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THE DEVELOPMENT AND EVOLUTION OF SILICON VALLEY

Ten Things YOU Can Do That Have Worked for Us

Introduction

Today I will speak to you about my home and its surrounding areas, most recently known as the Silicon Valley. I was born in 1950 in the rural outback of the San Francisco Peninsula among almond, cherry and apricot orchards, in a little town called Palo Alto.

Stanford University was affectionately referred to as "The Farm." This was because of its rural setting and because you could bring your horse with you when you came to study here. Believe me, NO ONE had ever heard of Palo Alto or Menlo Park. So I speak to you as someone who has grown up with Silicon Valley and been an astute observer of the changes occurring there, because as hoards of people and industry moved in, I was losing my home as I knew it. People were moving in. Oak trees and cherry orchards were moving out.

And that trend has continued. Today Silicon Valley is famous. Delegations come to Santa Clara Valley every day from Norway, China, Canada, Germany, Mexico, Australia and many other countries and want to know how they can bring the lessons and riches of Silicon Valley to their own country. Every region of the world wants its own Silicon Valley. In her 1994 book *Regional Advantage*, Annalee Saxenian describes the primordial soup that allowed the emergence of Silicon Valley on the San Francisco

Peninsula. I draw strongly upon Ms. Saxenian's theories and my own experiences to present my thoughts to you today.

A brief description of what we have in Silicon Valley is in order. Silicon Valley has expanded in the last 10 years beyond its original geographic boundaries of Santa Clara Valley to now include most of the Greater Southern San Francisco Bay Area. Here, 85 percent of our capital product is created by companies of 20 or fewer employees. The population of Silicon Valley is 2.3 million people. There are 1.25 million jobs, plus seven percent of the workforce is self-employed. Silicon Valley has the highest per capita income of the United States, and the highest housing costs. We have the entrepreneurial spirit and a cultural acceptance of failure. We have unemployment rates under 3 percent, and middle-management executives who have their phone and water cut off by the utilities companies because they are too busy to pay their bills. We attract entrepreneurs from all over the world. Twenty-three percent of residents were born in a foreign country. Venture capital investment in Silicon Valley companies in 1998 was $3.3 billion, up 14 percent from the year before.[1] The 50 fastest growing companies in Silicon Valley, lead by Siebel Systems and Exite, had an average rate of growth in 1998 of 115,833%. [2]

Order From Chaos

So how does one create a Silicon Valley? Very much like the creation and evolution of planet Earth, itself, the evolution of Silicon Valley has been a combination of chance and predictability. And staying with the analogy to chaos theory, chaotic systems display

a characteristic sensitive dependence upon initial conditions. This means that the smallest differences in starting conditions can lead to greatly different results.

There are several factors that we believe have contributed to the development of Silicon Valley in the place and time it evolved. Just as Earth's distance from the Sun, its orbit and rotation, the pull of other planets, volcanism, and the orbit of the Moon came together out of chaos to provide the perfect conditions to develop life as we know it on Earth, so certain conditions exist and have existed for some time in California's San Francisco Bay Area for the evolution of Silicon Valley. I will talk about ten topics, some of which I believe are important points put forth by Ms. Saxenian about the "starting conditions," if you will, of Silicon Valley, and some of which are my own observations after 50 years in Silicon Valley.

Ten Reasons We THINK It Works

First, like Rome, Silicon Valley was not built in a day, nor in a decade, but over several decades beginning before World War II. David Packard and William Hewlett incorporated their new company, Hewlett-Packard, on January 1, 1939, nearly 61 years ago. That's a long time. As the People's Republic of China was being born, Hewlett-Packard was already nearly 11 years old.

In that time Silicon Valley has acted like a backyard garden. Five years ago my backyard was barren from being sprayed with herbicides. At that time I scattered a few seeds, planted some vegetables and composted my kitchen garbage. Today I have Swiss chard and bok choy, tomatoes and potatoes, onions and chives, morning glories, chrysanthemums, and lobelia, strawberries, anise, nasturtiums, oregano, arugula, daisies,

and squash popping up all over--entirely on their own. Not only plants, but also animals have moved into my garden. Snails came to feed on my vegetables. Rats came to eat the snails. Birds bathe in the birdbath and eat insects and seeds, an old lizard eats who-knows-what, hummingbirds drink from the wet leaves after I water, and a chicken hawk hunts the birds.

Like my garden at home, with time Silicon Valley has re-seeded itself and grown richer and more complex. After each recession or economic downturn, GREATLY DIVERSE, small companies have emerged that have responded more vigorously to each new market opportunity. According to Saxenian, "In a network-based system like that in Silicon Valley, the region--if not all the firms in the region--is organized to adapt continuously to fast-changing markets and technologies. The system's decentralization encourages the pursuit of multiple technical opportunities through spontaneous regroupings of skill, technology and capital." [3]

Remember, 85% of our regional capital is created by companies of 20 employees or fewer. These small companies are unusually flexible when the need arises to retool and adapt to a different manufacture and support of a new regional industry or product. Highly specialized engineering, manufacturing, design, fabrication and research and development companies have sprung up and thrived in this particular business environment. And like the strength of bio-diversity, according to Ms. Saxenian, "In Silicon Valley industrial fragmentation did not lead to competitive vulnerability or economic weakness. In fact, it appears to have contributed to the flexibility and resilience of the industrial fabric." [4] So the first point is--plant the seeds, give it time,

and cultivate diversity. Encourage the businesses that WANT to grow in your regions according to the resources you have to offer.

Second, according to Ms. Saxenian, the cultural norm in the Santa Clara Valley of the 50s and 60s of cross-company socialization and problem solving, which came to be known as "networking," greatly contributed to the foundation from which the Silicon Valley blossomed. And I would propose that openness and networking continue to contribute today. According to Ms. Saxenian, culture determines the nature of institutions, and institutions determine the nature of businesses and their cultures.

In primordial Silicon Valley, engineers and designers from competing firms, who were friends and acquaintances from university, or who had worked together at a company, would meet at the corner coffee shop and together work out the solution to one of those engineer's design problems. In so doing, everyone at the table learned the solution, which he or she could then take back to their own company and apply that knowledge as needed. Secrecy and corporate loyalty were abandoned for sharing and regional advantage in which everyone's fortunes rose.

So try to break down cultural barriers and secrecy in corporations. Understand how your culture influences what kind of economic development zone you can nurture.

Third, Silicon Valley is a result of cultural factors which include the ability, the right, and even the expectation that one will fail. One is expected to fail perhaps many times before succeeding, because every failure is a teacher. Many VC firms look for CEOs who have had a failure, because one learns as much from failure as from success, maybe more. In Silicon Valley, if you don't have at least one failure under your belt, you may have just been lucky in your success. Maybe ANYONE could have succeeded in

this venture. Perhaps you still have not faced a real market or commercialization adversity. MAYBE it came too easily or was just dropped in your lap. Acceptance of failure has been and continues to be a very important element in the culture of success which is Silicon Valley.

If it's not okay to fail in your culture, think again. You may need to spend some time softening that point of view. And that should not be too difficult to do, since WE ALL FAIL ON A REGULAR BASIS. We make mistakes, conditions can change on us, things can happen which are out of our control, we are human. It's just that in some cultures one is ALLOWED to fail and still be respected. In others, one is not. I SUBMIT TO YOU THAT THE ACCEPTANCE OF FAILURE IS A PRIMARY FACTOR IN THE SUCCESS OF SILICON VALLEY. Explore the idea of failure and its value.

Fourth, Silicon Valley is within an hour's drive of four national research institutions (NASA Ames Research Center in Mountain View, Lawrence Berkeley Laboratory and Lawrence and Sandia Labs in Livermore); three major research universities (Cal Berkeley, Stanford & University of San Francisco), four state universities (San Jose, Hayward, Sonoma & San Francisco) and a score of California Community Colleges. Each of these institutions contributes to the mix, either technologies, degreed workers or workforce development.

The research institutions, which are supported by the government, provided the advanced thinking and technology that has been the feed stock for many high-tech companies. The most famous example is that of William Hewlett and David Packard, engineering students of Dean Frederick Terman at Stanford University, who took cutting-

edge concepts from their studies at Stanford and set up their small company in David and Lucille Packard's garage in Palo Alto. From here they created commercial products for the film and electronics industries from the technologies they worked with at the university.

Four-year universities provide the degreed engineers to work in the companies in Silicon Valley. Until 1990, these and other state universities provided the needed degreed workforce for high-tech jobs. However, the number of engineers being graduated in the region is declining. Between 1990 and 1997, the number of engineering degrees decreased by 11.7 percent. [5] In fact, the decline of the quality of the regional education of the population and the lack of degreed engineers in the area is considered by many to be the greatest threat to the area's competitiveness.

The California Community Colleges, with 106 campuses across the state, form the largest institution of higher learning in the world. Their mandate is to serve their local community, and emphasis at each college varies from university prep to the delivery of highly specialized, high-tech training supported by such companies as Cisco and Sun. Workforce development and promotion at California's Community Colleges is based upon a philosophy of life-long learning-- a constant exposure to training and educational opportunity which keeps regional workers on the leading edge of their professions and provides businesses with an ever refreshed workforce. The Community Colleges, like the small businesses, are relatively autonomous and more fluidly responsive to the workforce needs of industry than are the 4-year institutions. As such, they are the state's main educational and training vehicle for Silicon Valley workers and for state-wide economic development.

So the fourth lesson is to set your economic development zone in an educationally and research-rich region.

Fifth, 70 percent of America's venture capital is located on Sand Hill Road in Menlo Park, California, in the middle of Silicon Valley. Venture capitalists who invest in companies want to sit on boards of directors and be able to attend board meetings within a 40-minute drive of their offices. So they do tend to invest in companies located in the region.

Another reason VC proximity is important to start-up companies is that most start-ups do not have a lot of money to send their CEOs great distances on airplanes to make presentations to VC s about their company and why the VC should fund it. In San Jose or Milpitas, a CEO might make several presentations in a month to funding firms located only a short drive away. Think of how that benefits a small company with limited resources for travel.

And, by the way, the venture capital community is no longer the venture capital source. That job has been handed over to "angel" investors, people who have made their millions in an IPO (initial public offering) of a very successful start-up and are looking for companies to invest in. The seed funding of 50-thousand to a million dollars that 10 years ago was provided by a venture capital fund is now provided by angels. Because of the success of the economy and the growth of venture funds, venture capital firms are now looking at well-established companies in which to invest that second one to five million dollars to expand the business in explosive ways.

So understand how the proximity of venture and other capital can affect business development.

Sixth, a plethora of small manufacturing, design and marketing vendors provided the fertile environment that evolved into Silicon Valley and allowed the Valley's economy to recover quickly from the recession of the 1980s. If you want to development an economic zone, find out what you have a lot of, what you do well, what your strengths are, and where many small companies exist to support the economic zone. If you have an ocean, and a great cultural tradition of fishing, boating and other things associated with the sea, perhaps your economic zone should be associated with the ocean.

Monterey, California, and the other towns that make up their economic region, are great examples of this. An hour and a half drive from San Jose, over the Coastal Range on the south side of the Monterey Bay, Fort Ord, which heavily supported the economy there, was closed in a round of base closures several years ago. The economic development people in Monterey wanted to know how they could tie in with Silicon Valley and bring its riches over the hill to their town. But even only an hour and a half away, they are too far. V.C.s will only drive about 40 minutes, and manufacturers and fabricators are a 3-hour round trip away. Start-ups that locate in the abandoned fort facilities will simply be too far from the vendors and other resources that their competitors in Santa Clara or San Jose will only have to drive a mile or two to work with.

But Monterey does have one of the most spectacular ocean fronts in the world with a rich fishing history, the state-of-the-art Monterey Bay Aquarium, started by the daughter of David and Lucille Packard, and the Monterey Bay Aquarium Research Institute (MBARI) in Moss Landing. In my opinion, until Silicon Valley vendor density seeds itself up over the mountains and down the coast, Monterey's best opportunity for creating

an information industry is the ocean and the information resources associated with MBARI and the aquarium.

Silicon Graphics has already partnered with MBARI to provide high-school students in the region and in other regions with work stations that allow the students to view, over the internet, and use for their studies, the 3D maps MBARI has created from its deep-water exploration of the more than 750-meter-deep Carmel Canyon in Monterey Bay. Other information technologies and uses are being explored by staff at MBARI.

According to Ms. Saxenian, the Italians have developed economic zones around their leatherworking industries. Figure out how you can then create the information technology around these strengths. For instance, take the leatherworking industry to the Internet. Learn ways to make money doing that. As Bill Reichert of garage.com said, "Anticipate a need and invent a market." Establish information dominance in the field of your strength and grow more small information providers around that industry. Take your "brick and mortar" industries to the internet. In this information era, look to your many small companies in an industry cluster to support economic development.

Seventh, a good technology does not a commercial product make. I was at an environmental technology commercialization conference in Texas seven years ago. One gentleman in the audience stood to speak and said that he had THE BEST technology for the cleaning of sandy, loamy soils. He couldn't figure out why someone wasn't knocking down his doors to give him money for his technology.

The moderator told him, "Fine, you have a great technology. What's your product?"

"What?" Asked the technology developer, "I have THE BEST technology for this application?"

"Maybe so," said the moderator. "But who is the customer, and what is he supposed to buy?"

This lesson of commercialization is one of the most difficult for a research and development person to understand. They often do not realize that identifying, designing and bringing to market a product from a technology is a science in itself.

To commercialize a technology, one must identify the consumer product and the application for that product; identify the market; quantify that market--that is, how much money can be made each year in sales in that market; figure out a way to produce the product and then price it for a profit that will then become the cash flow that is the life blood of the company. Then, of course, one must identify who and how the product will be sold and distributed to the market, and convince a retail or wholesale and distribution company to carry and sell your product. These are your channels of distribution and sales. All the while, of course, one and one's partners need money to not only live on and pay those exorbitant Silicon Valley rents and mortgages, but also to purchase capital and operating equipment, such as parts for manufacture or simply office space. Often start-up companies identify a large company with which to partner. Then they must convince the larger company that they have something worth investing in. It's a huge sales job; from the investors to the vendors to the partners, one is always selling.

Learn about and understand commercialization.

Eighth, there are some things the government can do to promote economic development through the promotion of start-up companies and the industries they support and foster. Depending on your country's choice of government style and economic system, the role of the government will vary.

In the United States where we have a free-market-based economy one of the most helpful things the government can do is to get out of the way and let the entrepreneurs be creative and industrious, and perhaps provide them with tax and other economic incentives for taking the risks associated with business creation.

But in other countries with more central control of the economy, the government can act as the source of venture capital and design and support industrial centers much as the People's Republic of China has done.

In all situations, the government can provide excellent education, research and development and can attempt to simplify business processes such as those associated with the transfer of technology from the government to the entrepreneurs. The wheels move slowly within large institutions, and this culture can clash with that of an entrepreneur who needs to bring a product to market quickly. Researchers are often unable to understand the urgency to get testing completed and a product designed, fabricated and introduced to a market at a crucial annual trade show. If that trade show is missed, the entrepreneurs might be looking at another year before that window of opportunity to the market is open again. And that much time simply does not exist, either for the entrepreneur who needs to create sales and positive cash flow, or for a market in which a product that is 9 months old may be obsolete.

And although the flow of commercialization has traditionally been out of the large, government-supported research institutions to the private sector, I would like to refer you to a recent news item in the San Francisco Chronicle which is headlined, "CIA Asks Silicon Valley for Help: Executive to head venture-capital firm for new technology". The article states, "Unlike the Cold War period, when the most advanced technologies

trickled down from a handful of supercomputer companies, the most powerful technologies are increasingly being developed first by consumer electronics companies, which have vast markets to finance the development of powerful systems and applications." [6] In other words, folks, commercialization in the U.S. is being turned on its head. The private sector is now developing technologies in computers and internet security that surpass those in the large, cumbersome research facilities.

So learn about and understand commercialization, and don't think ANYTHING is cast in concrete. Even our most cherished beliefs can change.

Ninth, you can create entrepreneurs. Silicon Valley attracts entrepreneurs from all over the world, but as I mentioned earlier, 23 percent of our population was not born in the United States of America. In Santa Clara Valley people of all colors, races, ethnicities and religions live and work together. I can enjoy excellent Thai, Japanese, Vietnamese, Chinese, Argentinean, Greek, Hungarian, French, English, Irish, Mexican, Italian, Mongolian, German, Persian, Indian, and North African cuisine, just to name a few off the top of my head.

While I was working with the Enterprise Network/NASA Ames Incubator in San Jose in 1997 and '98, I set up a panel of entrepreneurs from the incubator to speak to students from the University of California international program. All of the students were foreign born, so I put together a panel of all foreign-born entrepreneurs. One was from Russia, one from Bangladesh, one from Germany and one from India. These courageous people left their homelands to find adventure and opportunity in Silicon Valley. What strikes me is that America did not create these entrepreneurs. YOU did. The world nations created

them; America only gave them the fertile soil in which to cultivate and harvest the fruits of their ambition.

Learn how to attract the entrepreneurs that you are already creating. Find out what they are searching for in Santa Clara, California, and try to provide that at home.

Tenth, recognize all the different types of intelligences in your people. A high IQ is not the only kind of intelligence that can contribute to your workforce and economy. People with high I.Q.s are great at research. But as you have heard me say, the type of intelligence it takes to imagine new applications for technologies, the type of intelligence it takes to be the consummate sales person, the type of intelligence it takes to manage and inspire a small group of partners or employees in a start-up company are all absolutely necessary for the completion of the commercialization process and the success of a start-up.

Fully 20 percent of the human population is dyslexic. [7] That is, the two lobes of their brain are the same size, and they process information differently from the way the rest of us do. They may have visual and/or reading and writing problems, but they are distinguished by having better than average verbal and creative skills.

In Silicon Valley one very successful entrepreneur whom I know personally is dyslexic. He never fit in well in the school system; he had trouble learning from books and writing and taking tests, and never finished high school. But he, like many dyslexic Silicon Valley computer and internet designers, is a brilliant, creative genius, and he's running a successful Internet start-up with millions of dollars in funding. Many computer-oriented technicians have brains which work slightly differently from the majority and which have kept them from succeeding in our wrote-based school systems.

This has blinded the rest of us to their own special intelligence and ability to contribute in dynamic, innovative ways.

It is very important to recognize, reward and take advantage of all the different types of intelligences in your culture.

So, in conclusion,

Give it time;

Understand how your culture influences what kind of economic development zone you can nurture;

Explore the idea of failure and its value;

Set your economic development zone in an educationally and research-rich region;

Understand how the proximity of venture and other capital can affect business development;

Look to many small companies in an industry cluster to support economic development;

Learn about and understand commercialization;

Understand the roles your type of government can play in business development and when you should simplify cumbersome government processes;

Learn how to attract the entrepreneurs that you are already creating;

Recognize, reward and use all the different types of intelligences in your culture.

NOTES

1. Joint Venture's 1999 Index of Silicon Valley, http://www.jointventure.org, Joint Venture: Silicon Valley Network.

2. 1999 Silicon Valley Technology Fast 50, http://www.dttus.com, Deloitte & Touche.

3. Annalee Saxenian, "Regional Advantage," p.9.(Harvard University Press, 1994,1996).

4. Annalee Saxenian, "Regional Advantage," p.44.(Harvard University Press, 1994,1996).

5. Joint Venture's 1999 Index of Silicon Valley, http://www.jointventure.org, Joint Venture: Silicon Valley Network.

6. *CIA Asks Silicon Valley's Help*, John Markoff, San Francisco Chronicle, September 29,1999. http://www.sfgate.com.

7. San Jose Dyslexia Center, San Jose, CA.