about

it, but eventually I came to realize it was a function of my temperament. I had numerous short cuts, underlying principles, analogies, and experiences that had built up over the years and simple triggers would tap into these files. The problem was, they weren't organized in a logical manner – they were just hundreds of experiences and files to be tapped into. There were many times when I had to ask myself, how did I come to that insight or conclusion or recommendation? Writing it all down in a logical and understandable presentation was much harder than I ever imagined.

By 2008, I had the first cut ready to go, and we hosted our first 4-day training class in which I went over all the basic elements of Economic Gardening. We began professional certification a short time later. Its purpose was to make sure people knew what EG was and wasn't and to give people a better grounding for running their own programs. If you are going to do real Economic Gardening, do *this* but not *that*. The classes were offered and filled up twice a year.

The National Center and the National Team

The other major initiative we undertook to get the fidelity issue under control was the establishment of a national center and a national team. I was monitoring the EG term through Google alerts, and I was getting one to four articles per day about new programs coming online. The problem, however, was that these programs had very little structure and didn't differ much from the standard small business assistance program available through chambers of commerce and the federal government's SBA offerings.

The National Center for Economic Gardening was established in 2008 so that we would have a formal organization through which we could work. At the same time, I filed a trademark on the term Economic Gardening, not so much with financial considerations in mind but rather to limit the usage of the term to high fidelity projects.

The other major event was the decision to create a national team to provide the same services we had in Littleton. There was a time in my career when I thought anyone could duplicate what we were doing, but a project in Colorado changed my thinking. I watched the City of Greeley struggle for a year with an underfunded program trying to get the specialists and the databases in place. It convinced me that duplicating the program would not be as easy as I thought.

A pilot program using our own team had several advantages. The local community could see exactly how we worked and what kinds of deliverables we were producing. They could talk to the CEO to see if it was of value. They could see whether jobs popped out at the end, and most importantly, they could make a determination about whether they could do it themselves. From our side, we could put a full blown, seasoned team in the field with very short notice. The local community's responsibility was limited to making the program known, finding and qualifying local growth companies, and picking them up at the end of the engagement.

Our first test of the approach was the State of Florida. Looking back, it was a little crazy to think we could jump from Littleton, where you can drive across town in 15 minutes, to Florida. Enter Steve Quello. Steve was a consultant who lived in the Orlando area and had co-written an

Economic Gardening chapter in the SBA's annual Report to the President of the United States. He was a strong supporter of the idea and had been working with various folks in the Florida state government to sponsor a pilot project. Steve, Mark and I put together a proposal, won the project and were now charged with working with companies across the State of Florida.

For me, it was one of those dog-catching-a-car moments. I had been actively spreading the word about Economic Gardening, had made numerous speeches across the country, and had hosted a number of communities who had come to Littleton--but this was the State of Florida. This was the 4th most populous state in the union with a reputation for contentious politics and sometimes odd events.

I started worrying about whether there was something specific about Littleton that made it work. Was it our city size? We were 41,000 population and Florida was 19 million. Was it related to being in the West? Florida was southern with a huge population from the Northeast and Midwest as well as Latin America countries. Was it related to the inherent entrepreneurial culture found all throughout Front Range Colorado? Florida was retirees, tourism, and federal government space work. What if it weren't the deep underlying principles we had discovered or the tools? What if it was just a fluke of geography and time? At this point it was too late to worry about any of this – the roller coaster had crested the top and was now tipped downward. We were going for a ride, ready or not.

Florida indeed turned out to be a ride, but we were lucky to have some strong partners at the University of Central Florida in Orlando (which I had never heard of but found out was the second largest university in the country with nearly 65,000 students). Tom O'Neal, the vice president of Research and Commercialization took strong charge of hosting the program, getting the word out across the state, and building internal resources to ensure its success. We worked closely with their staff over the next several years as they rode the ups and downs of funding issues. They became the early test bed and model for running a statewide program on a hub-and-spoke basis. All of the talent and tools were concentrated at UCF with outlying communities turning the program on and off depending upon their need. It was a very efficient model, that didn't require big investments in software or training of specialists. It resolved all of the Greeley issues.

Shortly thereafter, we went to work for the State of Kansas. Every concern Florida had about the program in Littleton (Florida is a big, urban, east coast state whereas Littleton is a small, suburban town in a western state), was reversed in Kansas. They perceived Littleton to be part of a large metro area, not attuned to the agricultural, small-town culture of Kansas. Most of the engagements were in communities under 2,500 population.

We adjusted our operations to reflect the new environment and continued to prove that growth companies can be found anywhere (including Marienthal, Kansas—population 100), and that our services were valuable to companies in any industry. In Marienthal, a company sold organic wheat to East Coast organic bakeries which was a growing market.

The program spread rapidly across the country. We worked with new age energy companies in New England, petroleum and seafood companies in the South, mining companies in the West,

agricultural companies in the Great Plains, defense contractors in the East, and with machine shops in the upper Midwest. We could see up close the devastation that the "China price" had brought manufacturers, but we were also able to see the country's entrepreneurial diversity at its most granular level. I remember an engagement call with a company that laser scanned Times Square in Manhattan and sent the file to Hollywood so Spiderman could fly around it in the movie. The next call was with an Amish furniture maker in Indiana who had no computer, but we could send email to a local company in town who would drive it out to him. This was the real America, and we were at the ground level.

The decade 2000-2010 turned out to be one of great progress. We had gone from simply hosting groups and speaking around the country to a structured program. We had codified the elements of Economic Gardening to differentiate it from simple business assistance programs. We made it clear that it was more than just "grow your own." It was a program tightly targeted on Stage 2 growth companies and more specifically their strategic issues. It was founded on deep scientific principles and used high-end sophisticated corporate level tools. The idea had spread across the country and into a number of foreign countries. We started a national conference which grew tenfold from 18 to 180 attendees.

Setting up the national center and the national team, along with the professional certification course, had brought discipline back to the program. Economic Gardening was starting again to look like what we did in Littleton with the same outcomes. Florida reported over 1,400 jobs directly attributable to their pilot project which had been run right through the heart of the Great Recession. Kansas companies averaged 16% growth rate in jobs and revenue (compared to 2% in comparable companies not in the program). We were getting over 90% "exceptional" ratings from the CEOs we worked with.

But we had still not jumped the "chasm" from early adopters to mainstream economic development programs.

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CHAPTER 8 ECONOMIC GARDENING TODAY

If communities are going to get the same results that Littleton, Colorado got (jobs going from 15,000 to 30,000 with no recruiting, while population grew 23%), then it is important that the Economic Gardening program be high fidelity. Other programs may work, but we can't speak for them. What we do know is that programs that use the same principles, practices, tools and techniques that were developed in the original program get the same consistent good outcomes.

Business Model

In the early years, our business model was to teach local economic development agencies and then turn them loose to run their own program. Outcomes using this model were very spotty. Sometimes they were underfunded or operating without the depth of tools that we used. Furthermore, we were not able to provide them with the critical ongoing coaching needed to learn this fairly complex program.

Today, we run pilot programs ranging from 5-20 engagements depending upon the size of the city or state. We bring a fully functional national team with all the specializations, tools, and analytical techniques (not to mention office space and equipment), so that the client doesn't have to make heavy investments in infrastructure and staff. Further, we have customized software with an application and vetting section on the front end combined with scheduling, task assignment, research posting, budget tracking, invoicing, and audit on the back end.

A typical pilot project engagement will have 36 hours with a budget split among the team members as well as a coaching/mentoring function and administrative support. The pilot begins when Stage 2 growth companies are identified by the local economic development professionals. The program is explained, and then the companies are vetted and enrolled in the program. An initial discovery call is scheduled in which the team leader and the coach develop baseline information about the company and CEO, including a sense of its business issues. Notes are written up by the team leader and then coaching comments added before they are sent out to the team. Each specialist is assigned questions to be answered (approved by the CEO) and a budget after which they begin work, posting results to our secure website. The engagement is closed out with a call and a survey.

At the end of the pilot project, we schedule an evaluation call with the program administrator to talk about their experience and where they want to go from here. The options are:

- That was nice but not what we thought it was going to be.
- We'd like to run a joint program with some of our people and some of the national team.
- This is a great program, but can you continue to run it for us? We like the fact that we don't have to gear up with a lot of infrastructure (staff, training, equipment, software tools, etc.) and that we can turn this program on and off at any time we want.

All of these options are legitimate routes, although over time we have found that a meld of the second and third option gets the best outcomes. Typically having a team leader from the local economic development agency backed up by specialists from the national team has a couple of advantages:

1. The local team leader will have a much better sense of the local conditions and probably background on the company. They may have been in contact with them previously or at least know them from social events.
2. The team leader, on the other hand, gets the benefit of working with a wide variety of specialists from around the country and will get to see a much broader spectrum of capabilities and tools.

There is another advantage of combining the expertise of the national team with local partners like the SBA's Small Business Development Centers and that is someone needs to pick up the company at the end of the engagement and help them implement the work identified by the national team (improve websites, develop marketing campaigns, engage in social media, etc.). Economic Gardening does not engage in operational parts of the business nor do we do any implementation. SBDCs are ideal partners to do this.

Finding and Securing Ongoing Funding

Funding may be the single hardest part of the entire project in that many agencies have tight budgets and are under scrutiny to show results. If funding comes from the local agency, the decision makers may decide to use a portfolio approach (some recruiting, some business assistance, some entrepreneurial support), which would require program money to be carved out of existing budgets. You can expect existing programs to defend their territory, and this may engender an "immune response" to the new program.

If on the other hand, the approach is to create an entirely new line item in a budget, success will depend on finding local champions and allies. This means getting others to understand the value of nurturing local growth companies, understanding what a high-fidelity project looks like, and showing success examples from around the country. Allies and local champions are most useful if they occupy positions of influence whether they are elected officials, respected community leaders, or in the media. In the modern world, the term media has expanded beyond the local newspaper editor to include bloggers and thought leaders on Twitter, Facebook, and LinkedIn. It sometimes takes months, if not years, for local champions and influencers to make their case with the community and those who control purse strings. More often than not, it is a change of elected officials rather than a change of point of view of existing officials which sets a project in motion.

A number of communities have secured short term funding for pilot projects from state legislatures, universities, and federal agencies (SBA, EDA, USDA, stimulus funds). The drawback to short-term money is that long-term funding still has to be put in place. Pilot projects, however, do have the advantage of limiting initial investment in infrastructure, limiting

initial exposure to risk, providing time for evaluation of effectiveness, and providing time for an evaluation of the ability to bring the projects in-house.

Building a Partner Network

The program administrator in the local community will be operating in an environment of potential allies and detractors. It is important to create a partner network early on for three reasons. These partners are the allies who believe in entrepreneurial activity and will support and defend the program. They will also serve as feeder networks to bring companies into the program. In small communities it may simply be the chamber of commerce while in larger communities it might be incubators, venture capital organizations, and industry associations. Finally, these same people and organizations will be the backbone of an entrepreneurial ecosystem needed to ensure the success of local growth companies. That system may include banks, attorneys, CPAs, local media, professional/ industry associations, and manufacturing extension programs. A marketing field kit is available to Program Administrators that includes collateral materials to use on a pick-and-choose basis as well as sample deliverables.

The most successful programs run a broad and continual marketing campaign. They use everything from speeches to community groups to radio and newspaper coverage to email and presentations to groups of service providers (attorneys, CPAs, banks). These latter groups are important in that they have established relationships with growing companies and have a self-interest in seeing them do well. Having CEOs who have been through the program provide testimonials that may be the single most powerful marketing tool (outside of having CEOs make personal recommendations to other growth companies).

Find, Market, Vet and Enroll Qualified Businesses.

The Program Administrator will have to find and market to businesses that qualify for the program. The target group is Stage 2 emerging growth companies which are defined as companies with employment between 10-100 and sales between $1 and $50 million. The type of industry is less important than the growth stage—growth companies can be found in virtually any industry. Finding companies with a history of growth and innovative products sold outside the community will require both good database subscriptions (Dun & Bradstreet) as well as field work. Other local databases to consult would include chamber of commerce membership rolls, city licenses, state professional licenses, industry association memberships, entrepreneurial associations, and municipalities with business licenses. Field checking industrial parks, business centers, college incubators and areas known to be breeding grounds for growth companies is a slow process but generates highly reliable data.

Once the business is targeted and contacted, the Program Administrator explains the nature of the services and has concrete examples of work done for other companies. Typically, the deliverables that catch the attention of a growth company CEO are qualified sales leads, competitor intelligence, industry trends, density maps of customers, and the ability to do customized business research.

Companies that express an interest still have to be screened and vetted against the core criteria for acceptance into the program: history of growth, minimum 10 employees, minimum of $1 million in sales, an intent and capacity for growth, and sales to external markets. The National Center for Economic Gardening (NCEG) has also developed five videos discussing the frameworks we use for analyzing businesses. The videos are available for unlimited use in an Economic Gardening program.

Communications Plan

Much of the Program Administrator's work depends on a deep understanding of Economic Gardening principles and the ability to communicate those to funders, the community, the partner network, and CEOs. This means explaining:

- Why entrepreneurial activity is essential to a community's health.
- What Economic Gardening is (and isn't) and why it is different than other business assistance programs with its specific focus on Stage II growth companies and their strategic issues.
- Showing results and outcomes in terms of increased revenue and new jobs.

There are four major groups to target in the communication plan: the funders, the community, the growth company CEOs and network partners.

We believe there is a difference between formal and informal communication with funders, and that informal communications precedes, and *sets the stage* for formal communications. Formal communication has the unwritten rule that it is a presentation of information; a one-way flow from presenter to receiver. It occurs through reports, speeches, presentations, videos, websites, and PowerPoints. It is used to consolidate and solidify beliefs and understandings developed over a long period of listening to informal communication.

Informal communication is a two-way dialog that occurs through conversations, email, and phone calls. The unwritten rule about informal conversation is that it is authentic. Think of the difference between how you speak to a friend and how you may represent your organization. You would not issue a report or make a PowerPoint presentation to your friend. You would not schedule it on an agenda. It would come up at fragmented and opportune times, and it would be part of a two-way conversation that contained questions and dialogue.

We use the term *drip irrigation* to describe the low-volume-but-constant-flow of informal information. It is *immediate, irregular,* and *informal*. A good example was our Littleton Hotmail, our email system for keeping the business community informed. Information was posted as it happened, not on some weekly or monthly newsletter basis. It was typically about projects and activities that were highly visible in the community—new construction or council decisions. We reported in a somewhat breathless manner—"I just got out of a meeting with the mayor and ……" Our information was like that of an insider who tells you what is going on in private

correspondence. We were scrupulous about rumor control and never put out hearsay or unconfirmed information.

We also made a point of irregularity. Sometimes we might post two or three things a day and sometimes we might not post for a week or more. None of our information had a polished graphic look to it as we think that conveys information push as opposed to information sharing. Four color newsletters, high production value videos, and graphic websites have a meta-message: we are pushing packaged information. Think of information that comes through public relations, employee relations, stockholder relations, and media relations. If it is formal communications, then it is probably edited and managed with an agenda. Controlled media has an objective of getting our side of the story out. Its purpose is to influence, not to dialogue.

Finally, we use a phrase called "stats and stories," and we think it is the most effective way of showing the outcomes of any program. Statistics without a human element are bloodless and may appeal to the rational, but rarely to the passion that persuades people to support programs. Stories, on the other hand, have strong emotional appeal, but don't provide much sense of scope or scale. Is that an isolated incident or a common outcome? Stats and stories are a powerful combination covering both bases.

Storylines, in particular, are absolutely critical for a program. Stories have premises, beginnings, supporting details, and outcomes. Everything we do works within a storyline. New initiatives do not arrive out of the blue, unrelated to anything—they are chapters in an ongoing story. We introduce them with a quick review of the storyline and where we have been in previous chapters. New initiatives are just the next chapter in this story. They may make twists and turns, but they always relate to where we have been and where we are going.

In Littleton, we had a couple of strong storylines: we have a strong sense of community, and we are a progressive community. We have lots of previous chapters which support those storylines. We have historically a number of progressive projects including the creation of a 680-acre South Platte Park in the heart of Littleton, the preservation of our historic courthouse, the first light rail line in the Denver metro area, and the construction of an infant/toddler center.

In the "strong sense of community" arena, we put up a million white lights during the holiday season, we support a 10 day community festival in late summer, we have a performing arts facility that ranks at the top in the metro area, and we built trails in every drainage channel in the community. These were all just different chapters around the premise that we have a high sense of community.

Annual reports, monthly newsletters, PowerPoints, and formal speeches, while occasionally necessary, are not as effective as the short, unplanned informal conversation. The Program Director should always have some stat, story, or current tidbit in reserve to be used in any spontaneous conversation. This may be meeting someone on the street for a few minutes or walking in from a parking lot or casual conversation prior to a meeting. The information does not have to be comprehensive nor particularly organized, but it should always be chapters in a story.

Pick Up the Company on the Back End

The local economic development agency will need to pick up the company on the back end to help them implement the changes needed. Sometimes the local agency will have these skills inhouse, and sometimes they will make referrals to local expertise. The NCEG team are high powered researchers on loan for an intense engagement, but the company is ultimately the client of the local agency; the NCEG engagement will only last a few weeks at most.

CHAPTER 9 HIGH FIDELITY ECONOMIC GARDENING

Economic Gardening gets consistently solid results no matter where the program operates: north, south, east, west, urban, rural, distressed or vibrant communities. Those results are not by accident. The program was built on a foundation of science, sophisticated tools, and enduring economic principles. The first part of this book tracked the history of how we discovered these tools, principles, and practices. This chapter summarizes the complete package used in high fidelity Economic Gardening projects today.

Tools

Database Subscriptions.
We have over 100 subscriptions to commercial databases services covering businesses, markets, companies, industries, and people. Each of these subscriptions may include up to 400 databases of specific subjects. Costs may run from free up to $20,000. The databases are coded by business categories (e.g. marketing) as well as specific search terms (e.g. thin film sputtering). NCEG also maintains its own list of exotic databases.

Geographic Information Systems.
GIS plots information on maps. A company called ESRI invented the GIS industry, and its ArcView software dominates the market. In addition, ESRI has consumer databases that cover lifestyles, demographics, and consumer expenditures. Any other database which has geographic descriptors (e.g. address, latitude/longitude, etc.) can be entered into the basic software and mapped. Typical maps are of customer densities, trade areas, competitor locations, natural resources, and route planning.

Digital marketing.
Digital marketing has a number of sub-areas including search engine optimization, Google AdWords, keyword search, competitor activity, and influencers. As opposed to information gathering, DM is about marketing. Many of the tools in this specialty are free or low cost.

Listening Post.
A listening post is software that monitors consumer chatter and business signals. It is like Google Alerts but better in two ways. Unlike Google Alerts, the signal/noise ratio is much improved because almost all of the noise is filtered out in the front-end design. In addition, the sources are curated so that Billy Bob's bedroom blog is eliminated, and the Congressional Research Service or Journal of Hospital Management are kept in. Listening posts are good for spotting public signals of volatility as well as odd stories increasing in frequency. Listening posts install directly onto a CEO's computer and generate, stories daily, weekly, or monthly.

Network Mapping.
Software like Maltego can generate a map of the networks that exist on the Internet. Those networks might be websites that are connected, LinkedIn connections, Twitter or Facebook followers. The network maps show both connections (lines) and the importance of the individuals by the size of their dot. Network maps visually show the center of the universe for

various subjects and industry terms. The large dot at the center can be considered both an influencer for marketing purposes and an expert for research purposes. For example, if you put in the term optoelectronics, you would not only see major centers in Rochester, Orlando and Arizona but also how the graduates of schools in these places have remained in contact with each other.

Principles

A second powerful element of Economic Gardening includes the scientific principles on which the program is based. These range from complex adaptive systems at the overarching scale down through economies, communities, and companies to temperaments at the individual scale. If companies are going to grow, it is imperative to understand the inherent forces at play in each of these levels.

Nature. All biological entities (including business) survive by creating designs fit for an environment. The search for better designs is constant because the environment is constantly changing. It also creates an internal tension between change and stability.

The most important system to understand — nature—operates on the singular idea that all biological activity is a search for designs fit for an environment. Or in the words of Darwin, survival of the fittest. This is true of species, individuals, political systems, economies, and businesses.

Because the environment is constantly changing (it is only the *rate* of change that varies), the search for a fit design is constant. In any given design, there is a tension between stability and change that goes on around the clock. How much stability do we need to maintain the essence of our current design, and how much change do we need to adjust to a changing environment? What this means for business growth is that the choice is between exploitation and exploration. Exploitation is making the design ever better while exploration is creating a new design. This game often plays out so slowly that businesses do not even realize they are in that system. Sometimes a product design may be fit for the environment longer than a human life span, so it is not evident that any kind of change is happening or needed.

At other times, we witness the stunning collapse of major American corporations which at one time looked like granite monuments to success and fit designs (think Kodak or Bear Stearns). The pattern has been described as punctuated equilibrium; whereby long periods of stability is punctuated by sudden change which tends to roil on for numerous rounds until equilibrium is eventually re-established.

So, the first principle is a requirement for constant innovation. That innovation can be slow and steady in making the existing product more efficiently (exploitation) for long periods of time but eventually it will require innovation in new designs when the environment changes (exploration).

Economy. New wealth and jobs are created by innovation. All innovation eventually gets commoditized which eliminates jobs and concentrates wealth.

Economies exhibit a pattern of expansion and contraction that reflect innovation and commoditization. During periods of innovation, new products are introduced, new companies formed, new jobs created, and new wealth created. At some point, the market saturates, and the competitors match the innovation, commoditizing the product. The market starts to consolidate, and the prices start to drop, putting pressure on companies to become more efficient or else lose sales and eventually go under. As the shakeout begins, products disappear, companies fold, people lose their jobs, and wealth starts to consolidate into the hands of a few owners of the assets.

Community. The only way local market companies can grow is to take business from other local market companies, unless new money comes in from the outside.

Wealth in communities is like water in a bathtub. Companies that serve local markets are constrained by the amount of money in town (amount of water in the bathtub). The mechanic spends money at the printer who spends money at the chocolate shop who eats at the restaurant who takes their car to the mechanic. Without new money coming into the community, helping the chocolate shop at one end of Main Street grow will always be at the expense of the chocolate shop at the other end of Main Street. What's more, when a merchant buys a new car from Detroit or takes a trip to Disney World in Orlando, some of the local money leaves town (water draining out). The long run financial health of the community depends on those who sell externally and bring money into town (faucets in a tub).

Companies. Innovation creates wealth and jobs.
Companies can compete with either the lowest price or a better product. Either is a viable core strategy (Walmart and Amazon successfully compete on price), but a commodity strategy leads to a lowering of living standards among employees and in the community. Further, in a search for ever lower costs, companies often look to offshore labor and eventually to robots to replace the labor force. Innovation creates new wealth and better paying jobs. Companies, of course, can chose whatever core strategy they want, but economic development public policy is better served by innovation as a core strategy.

Individual. Matching temperament to job requirements improves company performance.
Successful companies require a combination of skills and temperaments that are rarely found in one person. Finding out people's preferences in work styles and then matching that with job requirements is a formula for a successful workforce. Further, hiring preferences different than the CEO's temperament helps offset the CEO's weaknesses.

These, then are the major interrelated systems in which economic development operates, and these are the principles derived from those systems that lead to increases in wealth and jobs.

1. Nature: Constantly explore better designs for a changing environment.
2. Economies: Move from commoditization to innovation
3. Communities: Increase sales to external markets
4. Companies: Sell innovation
5. Individuals: Match preferences to job requirements

Five Frameworks

In the early days of Economic Gardening, we were trying to understand why businesses weren't growing. As the scientific principles started to fall into place, we were able to identify at least five root causes that had to be resolved before we could expect growth. Over the years, we came to call these root problems frameworks for thinking about company issues. These areas included core strategy, market dynamics, innovation, temperament, and qualified sales leads.

Core Strategy
All businesses compete in one of two ways: they either have a better product, or if they have a commoditized product they compete on lowest price. Management either has to be focused on driving down costs or continually creating new products for the market. We do not tell companies which strategy to use (they both work) but we do ask them to tell us how they currently compete, and which strategy they intend to pursue in the future. The two strategies take you down the road in exactly opposite directions, so it is important to identify it on the front end. You can see how competing with a higher price in a commodity business will keep you from growing regardless of how much money you put into marketing efforts.

Market Dynamics
Once core strategy is determined, the next major issue is the nature of the market. In particular, we are looking for ripe markets -- markets that are growing or being disrupted or not consolidated yet. We also need to know the number and nature of competitors, so competitive intelligence comes into play. Finally, we examine the company's own business models. Often a change in business models to extract more value out of the existing relationships is just as valuable as trying to make new sales. You can't grow if the market is not there.

Innovation
As discussed previously, all businesses need to innovate to compete. That innovation might be in processes to drive down costs or it might be in new product development to open up a gap between the company and its competitors. All product innovation will eventually be commoditized, and so you can never rest on your laurels.

Temperament
All businesses are composed of people – managers, work force, customers. Given that people have different personalities and temperaments, it stands to reason that some growth problems may well lie with people. Sometimes it can be traced to people in the wrong slot, or the lack of clear perspective in certain directions or even the misunderstanding of what good customer service means to different temperaments.

Qualified Sales Leads
Ultimately, if economic development is going to produce new wealth and jobs, companies must sell more. In the new economy, selling has shifted from trying to create a motivation to finding people who already have a motivation and are in the decision-making window. Developing a profile and finding companies and people in that profile is the first but rudimentary step. The real issue is finding people who are in the market today. Using public signals of volatility to spot

areas where change is disrupting the established relationships between buyers and vendors is key to spotting high probability sales opportunities.

Analytical Techniques

In addition to these broad principles, Economic Gardening has developed a series of analytical techniques and rules of thumb that allow us to quickly analyze a situation and draw conclusions. Like tools in a tool kit, there is no required use for any tool other than dictated by the facts of the engagement.

Acid Test
Within core strategy is the idea that businesses must choose between commodity (price) or niche (product differentiation). It is not uncommon for businesses to claim they are niche because of their service levels, but the acid test for niche is profit margins. When a company has a product that meets a customer need and the competition doesn't have it, it's possible to charge higher margins. If the profit margin is in the 5% range, it is probably not a true niche offering. If it is in the 30% range, then it meets the criteria.

Marketing Leverage
In short this means how many sales do you make per unit of marketing effort? Onesies are situations where you spend a lot of time making a single sale. If the sale is large, a onesie makes sense and is probably the best approach. Selling a $500,000 machine has a long sales cycle and successful sales are a combination of relationships, tech knowledge, understanding the motivation of the buyer, and identification of what else is in the market.

On the other hand, selling a $250 piece of software to an individual teacher rarely makes financial sense. Any profit margin is eaten up by the hours needed to make the sale. In this case, a leveraged sale occurs with the school principal or the superintendent or the school board. Leverage comes about when a single sale results in a number of deliveries. Selling to chains, selling through industry organizations or selling through girl scouts or soccer teams for fund raisers are all examples of leveraged marketing.

Markets
A market is defined by a combination of need, size, and ability to pay. All three must be present. The most common occurrence is the spotting of needs in small business. Two of the three criteria are usually met: small businesses have real needs, and the size of the small business market is large, but it is also a target group that doesn't have much money. The same is true when a target group has a need and the ability to pay but is not very large.

Decision Window
In the old economy, cold call sales were a two-step process: create a motivation and then make the case that your product was the best solution. It was an isolated conversation with low information about options.

New economy marketing works on a different approach. It assumes that most sales are made to people who already have a motivation and that the job is to find those people through public signals of volatility. The probability of a sale increases.

In new economy marketing, decision windows become important. Because we are calling on people who already have a motivation, the decision window is already open, and time becomes of the essence. That window may be open for a few weeks or months, but sometimes it is only days or hours. A drilling rig that costs thousands of dollars per hour to operate may break a tool during the night. The motivation is immediate, the hourly downtime is expensive, and the clock is running on making a purchase decision. In the drilling rig example (or a manufacturing line being down because of failed part), the entire window may be open less than 12-24 hours.

Customer Walk

One of the ways we use to focus on how decisions are made is a customer walk. Walk in the customer's shoes and imagine their job during the day. What is my process for getting information and making a buying decision? Do I go to the Internet? Do I read trade magazines? Do I attend a conference? Do I ask for references from peers and colleagues? Do I have the power to make the decision or does it go up the chain of command? What factors influence the purchase? What is my temperament likely to be? While we may not be able to answer each question exactly, going through the process often brings up considerations that must be taken into account in making a sale.

Moneyball versus Death of a Salesman

A major difference between old and new economy selling is illustrated by two literary analogies. The first is a play you probably read in high school: *Death of a Salesman* by Arthur Miller. In the play, Willie Loman portrays a beaten down door-to-door salesman who spends his days trudging from one cold call to the next. He is playing a strictly numbers game. If he can sell 2% of his calls and his goal is 2 sales per month, then he needs to make 100 calls. In 98 of the sales calls, he gets turned down.

Moneyball, on the other hand, is a movie about the Oakland A's baseball team and how its manager, Billy Beane, used statistics and probability to win a record setting 20 straight games. A key line in the movie is that Beane didn't want home run hitters; he wanted players who could get on first base. The more players on first base, the better the chance of scoring. The management looked strictly at probability, taking advantage of small differences to win games. In Economic Gardening, we look for higher probability sales by identifying who is actually in the market on this day.

Public Signals of Volatility

It is our contention that the probability of a sale increases in volatile environments versus stable environments. In stable environments, companies have vendors, relationships are established, and people are happy with their current product or service. Any change means taking a chance with a new solution that may end up being worse or may even fail. I'm risking my career for no good reason.

In volatile environments, the existing relationships are broken. New people may enter the scene or new motivation may arise. This could be because a new CEO was hired or maybe a plant manager was fired. Perhaps there was a merger or an acquisition that precipitated layoffs among duplicate staff. Lawsuits and/or a regulatory action by the federal government can set off internal changes in a company. Growth in employees or moving to a new building or changes in finances make for volatile environments. In all of these cases, stability breaks down and volatility opens opportunities for new vendors.

Ranking and Review Sites

In the old economy, information was scarce and guarded. The ability to find out about a company or product was pretty much limited by what the company wanted you to know. The corporate "relations" channels (customer relations, media relations, employee relations) pushed out company authorized information. It was molded, selective, and had specific objectives.

In the new economy, information is not only free but abundant to the point of overload. The volume of unsorted and unorganized information makes it more difficult to sort through, evaluate, and choose the best option. A new and critical step has been added to the decision-making process: rating and review sites. These sites have full-time people who are knowledgeable and experienced in testing and acquiring information about given products.

Early versions of this model were Consumer Reports and Kelly Blue Book for automobiles. The most critical step in the customer decision-making process (which option is best) is now delegated to a third party and decisions hinge on trust in the reviewer. Now the question becomes who has an agenda in making their recommendations? Who has financial backing influencing their work? Is a car comparison site underwritten by auto dealers more or less truthful than an independent site like Kelley Blue Book?

Review and rating sites have also added a critical step in the marketing process. For many products, getting reviewed and then receiving good reviews is as important as making a sales call. These reviews may be by formal industry organizations (think Capterra for software), in the writings of bloggers, or in the podcasts of influencers and experts.

Related to independent review sites are the crowd sourced reviews in apps. Wine tasting, for example, has the Delectable app which takes a photograph of wine labels and then gives crowd sourcing reviews and expert opinions of the wine via a smart phone.

Watering Holes

The concept of watering holes is based on finding target markets when you don't have exact contact info. Using an analogy of hunting for gazelles mixed in with other animals on an African plain, you have several options. You could blunderbuss the entire group of animals which would hit the gazelles plus all the other animals. Or you can take a rifle and target individual gazelles, which would be the equivalent of having a direct mail list. That approach is highly targeted but a list with contact information is not always available. An alternative is to wait until dusk, and all of the gazelles come down to a watering hole giving you a pure target market. Watering holes can be physical (conferences, trade shows, industry meetings) or they can be virtual (industry media, LinkedIn groups, Facebook, etc.).

These, then are the tools, principles, practices, and analytical techniques which undergird the program and are responsible for the predictable success of Economic Gardening in all kinds of environments. As opposed to generic "grow your own," lower case economic gardening programs, these are the elements of an upper case, high fidelity Economic Gardening program, created and refined over a 30-year period.

Perfect Storm Engagement

To close out Part I of this book, it might be useful to look at a "perfect storm" engagement, meaning the company has every problem that could be addressed by the full suite of tools, principles and practices we had developed over the years.

I chose a job shop machine company as the example for several reasons. First, it is the single most common type of engagement we had over the last decade. Second, it is symbolic of what is going on economically in this country. Like much of America's manufacturing base, the company is losing jobs to China. Finally, it is an understandable industry, unlike thin film sputtering or DNA research.

Establish Baseline Information
The engagement started with a three-part, 1½ hour Discovery Call with the CEO and members of his management team. In the first part of the call, we explained what Economic Gardening is and where it came from. We indicated the kinds of things we can and cannot do. In the second part, we established baseline information on the CEO and the company using our five frameworks outline. In the third part, we explored the business issues facing the company. From this Discovery Call, we established the following facts:

- The CEO is a hometown boy who excelled in math in high school and got an engineering degree in college. He returned home to work as a junior engineer for a job shop manufacturing company that made complex component parts for industrial equipment. After five years, he became a senior engineer and then seven years later, he purchased the company.

- The CEO completed the Keirsey temperament sorter and reported that he had preferences for introversion, sensing, thinking and judging (ISTJ). This translated into an introverted Guardian, a temperament which typically has preferences for low risk, tried and true methods, and a quiet, logical approach to problems. Marketing is uncomfortable.

- The company owns a five-axis machine and has capabilities of working on 70-inch pieces of metal. The five-axis machine is expensive and sophisticated (it can drill holes on the interior of metal pieces), but a number of competitor job shops also have these. The 70-inch capability, however, is rare.

- Historically, the company had a good book of business based on quality work and strong referrals. Starting around 2015, they found themselves bidding against Chinese

competitors who had labor cost advantages. Most of the competitors were equal in their capabilities, and the decision came down to price.

- The company traditionally built components in equipment used for sedans in Detroit. Chevy, Ford and Nissan recently shut down their sedan manufacturing plants.

- The company was looking for new markets in which they could compete. They indicated that large industrial powerplants were ideal customers because of the scale of the equipment. These were very profitable jobs.

- At the end of the Discovery Call, we made the following determinations using our frameworks for identifying root problems:

    - Their core strategy had previously been niche, but the competitors forced them into a commodity quadrant. The rule for winning in this quadrant is lowest price (meaning a focus on reducing expenses).
    - They have recognized this fact but has no stated core strategy for the future.
    - The market was changing from sedans to SUVs and pickups.
    - The market was also being disrupted. Newer automobiles with electric motors and self-driving software were being built in Nevada and California.
    - The company had no formal marketing activity or even marketing personnel. Sales were from reputation and referrals.
    - The engineering temperament throughout the company meant that marketing orientation and skills were left-handed. Marketing tends to be about people, about persuasive skills and possibilities, all of which ran counter to their preferences for things (vs. people), logic (vs. persuasion), and people contact (vs. isolated work).
    - The company had not refined their marketing discussions to the point where they could develop a profile, identify the universe of that profile, or identify who was in the market today. Further, they didn't identify where the customer went to find information to make a decision, and thus had no clear marketing channels identified.
    - The company had little history of innovation and it was not a natural discussion for the engineers in management. Again, temperament came into play. Innovation, by its very nature, is new and unknown, and the Guardian temperament prefers the known and proven.

In this perfect storm case, the root problems to be resolved first, included:

- Pick a core strategy and adjust management activities accordingly. The core strategy will determine the direction of our research.
- The marketing problem has temperament roots. It is unlikely that engineers are going to be re-tooled as marketers, so bringing in a marketing temperament may be part of the solution. The other issue is developing a marketing plan to identify targets with the highest probability of a sale.

- Innovation requires both the temperament (intuitive) and the infrastructure. The management discussion should shift to "what else can we innovate?" This may require bringing new temperaments into the organization, making contacts with local universities, and monitoring industry think tanks.
- It may be important to set up a listening post on key innovation words to track disruption going on in the industry or the customer's world. The key is to look for odd stories in the industry that are increasing in frequency.

The second problem to be resolved was research into ripe markets and high probability target customers.

Marketing Plan Research

- We developed a profile of the ideal customer which includes their motivation for buying
    - The CEO said their high margin work comes from large industrial equipment that requires use of the 70-inch machine.
    - They make parts for very large power generation equipment.
- We found the universe of companies that fit that profile:
    - We found the Dun & Bradstreet NAICS codes for the existing customers and ran a new Dun & Bradstreet list to put together a universal list.
    - We used the web crawler to identify keywords on the websites, further prioritizing the list.
    - We used database research to find out if the industry is growing, who has the major market shares and if any disruption is going on in the industry.
- From the universe above, we then identified those who were in the market today
    - We set up a listening post to look for public signals of volatility (changes in CEO, mergers and acquisitions, product lawsuits) among our target list.
    - We developed a network map to see whether the targeted group had strong ties to existing suppliers.
- We determine the media being used to collect information for decision making.
    - We looked at digital media for patterns in:
        - Google ads usage
        - Competitor websites and social media
        - LinkedIn groups, industry discussions and user groups
    - We researched physical watering holes where the market would concentrate.
        - Conferences
        - Trade shows
        - Industry meetings
    - We researched print and other media looking for industry information sources.
- We developed a contact list digital marketing analysis
    - We prepared contact information.
    - We used site drilling techniques to prepare a dossier for warm calls.
    - We prepared an analysis of their digital marketing efforts which identified problem areas.

PART II
AN AMATEUR'S OBSERVATIONS ABOUT THE ECONOMY

I am not an economist. I am not professionally certified in any aspect of economics. I did not major in economics in college -- I took two economics classes and cannot remember what they were about. I neither speak at economic conferences nor have I ever submitted a paper to a peer reviewed journal. I cannot do the math for economic projections. Hopefully, I have established my status as an amateur of the lowest standing.

What I have done is read and observe for a lifetime. Over a period of time I came to believe that not only do most Americans not understand the system aspects of a free economy (beyond the freedom part) but I have also begun to think there are some oddities that economists have never addressed. For example, if a product costs $125 to make and then we drive down the cost to $.50, is there more or less wealth? When economists say that capitalism is market efficient, how does that address poverty? Are sudden collapses an aberration… or a market characteristic? If government doesn't create jobs, what are those things? If economics is about calculating answers, how do you calculate innovation? If economics is based on rational man, where does the impulsive man fit in? The conservative woman? The idealistic teenager?

My other big interest is politics, mostly because much of politics is driven by economics (jobs, poverty, interest rates, gas prices, closing factories, jobs shipped overseas, stock market collapses, income inequality, wars over oil, hiding income in offshore accounts, etc.). Each political party addresses only a portion of the economic system – and neither deals with the total package of good and bad. I think we will get to a better solution when we do both. I also believe that commoditization is the root of poverty and innovation is the source of new wealth. We should be talking about these things instead of jobs going to Mexico and China.

CHAPTER 10 THE CURIOUS CASE OF A FREE ECONOMY

"Electric lighting is no great boon to anyone who has money enough to buy a sufficient number of candles and to pay servants to attend them. It is the cheap cloth, the cheap cotton and rayon fabric, boots, motorcars and so on that are the typical achievements of capitalist production, and not as a rule, improvements that would mean much to a rich man. Queen Elizabeth owned silk stockings. The capitalist achievement does not typically consist in providing more silk stockings for queens but in bringing them within the reach of factory girls in return for steadily decreasing amounts of effort."

Joseph Schumpeter

A Beautiful Person with a Bad Temper

American capitalism is like a beautiful person with a bad temper. You want to live with that person forever but wonder if you are actually going to make it through the day. The beauty is the creation of wealth beyond all historical imagination. The bad temper is the fact that people keep getting thrown out of their jobs, and wealth tends to concentrate among a few. There are so many great things about the person if you could only get rid of those sudden explosions that make you rethink the entire relationship every day. You can't live without the person, and you can't live with them.

Free markets do three things very well: they innovate new products; they make existing products cheaper; and they get supply to demand relatively efficiently. Society in general benefits from this cornucopia of new things being brought to market and from the existing things being made at a lower pricer. When the first electronic calculator came out, it was $110. Mind you it was not a scientific calculator, nor could it do anything fancy like calculate net present value. It only had four functions: add, subtract, multiply and divide. Today that calculator is given away for free by banks just for the advertising on the case.

With all its freedom, our economic system had created a new product that many people wanted. That same economic system over time, with all its powerful pressures to drive out cost and inefficiencies, had turned that simple little calculator from a fairly expensive $110 to a near freebie (actually it is free on the web). This was the best of our system that so enthralls the political right.

In accomplishing this, it is entirely probable that the production of that calculator went from unionized states to right-to-work states to drive down labor costs. Then the skilled manual labor was replaced with computer numerical control (CNC) machines and finally the whole operation was moved to China where production costs were cents on the dollar. Decent, hardworking blue-collar people lost their jobs in this country and then hardworking white-collar mid-managers and engineers lost their jobs. The factory closed and the shops on Main Street faltered. Windows were boarded up and high school graduates fled the town with the vacant stores and rusted factories. Crime, domestic violence and alcoholism began to rise but the town council could no longer afford to add policemen or social workers because the tax base had fallen. In the words of Bruce Springsteen:

Now Main Street's whitewashed windows and vacant stores
Seems like there ain't nobody wants to come down here no more
They 're closing down the textile mill across the railroad tracks
Foreman says: these jobs are going, boys
And they ain't coming back
to your hometown
To your hometown - to your hometown - to your hometown

This same beautiful person who created the electronic calculator that everyone wanted and who eventually drove the price down so that everyone could have it, also destroyed hometowns like those reflected in Springsteen's keening song.

So, we are left with this intractable problem: You can't have a low price and a well-paid employee at the same time. When salaries and wages are high, the cost of the product is high. To reduce the cost of the product, salary and wages must drop. You can't have it both ways.

America has long been intrigued with this dual personality of the economy, as reflected in the political debate that has swirled around it for the last couple of centuries. Is it good? Is it bad? Do we keep it, or do we try something else?

The far right can only focus on the positive attributes of wealth creation with the benefits going to the winners. Any criticism of "capitalism" is tantamount to treason and is the first step toward socialism where the rewards of risk, creativity and industry are distributed among slackers, welfare cheats and other members of the whining underachieving class.

The far left can only see cut-throat capitalism where survival of the fittest leaves the great proportion of the population as losers. In their minds, the welfare of the larger society is thrown beneath the grinding wheels of soulless profit motive to the exclusion of all other human values including a community, charity, a healthy planet and social justice.

Neither side is willing to acknowledge the detrimental attributes of their own side or the beneficial attributes of the other side. So political discussions, as 1960's protest song used to say, are mostly "Hurray for our side." No one seems interested in a discussion on how to keep the best aspects of the beauty and ameliorate the terrible temper. Let's take a look at how we got here, and how the New Sciences have cast a different light on the issue.

Conversations in Parallel Universes

Listening to national conversations about the economy is like listening to conversations in two parallel universes. In *one universe*, academic economists set the tone with their calculations demonstrating how and why free market economies ensure the efficient allocation of resources. A free market will price items right in order to assure the maximum and efficient delivery to all of those who demand them. Politically, conservatives jump in with "free markets are the bedrock of our republic and the American Dream." Capitalism is responsible for the highest standard of living in the history of the world, for creating new and useful products and for giving

anyone the opportunity to succeed and become wealthy. America's poorest people have cars, televisions and cell phones and live better, longer and healthier than the richest people of many countries." These statements are all true and logical.

At the same time, there is a *second universe* in which conversations are about the impersonal workings of a system that brutally violates core American social values of fair play, decency, kindness, good outcomes for hard work, and sense of community and neighborliness. Working people watch financiers make an obscene amount of money in speculative bubbles. Then the bubble bursts and working people lose their jobs while the financiers get bailouts with everyone else's tax money. Walmart gets a tax incentive to build a store which pays low wages and drives hometown stores out of business. Hard-working Americans who spent a lifetime working for a company see their factory closed and their jobs sent to China.

Politically, the liberals weigh in with charges that free markets have not solved poverty, nor stock market crashes or nor stagflation. Major corporations don't create many jobs in *this* country anymore. Instead they have moved jobs offshore, created extreme income disparity and social inequity setting the stage for political instability.

We quilted, the argument goes, a framework of institutions, laws and infrastructure that nurture American companies for the benefit of all who participate in that endeavor. We taxed ourselves for highways and schools and police, voted in elections, served on juries and fought overseas to defend that world. We gladly participated in these national endeavors because we believed it would create an environment which will benefit all of us.

But here's the rub. We are not sure who *us* is any more.

At first the company laid off minimum wage workers, but that was understandable. The CEO said the company needed to be cost competitive or the whole company would go under and no one would have jobs. That made sense. Besides, if the minimum wage people had a good education they wouldn't be in this predicament. To some degree, it was their own fault. So, the janitor was replaced with a cleaning service that hired cheaper labor from Mexico, and the receptionist was replaced by a phone tree. The company was able to survive and stay profitable.

Then blue-collar union jobs went to right-to-work states where wages were lower. The CEO said the union contracts were making the companies uncompetitive, and work rules were keeping the company from becoming more efficient. That was hard to swallow but understandable. If unions hadn't been so greedy and impossible to deal with, they would still have jobs. Except the blue-collar jobs proceeded to leave the right-to-work states and went to China and India. Stocks rose on the news that labor costs had been reduced.

A short while later the company announced a merger, and many of the mid-level managers were let go. The CEO said the company needed to trim much of the fat to run leaner and be more competitive. One had to wonder what those mid-level managers were doing if their jobs could be eliminated wholesale and have no effect on the company. The CEO got stock options for guiding the company through this painful time.

Then the company concluded that the engineers in India and China were every bit as educated as the engineers in America except they worked for about 1/5 the wages. It was easy to move their digital intellectual work over the wires and cut major labor costs which went directly to the bottom line for shareholders.

When it was all finished and morning in America dawned crisp and clear, the citizens reconvened to go over what had just happened. They looked around at the hollow corporations with their cash stashed overseas and most of their employees in foreign countries and wondered "We are not sure who *us* is anymore. If the janitor is not *us*, and the receptionist is not *us* and the shop guys are not *us* and the engineers are not *us* and the middle managers are not *us* anymore, then who is *us*?"

The answer was starting to look like only those at the top of the food chain: the CEO and the investors, who lived behind walled compounds in a few wealthy enclaves around the country. Everyone else looked like an expense. In order to make the company more efficient, the CEO eliminated level after level of employee expenses until virtually the entire operation was mechanized, outsourced or moved offshore. At each step, the stock went up and the CEO was rewarded. What's more, if the company failed at some point, the CEO had a golden parachute in which they could leave with a lot of money. It looked like some perverse Law of the Sea – if the ship is sinking, the captain throws the passengers off, then the crew, and then the officers before being rescued and flown away in a helicopter.

The political right counter argued, "I know it's tough but that's the way the system works-- it's the reason we can provide silk stockings to factory girls. It's the price of bringing prices down. It's the necessary reward to encourage risk and hard work. Like it or not, survival of the fittest is the natural order of things. There are makers and there are takers and without the makers, there is no wealth for anyone—not employees, not charities, not government. Those of you in the other universe are not very good at creating wealth and jobs. In fact, charities want wealthy capitalists to give them money so they can continue "doing good." Everyone is dependent on the capitalistic "makers."

So, it goes--conversations in separate universes. The reality is that we have two separate systems trying to accomplish two different things and neither one of them can accomplish both. The debate is always winner-take-all rather than the more nuanced approach of trying to figure out how to obtain the best of each and ameliorate the downsides of both.

Competition and Cooperation

How did we get to the polar-opposite views of the world that have split our country politically? Is it better to be a nation of risk-taking job creators, or a nation of safety nets and social security? Should we be unregulated capitalists with its high-powered wealth creation, class tensions and trail of heartache and destruction, and or should we be share-the-wealth socialists with a broad sense of equality and shared destiny but with reduced competitiveness and excellence? Are we winner-take-all competitive or leave-no-one-behind cooperative?

On the one hand, our earliest years are molded by values of how to get along with our fellow travelers by cooperating. It's the cooperative world we learned growing up in our homes and in early school years – the walls of a kindergarten class are plastered with posters exhorting kids to help, share, cooperate, be nice, and be considerate of other's feelings. On the playground, everyone gets a ribbon for trying. In sports, everyone gets to play. The focus is on "we" – neighbors, community, society, nation, one-world. It's the growth of all individuals and communities that share values instead of adversarial camps. It is an idealistic world.

In middle school it begins to shift to a world of competition – only the best win, someone gets the trophy and the rest go home empty. It's a realistic world about competition and adversarial hardball. Suck it up, rub dirt on it, more effort. Competition strengthens the individual, makes the system better for all of us and improves our ability to survive. The world gets divided into "us" versus "them" and we start defining some people as losers. It is a realistic world.

We go through the rest of life with both of these strong themes playing in our heads. Our college alma maters compete to recruit the best athletes to play at the highest levels to win a national championship. Only one team wins; that's what gives it value. The other 124 schools go back to the drawing board and wait until next year.

These same players at bowl game time visit the children's hospital to encourage the weakest of us to hang in there. The player's parents donate money, turkeys and clothing for families in need at Christmas. Their churches have a mission to collect money and help the poor. When a dire illness faces a neighbor's child, their communities pitch in to help with meals, lawn mowing, errand running and fund raising. The parents of these college stars console and nurture their own grandchildren when they don't win by telling them it's not that important.

If one approach is clearly superior, shouldn't the other have disappeared by now? Wouldn't Nature have selected one as most fit for an environment? As it turns out, Nature--or more precisely a Complex Adaptive System--has this tendency to set up tensions between extremes and then adjust that tension like a sliding bar moving back and forth. Should our society be conservative or liberal? Nature would say: wrong question. The better question is *how much* conservative and *how much* liberal? And in what kinds of conditions? Sometimes the slider bar is moved in the direction of more stability, and sometimes in the direction of more change. Sometimes businesses need more exploitation of their markets, and sometimes they need more exploration of new markets. Sometimes processes need to be customized to satisfy the exact situation, and sometimes they need to be standardized to make them more efficient.

Some situations call for more cooperation and some call for more competition. Early humans competed for food, but we also cooperated with other members of our clan in hunting parties. The hunting males cooperated with child nurturing females. Humans cooperate at work against competitor companies but at the same time we compete internally with fellow employees for promotions. Employees at all companies cooperate in the defense of our country and our country competes with Russia and China—unless, of course, we are attacked by aliens.

Eastern philosophies and religions have long recognized the concept of tension as a basic of life. The Taijitu symbol of yin/yang used in the Taoism religion (and probably better known in

Western culture as the interlocking teardrops shown on the Korean flag) represents this concept of opposites existing in harmony.

What is fascinating about this diagram is that if you follow one of the tear drops around, it is at the point of maximum size where you see the birth of the opposite. There is no point at which either is 100% of the picture. Like a photograph, the full story is in neither the black nor the white, but in the interplay of the two.

Thus, two systems emerged from human evolution: competitive free enterprise and cooperative human values. Free enterprise cannot survive embedded in a society which by and large does not benefit from it. The concentration of wealth is a recipe for heavy regulation at best and revolution at worst. A solely socialistic approach, on the other hand, drifts toward inefficiency and a lack of innovation, which can be dangerous in a world where nations compete and occasionally attempt to conquer each other.

Economy 2.0

"It isn't what we don't know that gives us trouble. It's what we know, that ain't so."

Will Rogers

Economics, as it turns out, has a lot of "what we know, that ain't so." We know, for example, that innovation is the only way to create wealth. We know that the creation of wealth at the top will trickle down through the system. We know that collapses in the stock markets are aberrations in an equilibrium economy. We know that government doesn't create jobs or wealth.

All of this "ain't so."

To hold any kind of fruitful discussion about the economy it's helpful to have an updated understanding beyond the traditional Adam Smith/John Keynes macro debate about the role of government or the Ayn Rand/Karl Marx political debate on the outcomes of capitalism. Ayn, of course, argued in Atlas Shrugged that there should be no regulation of the captains of industry or they would all leave for a hidden valley in Colorado and the economy would collapse. Karl could have made the same argument for the same outcomes if all the workers had gone to Colorado. Neither argument has much to do with how real economies work.

The new science of complex adaptive systems developed at the Santa Fe Institute over the last thirty years have given us a much clearer understanding of the dynamic nature of the economy as opposed to the traditional static models developed by economists. In the SFI's terms, it is not a system that settles into equilibrium; it is instead a system far from equilibrium.

Let's start with the fact that a free market is not planned; there was no founding constitution like that in our political system. No one agreed that it would be driven by supply and demand, that

money and banks would be needed, that businesses had to be profitable or that commoditized industries would drive down prices.

Instead, free markets *emerged* under the principles of complexity science, and they exhibit properties of complex adaptive systems including operating at the edge of chaos, exploring fitness landscapes, punctuated equilibrium, novelty and power laws. In everyday language that means they are neither stable nor chaotic but in between, and because of that they collapse suddenly for no apparent reason. They inherently look for the most fit design through innovation and they concentrate wealth in the hands of a few. These are all signatures of complex adaptive systems.

Free markets are not a system to "be nice" – it's a system that gets goods and services to whoever has money. That system doesn't care who has money or how they got that money or whether it's socially equitable or not. It doesn't care if some people are poor, lose their jobs, or don't have health insurance even though their lives are exemplary. The system doesn't care how many poor people there are, and it doesn't care that poverty may fuel crime or revolutions or violence. It's not in the caring business. It's in the getting supply to demand business.

When economists say that a Capitalistic system provides the most efficient allocation of resources, that's exactly what they mean—in the narrowest sense. The system allocates resource to get supply to demand in the most efficient manner. You don't have money to create demand? Not the problem of Capitalism. Most of the demand is being concentrated in a few individuals? Capitalism doesn't and can't address that issue. Those who don't have demand (money) are demonstrating in the streets of New York and Seattle against the 1%? That's some other system's problem. If you *can* create demand, capitalism will deliver supply. If you can't, it won't. Capitalism is not in the business of making sure that you *have* demand.

American Dream Revisited

The American Dream is a belief that if you take responsibility for yourself, work hard and play by the rules, you can make money and be successful. The sky is the limit. If you are poor, it is pretty much your own fault. The only problem is that data points in the economy don't match up with the Dream.

I am a machinist. I went to a technical school and learned a complex skill because it would ensure a good middle-class life for me. I worked for the company for 30 years, providing high quality work, on time and in budget. I was highly reliable and given raises during that time. An investment banker bought the company and closed down our plant. I am 59, in line at the unemployment office and getting no responses to my job applications.

I am a farmer, working long hours doing physical labor. I have never committed a crime (except that speeding arrest when I was a teenager). I am a respected elder in the church and have raised five wonderful, productive children. I pay my taxes and vote in every election. I am a member of the school board and serve as an officer of the grain board. I help my neighbors when they are sick. Supply is excessive again this year and it drove down prices. I filed bankruptcy this year.

I am a brain surgeon. I have 4 years of college, 3 years of med school, 3 years of residency and 15 years of experience. I belong to the city's best country club and live in an exclusive neighborhood. I have access to the power elite of the city and serve as the president of the state medical association. I have two lovely children who are in Ivy League universities. A long commitment to a difficult education, hard work and an extremely rare skill has paid off for me.

I strip for a living. I dropped out of high school after my freshman year because I couldn't see how I would ever use geometry or history. I was into drugs pretty heavy for a while, but my friend introduced me to the club owner. You have to be clean to strip at this gentleman's club which has lots of rich businessmen, so I kicked the drug habit. I could dance for the dollar bills they put in your G-string, but I specialize in lap dances and can make up to $2,000 on a good night.

I am a software engineer. I went to Stanford and graduated summa cum laude from a top computer school. I live in a comfortable suburb outside of Seattle and just bought a boat two years ago. I belong to Rotary Club and serve on the building committee at the church. I took a trip to Europe last year and am glad we went then. My company announced they opened another software engineering center in Bangalore, India and wages are one quarter what they pay in the U.S. The work is every bit as good as many of the Indian software engineers were educated in America's top schools. I was laid off last week.

I am a drug dealer. I have no regular job. I have been accused of murdering someone that tried to double cross me. I don't go to church; I didn't finish school and I have no intention of ever working 40 hours a week at a fast food restaurant. I have fathered two children out of wedlock and claim neither of them. I sell cocaine to people in the suburbs. The feds make big busts every once in a while, but it only means I can charge more.

My brother is a drug dealer, but I don't like him, his friends or that world. I expect he will die young. I graduated from high school and started working at McDonalds. It took about two days to learn all the parts of the job. I make $9 an hour which is about $18,000 a year. I joined the nationwide demonstration for more money for fast food workers.

I am a pre-school worker. I went to college and have a four-year degree. I understand the brain research behind early childhood education and am passionately committed to helping every child reach critical benchmarks at an early age. I work in a critical area of society with a keen understanding of complex theories of the brain. I make $13 an hour with no benefits. I am eligible for food stamps, but I would be embarrassed to take them.

I am a rock star. I dropped out of high school my senior year to play in the garage band I formed. I hated reading, studying and "applying myself" as my dad badgered me every day. I knocked around in bars and small gigs building up a local following among the high school kids. We caught a break when a super star band saw our act and asked us to open for them. We now fill stadiums and make about $4 million per gig if the stadium is big enough. Dad's company closed but I bought him and mom a new house.

I graduated from a good law school last spring. I expected to be recruited by a prestigious New York firm with a starting salary of $165,000 and a shot at a partnership by the time I am 40. The economy collapsed and law firms started laying off employees and sometimes even forcing partners out. Only those who majored in bankruptcy law have secure jobs -- I did and I do. Several students in my graduating class did not get offers. One is managing a restaurant until the economy improves. He moved back in with his parents although his dad is going to introduce him to some of his business associates.

I am a young African American from Chicago with incredible basketball skills. I was heavily recruited in high school and played for the Kentucky Wildcats but decided to leave after two years for a pro-career. I took the easiest courses I could in college but was barely passing. I couldn't see why I should continue doing that when I could sign a multimillion-dollar contract with the Miami Heat. Would I ever be able to match that with any college degree I could get? If we win the NBA championship, I will get an additional million dollars.

I am an investment banker. After high school I spent 2 ½ years on a church mission and then went to an Ivy League school as a legacy. I graduated and was accepted into my father's elite business network. I joined a small private equity investment firm and built it into an extremely successful one. I am very generous and donate a significant percentage of my income to charity. I borrow money, buy companies, lay off the employees to drive up the stock prices and then sell the company. In doing so, I capture hundreds of millions of dollars for myself and my partners. I own four houses including one in the Caribbean.

You may notice a pattern in this American job sampler: success was not highly correlated to working hard, playing by the rules or taking responsibility for yourself. For that matter moral work didn't even matter. Passion didn't matter. Neither a good education nor a poor education was a good predictor. In a free enterprise system, what did matter was the individual's supply and demand ratio. If there was a high demand for what the person did and the supply was limited, they made a lot of money. If a lot of people could do the individual's job, they were poor. You can substitute factory worker, shop owner, prostitute, engineer, arms dealer, ditch digger, CPA or any other job and the outcome is still the same. Money flows to people who have favorable supply/demand ratios. Period.

The idea that individual success is strictly a function of hard work and self-responsibility is overwhelmed by system dynamics. A farmer planting more wheat actually drives prices down. An engineering working hard at $40/hour will not keep his job if someone in India can do it for $10/hour. Upgrading your machinist skills makes no difference if a CNC (computerized numerical control) machine can replace you. All of those factors are beyond the individual's control.

Any political conversation that is going to affect real outcomes should be less about hard work and more about your personal supply and demand ratio.

Trickle Down

There is an argument that if the top people in an economy do well, the increased wealth will trickle down to everyone else in the lower echelons of the economy. That's a mechanical thought process that is analogous to the mechanical process of water. It is not true.

The wealth of any given person is not dependent on the creation of wealth at the top but rather on the supply/demand ratio of the individual. The creation of more wealth by the Walton family or the Hilton family does not make the checkout clerk or the maid scrubbing toilets any wealthier. Their status is determined by massive supply of unskilled people which keeps their wages low. The attorney making more money does not make the waitress richer – unless he leaves a big tip.

At every level in the economy, it is the exact supply/demand ratio for that economic activity that determines how much wealth flows to the individual. Those at the economic bottom suffer from too much supply relative to demand. Poverty is a function of an unfavorable supply/demand ratio. If we teach our children nothing else, we should tell them to keep their ratios in good order. It's more important than keeping their bedrooms in good order.

Wealth does not trickle; it pools in favorable supply / demand ratios.

Government Doesn't Create Jobs or Wealth (does it?)

If you examine what a person who works for government does and compare it to what a person in the private sector does, it has all the earmarks of a job. The government employee gets up early and starts work by 8 a.m. each morning. He engages in activities that produce a product or service that benefits someone. He gets paid. He spends that money back in the economy. One would have a difficult time figuring out why it wasn't a job since it has every distinguishing characteristic of a job. Further, the output has every distinguishing characteristic of wealth creation – a product or service that wasn't there before.

This is a better way of thinking about it. Government creates a forced expenditure in exchange for a product or service. Any given individual may or may not want the exchange, but the decision is removed from the individual and given to a small group of elected representatives. Those representatives may allocate those expenditures as you prefer (schools, roads, defense) or they may buy things you don't want (public art, social workers) but the point is this: it is still the creation of wealth and the creation of jobs. It is just done via *fiat* as opposed to individual decisions.

At this point, you may reluctantly conclude that "well, yes, technically government positions seem to have the characteristics of a job, and technically they create products and services, but government is not the engine of the economy. It does not drive innovation, nor does it make things more efficiently like the private sector."

Putting that to a reality test, the NASA website alone lists more than a thousand spinoffs from the space program including everything from solar cells and ventricular assist devices to temper

foam and powdered lubricants. In agency after agency, the federal government was the source of innovation that has changed our lives.

- Human Genome Project (National Institutes of Health)
- Modern fingerprint classification (Federal Bureau of Investigation)
- Weather forecasting (National Oceanic and Atmospheric Administration)
- Disease tracking (Center for Disease Control)
- Internet (Defense Advanced Research Projects Agency)

Furthermore, the federal government funds Small Business Innovation Research on a full-time basis and public universities are the bedrock researchers of the country. Harvard, in fact, has a national award program for Innovation in Government. The contention that government doesn't innovate is not true anymore than the contention that government doesn't create jobs.

The same argument holds for efficiency. Would anyone argue that assessor records access or highway design or emergency response is not more efficient than it was a 50 years ago? The facts outweigh the polemics.

There are two facts that *do* separate government from the private sector. The first is that government does not meet the fine-grained demand of the private sector. It creates and distributes products and services in bulk needing only a majority approval. Even a sizeable minority that doesn't want the offering will get it any way through a forced expenditure. This is not true in the private sector.

The second fact is that government has no competition that creates the ever-present pressure to do things more efficiently. It doesn't mean that government can't or hasn't become more efficient (it has the same phone tree answering system that the private sector does), but it doesn't live and die under daily competitive pressure to be more efficient. You can't go to a competitor government and get cheaper services. Efficiency in government is more a function of dedicated employees who take on that task out of a sense of professional responsibility. Efficiency measures can also result from budget cuts during the down cycles of the economy—but these are over long cycles and are not daily considerations like in the private sector.

Government creates real jobs that produce real wealth and government innovates and makes things more efficiently. What it does not do is meet fine grained demand, and it doesn't operate under constant pressure to be more efficient

The National Discussion

Let's measure the current national proposals for increasing the wealth of the nation against the factors of population growth, new products and productivity.

<u>Proposal #1: Infrastructure Programs</u>

Keep in mind that money doesn't go *to* someone, it goes *through* someone. Money has no value if you can't trade it for goods or services. Money does not go *to* the 1%, it goes *through* the 1%. They buy things (granted more expensive), they invest in companies that earn profits, but very rarely do they store it in their basement (like the old Jack Benny routine).

Since money is constantly moving through people, we can visualize it as water in pipes. In the private sector, pipes come into your life from various sources (wages, interest, stock appreciation, social security) and pipes go out to numerous places (grocery store, auto dealer, pharmacy, clothing store, etc.). If we draw back and look at this from the 30,000-foot level, it is a closed system of pipes with money constantly moving around the private sector.

If we introduce taxes, then in effect we are building a second system of pipes that tap into the first set (forced diversion out of the private sector) but which then *dump back into* the private sector system (the police officer or road maintenance guy also buys groceries and clothes). The wealth created in the public-sector pipes is in the form of police protection and good roads.

Keeping in mind this simple diagram – a big private sector network of interconnected pipes and a smaller public sector set of pipes off to the side that taps into the private sector and dumps back into the private sector network – then what is the effect of a big infrastructure project on the economy?

Public infrastructure (road construction, bridge replacement, dams, canals, new airports, etc.) is typically paid for by bonds financed with taxes. In our simple pipe diagram, it is a diversion of water from the private network into the public network (and then back into the private network). But here is the point: *no new water is being created*. It simply runs through different places. The argument can be made that an individual in the private sector is poorer because part of his water went to the public network, but a more accurate description is that he had less choice where to spend it (I was thinking of going to Disneyworld this year but instead I got a replacement for that deteriorating bridge.)

If we check against our three ways of increasing wealth (population growth, new innovations, productivity), there is no new wealth in the economy – only redistributed wealth and different purchases. The steel factory which is building the bridge may get a boost at the expense of other citizens of the United States—but it is not new water in the system; only *redistributed* water going through different places.

Proposal #2: Tax Cuts

Let's take the reverse situation: a tax cut. In its simplest form, it reduces the water flowing into the public pipes and puts it into the private pipes – but again without any increase of water. The private sector employee now goes to Disneyworld, and the public sector employee is laid off ending his purchases at the grocery store and apparel shop. If we could stop the flow and drain the system *before* and *after* the tax reduction, it would be exactly the same amount of water—just in different places.

The only way that a big infrastructure project or tax reductions could increase the economy is if they somehow ignited innovation or commoditization or increased population somewhere along

the line. Creating a job at the hardware store at the expense of a police job does not increase the total economy.

Proposal #3. Bring Back Companies from Mexico and Quit Buying from China.
Assuming that companies go to Mexico and buy from China to get cheaper prices, we can guess that they are under commoditization pressures. Moving them back does not change that equation—they are still commoditized and need to reduce expenses. If they are forced to produce at American wage rates, they will find technology to replace labor (the American Midwest is already a major user of robots).

Globalization did not create the commoditization equation; it only increased the scope and speed at which it was happening. Without globalization, the story is still going to have the same ending, just at a slower speed. Commoditization is not a China or Mexico problem; it is a system property within an emergent complex adaptive system. Commoditization creates national benefits and at the expense of localized pain.

If the above is a list of things that aren't true…

- It's not about hard work per se; it's about supply/demand ratios
- Wealth doesn't trickle down; it pools in supply/demand ratios
- It's not the American Dream as we knew it; labor is an unwanted expense
- It's not "government doesn't create jobs or wealth"; the issue is about forced expenditures
- It's not infrastructure and tax cuts that create wealth; they just move money between public and private pipes.

…then what new understanding does Complexity Science bring to the economy?

The Odd Thing About Wealth

Think about this question: what is the definition of wealth? Is it the possession of a *tangible* product? Or is it the *trading value* of that product captured in money?

It is, in fact, both. If we were to rewind history prior to the creation of money, and then go visit a small society, how would we determine how wealthy they were? We would probably go around counting all the things they had made, no? That combined list of all the things in the tribe would constitute the "GNP" of that group. So, one aspect of wealth is the creation of something utilitarian that benefits someone: a product or service. In fact, that is a core litmus test—you have to have products and services to have wealth.

Our modern-day perception of wealth is how much *money* someone has, but money isn't really wealth—it is just a universal IOU for some *future* product or service. You were willing to accept a piece of paper (IOU) from someone because everyone else in the country would accept it from you (universal). It is only the ability to cash it in for some product or service that makes money

valuable. If only you and another person lived on an island and you had your choice between a pile of food, pots, a tent and some clothes or a pile of money, which would you take? If you took the food and the other person said, "I will give you a million dollars for it" – would you take the money? Of course not, because the money has value only if you can *trade* it for something real.

The production value of wealth is the amount of material, time, skill and knowledge it takes to make something. In classic economics, capital is in that equation, but capital is only a means to acquire the first three. The actual, measurable wealth in all societies comes from counting what was made. Its production value is the sum of what it takes to make it (20 yards of tent material, sewing skills and 20 hours of cutting and sewing).

There is, however, a second aspect to the value of a product: it's trading value. What else could I have if I traded it for something? My first tent has a lot of utilitarian value to me, but my second tent has minimal utilitarian value (I'm not really using it for anything; it's just taking up space in my first tent). But my second tent may have trading value; I could trade it for a pot.

Trading value is what creates money, markets and finance. Trading value can be fairly volatile and dependent on the actions of millions of other people, both makers and buyers. If the market is flooded with tents or a number of alternative options exist, the trading value might drop in half over a short period of time. Whereas production value is specific to the individual—I am willing to work 20 hours to get this tent-- trading value is a constantly changing relationship between supply and demand of the much bigger marketplace.

Invisible Wealth

On the flip side, there is a little understood aspect about wealth that is almost invisible to everyone but economists. Making things more productively brings down their price and actually increases the wealth of the buyers, even though they don't make more money.

Schumpeter's observation that capitalism brings silk stockings within the reach of factory girls is part of its beauty. His insights are directed toward the second-born child of free enterprise: efficiency. While the world marvels at the ability of free enterprise to create new wealth through innovation, it is the constant pressure of competitors to make things ever more efficiently (thus lowering price in commodity markets) which means that more people have access to the physical wealth creation of products and services.

Interestingly, there is no accounting entry for this increase in wealth on the national balance sheets. In fact, the opposite shows up on the financials. If we were to initially produce a thousand items and sell them at $100 apiece, the accounting would show a Gross Domestic Product of $100,000. Over the years, if we could drive the costs down so that we could sell them for $10 and we still sold 1,000, then the GPD would show $10,000 or a $90,000 drop. But back in the real world, one thousand people would have that item in both situations. Because the price has fallen, it appears we are less wealthy but if you inventory the products created, we still have the same amount – and what's more, people with less income now have that item. They are not wealthier because they make more money, but rather wealthier because products are cheaper.

The reason is that GDP and productivity are measured in dollars, not in things produced. The lens is through the financial economy, not the production economy.

Given that we track wealth both by its production (count all the tents and pots in the tribe) and by its trading value (five pots could be traded for a cow), we can then say that wealth increases in one of three ways.

- Making more of the same serving population growth (more tents for more people). New makers and buyers. We used to have 10 people making 10 tents. Now we have 15 people making 15 tents. Our wealth has gone up by five tents.
- Making new products (yesterday our tribe had ten tents; today we have 10 tents and five pots. Our wealth has gone up by five pots.).
- Productivity. The buyer's income didn't go up, but their buying power increased through lower prices (reduced trading value on the other side because of competitors.).

The Production Economy and the Gambling Economy

Because wealth can be considered in two different ways, there are two distinct economies in the U.S.—the production economy (industry) and the gambling economy (finance). The production economy makes and sells things; the gambling economy gambles on future trading value. The production economy is driven by supply and demand while the gambling economy is driven by greed and fear. Most of America works in the production economy and assumes that you get ahead by hard work. The elite of America work in the gambling economy and believe that you get ahead by making smart bets. This fact underlies much of the Main Street / Wall Street tension in the country.

Stock markets are gambling halls, no more and no less. You invest, gambling on a current return from the production of goods and services, but perhaps more importantly you are gambling on the future value of a stock. While the good aspect of public ownership of companies is the infusion of capital into a company, the downside is that the production economy is tied to the wild episodes of fever and chills in the gambling economy.

All stocks have a real current value determined by the profitability of the company but that is not what stocks are about—they are about gambling on the future of the company. Stocks also have value based on the future returns of the company, but no one knows exactly what that will be. So, on both sides of the base line of current profitability is a range of possible futures estimated by all the players in the game—some betting the stock will be more valuable, some betting it will be less valuable. We should note that this range is essential and healthy to free enterprise. Companies need capital to explore the fitness landscape of products and services and to exploit their existing fit products.

High range of probable future returns
Actual company profits today
Low range of probable future returns

Beyond that, however, is another band that can be described as greed and fear. That is, when stock reaches this area, people buy (or sell) simply because the value is driven up by other people buying (the classic bubble) or selling (the classic panic). It no longer has a relationship to the production value of the company but rather the rise of the stock due to Ponzi scheme dynamics.

Greed
High range of probable future returns
Actual company profits today
Low range of probable future returns
Fear

The value of the stock comes unhinged from the value of the company and enters the zone of appreciation because it is appreciating. It is caught in an increasing returns loop whereby more people want it because its price is going up, and its price is going up because more people want it. It has created its own internal fire storm unrelated from the underlying production for which it represents.

The increase in the value of stock just shifted from being driven by *returns on production* to *returns on greed.* What difference does it make whether the additional money I made was from production or from a bubble? I get paid in dollars either way, and so I ride the updraft knowing we are far beyond the production value and are entirely in the territory of greed. That's of little concern to me as long as I keep making money. I know this is a bubble (as do most other investors) and that eventually it will collapse. My calculation at this point is no longer about the company but rather how far I can ride it before it collapses.

My working neighbor puts a few dollars in his retirement account every month while he watches me buy a Lexus with all my additional winnings. Other people he knows jump into the stocks because it is so much easier to make money this way than working 8 hours a day--which drives the stock up even further. He feels like the chump in the game—a small time loser trying to succeed in the production economy.

Finally, I sense that everyone is getting nervous about how far the stock has skyrocketed into the greed territory, and I sell everything I own. Everyone else riding the bubble is hypersensitive about when it will burst. They see smart investors getting out, so they decide to sell also. Fear spreads quickly as the amateurs try to dump their stock before it loses any more value. This, of course, drives the value down even more, and its price drops through the zone of production risk in a headlong dive into the fear zone. Just before it disintegrates, smart investors calculate that the price is now less than the basic returns it could provide as a production company, and they start to buy it up.

And so, the gambling economy, driven by greed and fear, bubbles up and collapses by dizzying and stomach wrenching turns. Its only relationship to the production economy is that current profitability establishes the baseline as it roars by going up and coming down. The confidence in the direction it is going is an inverse relationship to the distance from this baseline number. The

higher that greed drives it from baseline, the less confidence in the value. The lower that fear drives it from baseline, the less confidence in the value.

Gambling wealth is not created by the physical work of making tangible goods (middle America values). It is created by calculated gambles on the value *of the investment* without necessarily creating more tangible goods or changing the supply/demand ratio for goods. At times it becomes independent of the production economy (other than as a benchmark for determining whether we are in greed or fear territory). Like all good gamblers, sophisticated investors have nerves of steel riding the greed bubble until the absolute last moment before they bail leaving the unsophisticated in a fear-driven panic selloff. In fact, they count on the unsophisticated production economy Americans to get in too late and get out too late. You cannot make big money if all investors are sophisticated.

Americans living by production economy values of fair play, hard work, and cooperative concern for your neighbor are monetarily, physically and emotionally devastated when the gambling economy shatters the production economy. People in Elkhart, Indiana who got up every day and worked hard at making recreational vehicles woke up one day with 22% unemployment created by a gambling economy located half a continent away. They had done everything right in the production economy. They had found good markets, made prudent investments in the company, ran a tight ship, took care of their customers, took responsibility for themselves, worked hard, and played by the rules. As they drove home from the unemployment office, they saw one car in the massive parking lot of their former employer: the security guard.

This is not to make a moral statement about the gambling economy. In the production economy, gambling in the intermediate zones is absolutely essential. It is the risk capital it takes to explore new products and services to see if there is market demand for them. Gambling is essential to a free enterprise, yet it is plagued with bursts of greed and fears that whiplash the trading value from extreme highs and lows totally unrelated to the production value which it represents. The creation of these mini storms in the big picture distorts the allocation of capital and creates havoc in the production economy that is totally unrelated to supply and demand.

Sudden Collapses

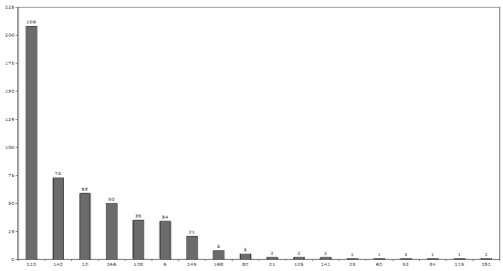
Not only is a lot of what we know ain't so, but there are other things we now *do* know about the economy that are unsettling. Take for example, the fact that complex adaptive systems work at the edge of chaos—not in the stable regime or in the chaotic regime, but at the dividing line between the two. They need enough change to be able to adapt to a changing environment but not so much that they are no longer who they were yesterday (a disassembled biological entity is generally referred to as dead). One of the drawbacks of operating at the edge of chaos is that the whole system is so precariously balanced that it is prone to occasional sudden collapses. In scientific terms, this is known as punctuated equilibrium meaning that things go along very stable for a period of time and then the bottom suddenly falls out.

You may recognize this pattern in stock market collapses or shifts in the political winds or technological "gales of creative destruction" as Joseph Schumpeter so astutely noted. The

changes are typically big, fast and alter the game. Despite all the data crunching and sophisticated theory of the Federal Reserve Bank, they still can't stop the bottom falling out of the economy. They can only try to staunch the bleeding after it collapses.

The Concentration of Wealth

Here's another unsettling fact. Wealth naturally concentrates in complex adaptive systems because of power laws. A power law gives rise to 80/20 rules and extreme concentrations. In a Pareto chart (in which the biggest item is shown as the highest bar on the left and the next largest is the second bar, etc.) the first bar can be extremely large.



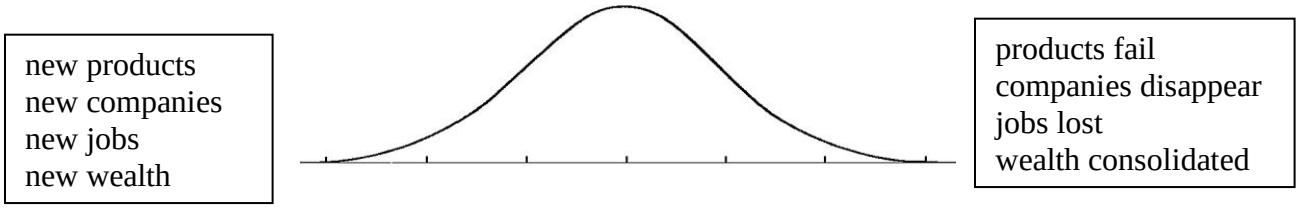
That would be Bill Gates's income on the left and my income way to the right.

In the everyday world, we see examples of power laws in the size of businesses (a few very large and many very small); populations of cities (a few very large, many very small); business problems (a few very important, many that are a little bit important); and sales by employees (a few produce a lot and many produce a little).

If economies are complex adaptive systems (and they are), we should not be surprised that wealth concentrates. It is a system characteristic. Today, according to Credit Suisse, one per cent of the population owns almost half of the world's wealth. Not fair, not equitable, maybe not even desired—but expected.

Commodity Traps: The Road to Poverty

Like the beating heart of the live organism it is, economies expand and contract wealth creation through cycles of innovation and commoditization. We can visualize bringing new products to market as a bell curve. On the left-hand rising side, the creation of a successful new product also creates a new company, new jobs and new wealth. Profit margins are high, the economy improves and most everyone benefits.



At some point the market saturates, the competitors catch up, commoditization sets in and a shakeout begins. On the right-hand falling side, the higher priced products lose out, those companies fold, and their jobs and wealth disappear. The remaining wealth becomes consolidated in a few companies and then in the hands of the owners as commodity pressures force down wages for those with unfavorable supply/demand ratios.

Communities caught in commodity traps drift toward the Latin America model of a small wealthy elite living behind walls high on the hill with poverty spilling down through the slums and favelas below. On the other hand, communities that continually innovate pump new wealth into their economic system and end up with a healthy middle class.

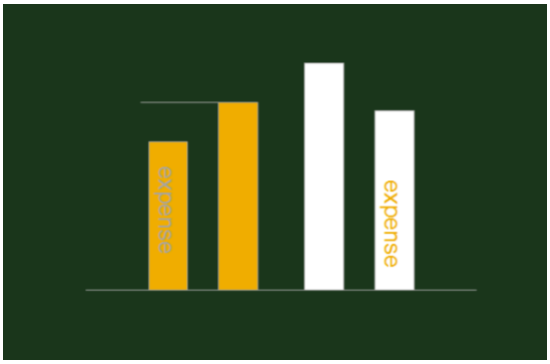
Let's explore both paths, starting with the commodity trap. Here is an eternal truth: If there is more supply than demand and you can't differentiate, you will be poor. You cannot get away from that fact in a free market economy. Take this simple example to understand why this is true.

If you and I are competitors and we sell exactly the same product (think of salt; no matter how you package it, it is NaCl –sodium chloride). In the diagram I sell salt for $2.00 a pound and that creates my income bar. I can produce it for $1.90 a pound which creates my expense bar. The gap between the two is my profit: $.10 pound.

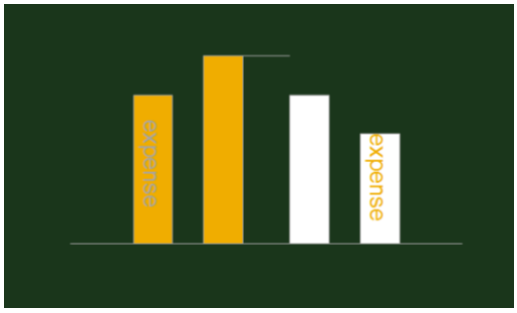
You, on the other hand, have your salt priced at $1.80 a pound (your income bar) and can produce it for $1.70 a pound because you have more efficient systems, buy in bigger quantities, pay your employees less and a myriad other reasons—all of which lead to the fact that your unit costs are cheaper than mine.

The customer looks at our two companies with salt for sale – $2.00 at my business and $1.80 at your business. It is exactly the same: sodium chloride and nothing else. It's a short discussion in the customer's mind: "I'll take the less expensive one, thank you very much."

I figure this out pretty quickly and soon I drop my prices to $1.60 per pound, twenty cents cheaper than yours. But my expenses are still at $1.90 and so I work to get those down. I put in even more efficient systems, buy in even bigger quantities, pay my people even less and negotiate my lease rate down. Customers flock to my salt store.



You now have the problem that I had yesterday in that your prices are too high because your expenses are too high. You are forced to do what I did and that is get your costs down even further so that you can drop your prices below mine (say $1.40 a pound). Once you do, the customer streams divert from me back to you.



And then I lower my expenses and drop my prices again followed by you dropping your prices and lowering your expenses. You can see what is happening: we are in a race to the bottom. We are both caught in a downward spiral that neither one of us wants to be in but neither can get out of it. It's like an arms race: neither side wants to do it but neither side can afford to stop.

This, then, is the core problem with commodities regardless of whether it applies to your job, your product, your company, your community or your nation. If you cannot differentiate, you have to compete on price alone and that pressure forces a reduction in costs. Depending upon which side you are viewing it from, the system is either making us be more efficient and reducing the price of things (the Walmart effect), or it is driving down profit margins and wages making us poorer. Both are true.

Good people—people who work hard, play by the rules, who take responsibility for their lives—get caught in commodity traps and end up poor. There is only one way out.

An Innovation Tide Floats All Boats – Restoring the Middle Class

We are in our second decade of media stories about the disappearing middle class. According to the pundits, academic authors and economists we have become a nation of rich and poor people, but not much in between. National leaders have stated that the inequitable distribution of wealth is the defining issue of our time. The Pope attacks the "mega-salaries for the rich and the crumbs for the poor." Capitalism is once again under attack as a system that exploits the many poor for the benefit of the rich few.

There is a fairly common understanding that the concentration of wealth combined with large scale grinding poverty is an historical recipe for change. In other episodes of American history where capitalism seemed to be working only for the owners, American workers sniffed around socialism, Marxism, communism and even anarchy as possibilities for getting a fair shake. Thus, the great question in free societies is how to get the benefits of innovation and efficiency from free enterprise without jaundicing the environment it needs to thrive. Short of income redistribution, none seem to have a conceptually sound pathway for ensuring a middle class. It could be because the question is phrased wrong. Rather than the "either/or" question posed in political debates, maybe it is a Taijitu question: "how do opposites exist in harmony?"

Is there a tension setting that allows robust Capitalism but still distributes wealth widely throughout society? The answer is yes, and it lies on the innovation side of this naturally emergent system. If the commoditization is the root of poverty, then innovation is the root of wealth. To wit: If a company innovates something that no competitor can match, then profit margins rise. In effect, it is a short-term monopoly during which the company is awash in wealth. Historically during this phase, the money has been liberally distributed throughout the organization. Thus, we can conceptually argue that the maintenance of a middle class depends on innovation's new wealth which flows to everyone before commodity pressure squeezes that wealth out of employees and into the hands of owners. If there is a pipeline of innovation, commodity pressures are kept at bay.

Conclusion

The argument made throughout is that the debate about Capitalism has historically been cast in either/or terms. Depending on our politics, we tend to pick one or the other system (economics or social values) and defend the pluses and deny the negatives. If we are on the political right, we laud the pluses of an economic system that produces innovation, drives down prices, and delivers supply to demand efficiently. We ignore the life changing disruptions of people thrown out of work, the concentration of wealth and the sudden plunges into chaos. If we are on the political left, we ignore the constant improvement in people's lives over the long run and focus on the inequality and the inhumane way that the results are achieved.

Further, the debate is muddied because of the lack of a modern understanding of the economy. Free enterprise is a Complex Adaptive System with its own set of emergent (if unsettling) signature properties.

- It develops *power laws*. Unimpeded, a few people will become extremely rich and the great majority will fall somewhere out on the long tail making a little bit of money. It's a system characteristic; the actors are just playing out a script deeply buried in the system.
- It operates at the *edge of chaos*, causing the economy to crash on a regular basis for no discernible reason.
- The whole system is exploring a *fitness landscape* via innovation. When innovation lags, wealth consolidates, and people lose their jobs.

And there are all these other economic oddities which don't get addressed very often:

- Wealth is calculated both by cost of production and by trading value, creating two intertwined economies. The *production economy driven by supply and demand and the gambling economy driven by greed and fear*. Although joined at the hip, on occasions the gambling economy will create Ponzi scheme bubbles in which the value of stock goes up simply because the value is going up (without any relationship to the underlying supply and demand of tangible products) and it becomes unhinged from the production economy. It then crashes taking the production economy with it.
- Whether you become personally wealthy or not will depend on whether you have a *favorable supply and demand ratio.* That ratio is not necessarily dependent on hard work, taking responsibility for yourself, education, passion or even morality. Because of that, wealth doesn't trickle down, it pools in favorable supply and demand situations.
- Anyone caught in a *commodity trap* will be poor. It is a systems issue, not a Mexico or China issue. They are only players in a script written in the stars.
- Commoditization also means that trickle down doesn't work. *Wealth pools* where demand is high, and supply is low. The Walton's making more money does not increase the wage of the Walmart worker.
- National wealth is increased in one of three ways: *population growth (more people making things/demanding things), innovation (new things invented and added to the mix) and commoditization.* C*ommoditization* drives down prices, meaning I can buy more even though I don't make more income (allowing factory girls to buy silk stockings).
- Moving money out of government (*tax cuts*) or into government (*taxes to fund infrastructure projects*) has no effect on national wealth if it doesn't address population growth, innovation or commoditization. These actions simply move benefits around. The water moves from one pipe to another but there is not more water in the pipes.

- *Government jobs* are pretty much like other jobs except for their inability to meet fine grained demand and constantly become more efficient. It's products and services are like an army chow line—here's your choice: hash.

Economic Gardening makes a more nuanced argument that we should keep the best aspects of Capitalism (free market forces that encourage exploration of the fitness landscape) and ameliorate the downsides. National economic policy focused on Mexico or China is trying to reduce the impact of commoditization. It will ultimately fail because it can only reduce the scale and speed but not the direction. If cheap foreign labor is not an option, robots will be.

The answer lies in continual innovation. The Luddites destroyed looms in mills to protect the home weaving industry. Do we really want everyone weaving their own cloth at home today? Modern farm machinery drove nearly everyone off the farms. Would we have denied that technology to preserve 10 man threshing crews as a major job option today?

Think of the economy as a platform in space in which commoditization is destroying the back end and innovation is building a front end. If we stand still, sooner or later our jobs will crumble beneath us. The objective is to keep moving forward. Public policy's role is to get people off the back end and move them toward the front end. This is where the national conversation should be focused.

To re-establish the middle class, we need to increase the rate of innovation. If you are innovative, there will be wealth to spread around. If you are caught in a commodity trap, you will be poor.

The Work Remaining

What I love about Economic Gardening is the intellectual stage on which we get to explore. Its very essence requires that we not only understand the complex mechanism of economies but the never-ending kaleidoscope of human activity as it relates to the building, maintenance and survival of companies and communities. I doubt if we will ever completely understand it but if we come to an appreciation of how complex of a task we have undertaken, that will be a major step forward.

Maybe even more exciting, other communities have joined the grand experiment and are bringing their own insights and experiences to add to our unfolding understanding of this complex subject. In 50 years, we will look back at these early efforts and marvel at how crude they were. These are the "Kitty Hawk" days in which we are simply trying to prove a principle. I am absolutely convinced that the tools, techniques and general theory will get more sophisticated with each passing generation.

Some day in the far future, when policy makers and field activists are working with third world communities trying to improve their lives beyond small hovels, starvation, poor health, ignorance fueling hatreds and all the other issues associated with poverty, they will automatically

refer to their field manual for growing healthy economies, and we as Economic Gardeners will have developed and tested those best practices.

And as such we will have made a difference in the world.