

Why Does the Silicon Valley Need Large Companies?



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What are the primary goals of the US-Asia Technology Management Center?

As a research and education center in Stanford's School of Engineering, we are looking at interphases between business and technology. We do research on various management of technology and management of innovation topics. The things I enjoy the most are looking at a new technology and how it affects an industry's structure and dynamics. I also look at national innovation systems. I'm called on to interact with people in universities and companies elsewhere, and the innovation systems are quite different. People need to understand their systems. And now I find that that's a very good area of research — government, industry, and university sectors interact in various ways to form such a complex system. We also look at a certain amount of R&D management, research globalization.

Most of our studies are about 1 or 2 years long and involve Masters students. In contrast, PhD level studies would usually require 3 or 4 years. Most of my studies are really about 2 years of length and they don't really turn into academic publications that often. Our sponsors find them very interesting, and they are great for the students — our students often are getting great jobs at consulting companies after graduating, and so they are able to go out and use what they learn in a practical way. I hire graduate students in technical fields as research assistants to study about business problems. On the education side we present university seminars about management of technology and innovation and on an international scale about entrepreneurship. I'm also a specialist in Japanese business. So I teach a course on this.

The Japanese culture is very closed. How did you manage to be on the Board of Directors at Tohoku University?

The specific story is that I've been known as someone who has worked a lot with Japan for many years. The Japanese Consul General in San Francisco introduced me in 2001 to the Cabinet Minister in charge of Science and Technology Policy (a Member of Parliament), who needed an international committee for one of his projects. I served on that international committee. He then recommended me to the Tohoku University President in 2003 as they were preparing for the new law that would make Japanese national universities into "university corporations". When the new law took effect in 2004, Japanese national universities were no longer part of the government, and they could include foreigners in positions that previously were only open to Japanese citizens. So I became the first non-Japanese person ever asked to join the board of a Japanese national university. Although I'm not Japanese most of the time people in Japan are very interested and find it useful to hear outside points of view. I know the system well enough to understand what's going on inside the system, and can bring something from outside — that's really my value to them.

To your mind, how will the earthquake influence the Japanese innovation system?

First, and this is background to the innovation topic, the disaster is going to have a huge negative impact on the national government budget. There may actually be many opportunities for financing government bonds. The government will have to issue a lot of bonds for reconstruction and rebuilding. They'll be expensive because the government already has a heavy debt load. So the investors stand to make a lot of money. The Japanese will rebuild.

And the earthquake will have immediate bad impact on

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GDP that will gradually improve as rebuilding proceeds. I also see an impact in the supply chain itself; from now, companies will make extra efforts to do more multiple partnering with component suppliers in different geographic regions. That's critical because they cannot afford to stop making automobiles just because they can't get the parts from one area. That won't happen again. The auto companies now will make sure they have suppliers in multiple areas.

As for the innovation system itself, I think the biggest danger is how much the Japanese government can continue its efforts to improve the system despite having to deal with this massive huge problem of reconstruction. I think it's a financial problem for the government. The biggest trouble with the Japanese innovation system is that it has not been open enough: universities are too self-contained, and big

companies are too self-contained. It's very much like a model the US was using 70 or 80 years ago.

But maybe in a long run those companies and the system in general will become more open...

I think it can. I do think it can become more open and I think that I see tendencies towards that.

When you have the industry it's hard to make changes. But once its destroyed, it's easier to make changes, because you will use the newest technologies. And once you rebuilt it, it will be the most advanced in the world.

True. There were some good universities in the part of Japan that was hit with the disaster, including the university I was on the Board of the Directors — Tohoku University, which is in Sendai. They were hurt pretty badly but should recover. A lot of small manufacturing was destroyed, so the disaster hit the supply chain hard. But in regard to the actual innovation system itself, I'm sorry to say about for the people of Tohoku, but they were not the critical place where the innovation is happening in Japan. If the same thing had happened between Tokyo and Osaka, in that corridor, Japan would have a really difficult time getting out of that.

You've studied national innovation systems all over the world, and you can compare. To your mind, what innovation systems are the most improved in the world?

I've been looking primarily at Asia and the US. I have to say that the balance of the US system is truly remarkable. It's better balanced than the systems in just about any Asian country I've looked at. I haven't done sufficient study of Denmark, but I've heard really good things about it. I've heard good things about Finland. So I'm very interested in looking at Northern Europe.

What are the specifics of the US innovation system?

By innovation system I want to look at the flow of people from one organization to another, the flow of money from one sector to another, and the flow of ideas (e.g. intellectual property) across organization boundaries, as well. By sector I mean university, or industry, or government. In speaking about the characteristics of the US innovation system, first, it's important to remember that there is a lot of regional variation. We have a more open system here in Silicon Valley than a lot of other places, especially places with more of a manufacturing-based economy. Silicon Valley is really an innovation-based economy, and so here the flows of people, capital, and ideas characterize a robust innovation system.

There are some dominant characteristics. First of all, we have a very fluent labor market, so that the people will change companies often and be in contact with many other people outside their company at any point at their career. That's important because it allows for efficient allocation of resources. The best projects tend to attract good people to work for them. We also have a well-established legal framework for managing intellectual property; that actually enables a lot of discussion, which leads to transfer of intellectual property. If the legal system were not clear or well enforced, you would not be able to have transfer of intellectual property. And such transfer of property is essential in order to make innovation happen. It's very rare for an idea to stay in the same person's hands from its original conception to the market.

With regard to the government's role in the innovation system, the national government provides a lot of research

and development money. A distinctive feature of the American system is that the government expects universities to compete for almost all of their research funds, and one of the biggest competitive tools is to match the government money with funding from a company that is interested in the same area of research. For example, if I apply for 1 million dollars of government money, I will make a promise to do a 1.2 millions dollars of work, or even more — 1.5 million dollars of work. That extra money can only come from industry. The government has the right to make sure that I secure and spend those matching funds in support of the research that their grant has supported. In this way, the government in effect forces universities and industry to cooperate with each other in order to obtain government funding for research.

What are the major participants of the innovation process in Silicon Valley and the US in general?

Let me talk about Silicon Valley first. I think that Silicon Valley is famous as a place where there is a great environment for starting a company. The knowledge and expertise, and also the availability of investment money are very strong. And in some ways that makes it like Hollywood for movies. You have to have a really good idea here. It's actually harder here because there is so much competition. But people know how to start companies here. That's famous. What's not so famous is that big companies in Silicon Valley are a very important part of the system. In some ways, they may not want to be so much a part of it, because they are the source of most of the employees of start-up companies. That's the first function of big companies in the innovation system here.

The second thing is that they will often be the first customers of a start-up company, becoming a reference customer whose purchase validates the technology of the start-up and provides valuable revenue. Companies here also do some corporate venture capital investments, and they are very good at acquiring companies. Consequently, the big companies here are a very important part of the system.

As for the rest of the US, it is more difficult to promote the flow of innovation in areas whose economies focus on manufacturing industries. The job skills that they require from the labor market are more about following assigned tasks very well than about creating new ideas. Even in precision manufacturing — a lot of work can be done just with a high school degree. In contrast, the level of university education is quite high in the population of the Silicon Valley. You find many more PhDs and Masters graduates than in the general US population. And with manufacturing based economy, manufacturing does not lend itself to switching to new lines of business. In Detroit, when the automobile industry goes down, what new work can the autoworkers do? Their skills do not easily translate to other industries. Here in the Valley the employment situation is always uncertain and unstable. People are laid off all the time. But they manage their careers, and so in some ways they are used to that insecurity. And now we see hiring again this year, and people who have saved all their money because they were afraid to be laid off — they spend their money now and get next job.

How important are innovation parks?

The innovation parks are good if they have programs that really help the people who locate their companies there. If they do what they really can do, they can be very useful parts of the system. They are not just real estate developments. Programs that they put on for the

tenant companies are important. It's important to have places where people can meet each other, hear new ideas. That's one of the most important needs in an innovation system — to hear a new idea that is different from what everyone in your existing organization thinks. The innovation park can really help that. They can help bring together investor and entrepreneurs. With university participation they can facilitate university-industry knowledge transfer. But it really requires a very active gifted manager who works very hard to provide good programs to the people there.

To your mind, what distinguishes the local innovation park from other innovation parks all across the US?

The day of the Stanford Industrial Park is really 1950s and early 1960s. I would like to go back and do a study to see. May be it was very successful because we don't need it any more.

You don't need it?

I think that the industrial park is a great place for HP and other companies to have their own offices, but the entire area developed this openness and ability to meet people with different ideas. I do think the Park played a big role in that in the 1950s and 1960s. I don't think it's that significant now. But it still exists and it's a good income for the university — we are renting out our land. And it's convenient for the companies. The terms are as good as in any other industrial park. But I don't think you see the kind of the promotion of closeness to university through that park that you used to. Now companies have close connections already. And now with the Internet you don't need the physical closeness so much.

But where would small start-ups go?

But Stanford does not have an incubator. It's because we don't really need one. There are plenty of incubators around the area. I think that the incubators have helped but the primer responsibility rests on the entrepreneurs and the investors. The incubation facilities helped bring them together but what really matters is whether you have good ideas being able to attract sufficient funding to become real.

How does the legislation in California differ from regulations in other US states?

Most of the laws are national; they are not state. Situation is not really so much a function of the State of California (the government), as it is a function of innovation activities and innovation industries that have clustered so much in California. There is at least 50 years of clustering that have led to a very strong economy here. The one thing that you can say that the government does here is that it's relatively transparent. You can understand what the regulations are. But tax is expensive in California. The environmental regulations are very tight in California. So, if anything — that would be a negative, that would not encourage people to do their business here because taxes are high. People want to be here because the cluster of the economy itself.

What is the key to understanding the phenomenon of the Silicon Valley? Why did it cluster so well at first place?

There was a combination of factors. At the end of the WWII a lot of government money was going to support research and development. A lot of money did come to universities and existing high tech companies here. Stanford attracted a lot of research and development money. I think that because we are so far away from Washington DC there was a freedom.

It's hard to say what is the one thing is. I think that a combination of a lot of money after the WWII, people who felt free to try to start their own companies. At the same time Stanford wanted to build itself into one of the best world's universities. And they had some very good leaders who made good investments not only in people, in good young professors, but in the fields that those professors were teaching. Stanford was one of the first places that saw the growth of microelectronics, and then one of the first places to see the growth of computer science. Professor Miller was the first person in computer science here at Stanford, the founder of computer science department.

In some way we were very lucky. During the WWII almost all America's advanced electronics research was done in the East coast. And after the WWII the American government realized that this was a dangerous thing

INNONEWS

Modern IT Technologies

The Yakutsk State Agricultural Academy under aegis of the Council of Federation of the Federal Assembly of the Russian Federation and the Ministry of Agriculture of the Russian Federation will hold the international research and practice conference «Modern IT-technologies: modernization of the agrarian education and innovation implementation in agro-industrial complex» in Yakutsk July 1—5, 2011.

www.ysaa.ru

Russia Approves 95 New Clinical Trials in First Quarter

Monday, June 6, 2011. The Ministry of Health and Social Development of the Russian Federation (MoH) approved 95 new clinical trials of all types including local studies during the first quarter of 2011, 29% less than the year-ago quarter, according to a quarterly analytical report produced by Moscow-based CRO Synergy Research Group (SynRG).

The quarterly report on Russia's clinical trial market is another step in improving the research attractiveness of Russia for foreign sponsors, one of SynRG's goals. Clinical trials in Russia in the first quarter were sponsored by companies from 15 countries. The maximum number of trials — 22 — was initiated by US sponsors; Russian sponsors had 19 studies; Swiss sponsors had 15 and UK companies had 10.

www.centerwatch.com

Rosatom Chooses Kaluga Oblast for New Center

“Rosatom is preparing to establish a center in Kaluga Oblast where medical equipment and accessories will be sterilized and technetium-99m generators produced,” Mikhail Batkov, director of Rosatom's Radiation Technologies program, announced. Plans for the center were unveiled at the II Obninsk Innovation Forum, which opened on May 19, 2011.

www.rosatom.ru

to have everything done at the same place. So it was easier to get money here. We did have some basic industry from before WWII. HP was founded before WWII. So there were people here who knew how to get money. Then you had Stanford doing some brilliant things, I mean, really kind of unusual for university things to strategically put Stanford into where the leaders thought the world would be 30 years later. You really need to look at your strategic investment in young professors in fields that would change the world. And at the same time you have this kind of mood that starts to develop in industry, where if you don't like your company — go and start your own. There was a lot of informal interaction between people at the university and people in industry here.

So Stanford itself did not really try to build the industry. They were after being a great university. But a lot of communication — consulting by professors, industry people who would come to the university to meet with PhD students to hire them — that kind of close communication was, probably, the biggest thing.

Are there special classes where students are taught how to be innovative?

There are programs now. But the system here grew up before the education programs. Stanford's program to teach entrepreneurship started in 1995. And the system grew up before that. Most of it is informal where the knowledge is transferred not through university but from person to person. And the students at Stanford are very good at getting out and meeting people before they graduate. Now there are good education programs, not only in Stanford but also in other universities too. But I think that without a practical side the education programs would not be successful. I bring in maybe 35 speakers from industry to lecture in my classes every year. And I know half a dozen of other professors here who are doing similar things. Students can talk to them, and hear a real-world, practical point of view. The students are studying with professors at the same time, but there are so many places to go and hear about new opportunities in a particular area like biotech or electronics. So there are plenty of places to hear about opportunities. There are also plenty of places to see real projects — projects that fail as well as projects that succeed. Watching your friends' projects is an important thing that young people do.

If a research takes place in a university, who would own the IP rights?

Stanford will own the IP. But, of course, the reason that system works is because universities don't make products. For universities the IP to benefit society at all some company has to buy it. Without motivation to license the IP it stops at the university. I think it's important to university to own it because one alternative would be for researcher to own it. Most of them are too busy doing research to go and found their own company. And if a team here at Stanford does form a company they have to buy the IP back from Stanford. If I invent something — Stanford owns it. If I create a company around my invention, first thing I must do is to negotiate a license arrangement with Stanford for my own IP.

Being an inventor, would you have a priority to buy it?

There is no written policy about that. I think Stanford would want the people who are likely to use the property to buy it.

Once a company buys it, how much would you get?

That's where I have 2 things. I would have to pay Stanford for my own intellectual property to start my company and use it,

but as an inventor who works for Stanford I would get part of the royalties back to me as a person. So I pay money to them and I get some back.

Stanford system has been very generous. The office of technology licensing takes 15 percent of the royalties off the top because they have to support their own operations. Then the remaining 3 shares, the remaining 85 percent, are divided 1/3 each to the inventors, to the inventor's departments, and to inventor's school. You know in the US system you have department like Electrical Engineering inside a school like the School of Engineering (some places call those faculties). Nothing goes back to the central university budget. It stays relatively close to the research area that led to the research, which is good.

What are the royalties?

It would be 1/3 of 85 percent of the royalty to the inventor. But the exact amount of the royalty itself — that's decided case by case. It has to be negotiated. The reason that Stanford office has been so successful is that they realize that IP is important but it's not the reason for the university to be here. They have to put themselves in a supporting role to support research, and sometimes that means taking a lower royalty, so that you encourage people to use the intellectual property more.

Were there any recent changes, under Obama administration, for instance, in the innovation policy?

I think that the biggest change has been more money flow in the science and technology during the Obama administration. The budget of the National Science Foundation almost doubled.

Is this money for basic or applied research?

It includes everything. Still, only the government can fund more basic research. But, you see, that provides a stronger base for other people who do innovations.

So the budget for science grew. What might be achieved through this change?

First of all, I think that we have a delicate situation in government this year. And the economy is in a difficult situation. I'm not sure how well the government can maintain its support. I think that you will see a lot of efforts in areas that are clearly of interest to the Administration, like energy and environment. In some ways the US was behind its big competitors — Japan and Europe in those areas. That's one thing that I see. Medical research will continue to be strong, but the health care system is uncertain. How it's all going to work? Medical devices, new pharmaceuticals have taken an awfully long time. Right now I see 3 to 5 years boom in environment and energy related industries.

Will the government be able to handle huge spending on health care system?

Probably. There will be a lot of fighting about how to work. It will be in danger for a long time, but I think it has to. That's one of the basic things that people depend their government for. So I think the medical system will eventually work itself out.

To your mind, was it a good decision to increase spending on it?

There was not so much an increase in spending on health care research. There was but that wasn't the real source of the problem. The real problem was our equivalent of national health insurance. And I know that some people in the basic biomedicine research area have been concerned that

more of government money is moving away from basic research and are going towards health care delivery. Maybe it's unavoidable. That's one of those things that the government has to do somehow.

What helps and what hinders the development of the innovation system in the US?

I think that it has an incredible flexibility. It's very good at being responsive to changing needs of society and yet allowing leading institutions to come forward and promote new things before people know they need them. And to a certain extent universities have that kind of role. We are looking for alternative solutions to problems. Big companies like Google have that role. They are developing new ways of approaching problems as well as being responsive to the market. I think that's the greatest strength. My biggest concern about the future of this system is really the quality of education for children. The colleges are fine, but the quality of education at the school level in all fields is a very difficult question.

In what areas the results of innovations were the most impressive?

We are living in a middle of a third industrial revolution. I would say the third because I think the first was basic mechanization of industry in the late 1700s and the early 1800s, and then mass manufacturing techniques was the second from the late 1800s and the early 1900s. The information technology and communications (ICT) has had an incredibly huge impact on people's lives over the last really 15 or 20 years. I think that was an outcome primarily of the innovation system. You had the government that supported projects like what later became the Internet. You had companies that were able to take advantage of that. You had the openness of the system. The http protocol came from Switzerland, from CERN. So we took advantage of it here, in the US, and the universities had people coming up with new ideas and new things to do. I think that's a real casebook study of, probably, the big story of innovation over the last hundred years. More recently it's been interesting to see this pattern of waves where something would bubble and then burst, and then you have a real growth. So electronic commerce bubble burst in the year 2000. And really everything that has happened with Google and more recently with Facebook and so forth since about 2003 is the real growth of that bubble that first burst in 2000. So that's kind of an interesting pattern that I see repeated over and over.

Do you see any other sources of growth in the nearest future?

There are many opportunities, and there are many challenges. The energy environment is an industry sector that I see growing. I also think that one of the changes that happened along with this industrial revolution is global business. And certainly the growth of economies not only of China but all of the BRICs presents great opportunities for people everywhere, not just in the four BRIC countries. I do think that business globalization is an opportunity for greater economic growth. It's also a bigger challenge because your competitors are everywhere. You can't have your own little market and be happy with it, because as soon as you bring the product to market anywhere, people all over the world know.

What is your forecast for the development of the US innovation system?

I would do a forecast like some people draw a business plan. I would have one line for what I really hope for to happen; one line for worst possible scenario; and then in the middle is the line where I think it will really go.

The best thing would be a continuation of the best aspects of the current system, including good decisions made by the government and a continuation of the openness and flexibility of the system. This system at present is remarkably balanced between university, industry, and government. No sector really controls all of it. And that balance is its best part. That means that government puts money into areas it thinks are important and without company people and investors pushing the government forward into self-centered directions. One reason the government does so well is that it has experts from the university and industry, who take leave from their regular jobs to serve as its program managers for two or three year terms. I think that from here best possible world would really be a continuation of that balance where government provides money to stimulate the system but where university and industry really exercise their unique roles and help the system to move forward in the most reasonable direction possible. In the best possible scenario, good people will continue to come into the system from elsewhere. One reason Stanford is successful is that we are trying to get the best students in the world. So you need good people coming into the system. That's the great thing. It's more or less a continuation of what we have. I think we have a pretty good system.

Worst possible scenario — it gets out of the balance and either the government tries to exercise too much control or the continuation of funding programs become so unreliable that researchers cannot engage in long-term innovation. Many advanced technologies require long periods of time to incubate before they are ready for commercialization. And, if you cut a research program one year it takes 5 years to get it back. So I do worry that we will lose some areas due to uncertain funding and that will make us behind the rest of the world quickly. And I worry about the education system in the US (for children). To a certain extent I'm a little concerned that government seems to be having a harder time to keep going. I don't think that the government will fall but it may become inefficient.

Somewhere in between those two: I think we will continue, we will eventually stop being the biggest economy in the world because China has so much room to grow. Sometime in the next 15 or 20 years, probably, the economy of China will be as big as the economy of the US. I think that part of the US future depends on how well we manage our own position in the world where there such large newcomers appearing.