Generation X — the US Secret Weapon

What are the specifics of the US innovation system? It's a very broad question, and the answer depends on whom you ask about the innovation nation. There are several factors that affect a country's success and ability to innovate on a regular basis. At the top, we have talent to innovate; you need to have right people, and a critical factor is that the US is very open to having people come from outside the country, and having highly skilled and educated immigrants plays an important role. You need to have people with a certain hunger for creating new ideas who are eager to bring those ideas to life. That was certainly one of the reasons why Silicon Valley has been able to thrive, and, in fact, Silicon Valley is over 50 years in the making. The entire region has really evolved and undergone several transformations from early agricultural roots to now Internet solutions, social media, new working tools, and all of that. Therefore, people — that's the first important element.

Second is having an opportunity to be able to create. I travel often to different countries, and sometimes there is a different view of risk. Risk is one side of a coin with opportunity on the other side. You need to realize that for every risk, there is an ample opportunity, and people have to be willing and open to find opportunities and having optimism to pursue these opportunities. One really needs to have an open mind and a positive attitude. You have to be able to envision a better world in order to actually have that world come true, because in the end we are all responsible for building the future that we want to live in.

And the third factor, which is important, is the resources. What I mean by resources is being able to have access to raw materials, to the elements that you need to innovate. For some regions within the US, there may be more emphasis on basic research, fundamental discoveries; therefore you need to have lab facilities to support that. For other regions, it may be access to venture capital funding to accelerate product development. That's the case in Silicon Valley where you have different groups, which take advantage of being close to venture capitals here on Sandhill Road, and entrepreneurs use venture money to help accelerate their companies' growth. In many ways, Silicon Valley is a commercialization incubator. The focus here is on getting new ideas faster to the market than other regions, both in the US and abroad.

The fourth factor is the culture. And that's a hard one to pin down, in many ways it goes hand in hand with opportunities, the type of people who can find and see new possibility. In Silicon Valley, there is a belief that everybody can be an entrepreneur; that everybody deserves to have a chance to create one's own business, that anybody can do that from any background — women, minorities, etc. Here at Stanford University, we encourage students to start their own businesses, which further contributes to a rich environment that allows all of this happen. Education is important, but you find from many entrepreneurs and people who are innovating that they are often self-trained and they believe in learning but that doesn't necessarily have to be formal education, it's just opportunities that allow them to find and create these new ideas. The right innovation culture is based on a powerful mix of formal and informal elements that creates its own ecosystem.

Is government policy also an instrument to influence innovation process? Yes, although it doesn't create innovation, government policy can help foster the conditions that enable innovation. In particular, government plays a critical role in several areas by setting policies that provide the right infrastructure, allowing immigrants to work and collaborate with citizens in the country, and encouraging the flow of new ideas and people who feel that they have freedom to create. But you cannot force innovation: many regions around the world have tried to replicate the Silicon Valley formula and they found it didn't work for them, or they mimic the motions for what should be the obvious factors, and after a few years, they find they don't have the same output.

What else apart of things that you've mentioned earlier such as education and culture drive innovation? Each region has its own temperament when it comes to innovation. That is what people consider the magic of Silicon Valley: many people come to this area and enjoy the sunshine, the cafes, and the relaxed energy — all those elements are considered vital and intangible parts of the Valley culture. This magic is hard to explain to outsiders and often required to experience personally. Many visitors tell me that they can't leave Silicon Valley after they've been here for a very short time. And many find a way to return, so that they can re-experience that magical feeling. In contrast, Boston has a different type of culture that allows innovation to occur within its own environment. Seattle and Northern Virginia also have their own feel.

How does legislation regulate the innovation process? What laws facilitate it, are there tax breaks for companies that do R&D, etc.? The term “innovation” covers everything; in fact, it is used interchangeably for both process and output. Ultimately to bring about innovation, multiple types of organizations have to work together from creation to development of a new...
idea, to its commercialization and transfer of technologies. Government plays a role at all those levels. Ideally, in the beginning, legislation should allow the right groups to come together to create, and often there is a fair amount of forming and reforming. I mentioned immigration earlier, and government policies for educated and skilled foreigners are very important. AnnaLee Saxenian, a dean at UC Berkeley, has written a book called “The New Argonauts”. She has gathered ample evidence about the importance of foreign talent: they are critical to start and to develop innovation, particularly in the history of Silicon Valley.

What are the major participants in the innovation process and what are their roles?

Has anybody mentioned the concept of Triple Helix to you? It’s a simple academic model that describes three institutional spheres that work together in innovation: industry, academia, and government. The belief is that you need all three to collaborate together for effective progress in innovation. There is also recent dialogue underway among scholars that it is actually not a Triple Helix, but more of a Quadruple or Complex Helix. For one reason, the consumer or the citizen plays an important role in providing feedback, interacting and influencing the directions of new technologies. Particularly we see that in the space of social media.

Ultimately when you search for the heartbeat of innovation, it comes down to the entrepreneurs who have the abilities to establish new businesses, and these entrepreneurs find the right people to support what they want to do: such as the investors to fund them, not necessarily venture capitalists, but any willing funding source. The government could be one of these friendly funding sources. Entrepreneurs also need markets to sell their new ideas into, and this is again where government policies can influence. If entrepreneurs can sell easily outside their area, and they are not forced or required to sell always to domestic market, they can look outside for other customers and generate new growth and wealth for their home country. All of these different avenues really enable entrepreneurs to succeed, and then everyone else can play a supporting role to make sure that new ideas come together or that basic science breakthroughs can be transformed into new engineering applications, and so on. It’s a broader system view of innovation.

From the state perspective what are the major government agencies involved in promoting innovation?

I can describe at least several influential agencies in the US. A popular player that is always mentioned is the National Science Foundation that funds basic science. They stimulate much academic research around new scientific ideas, but one criticism is that the agency doesn’t truly drive or measure innovation or take a broader view of the innovation process, particularly past the stage of science. The National Institutes of Health, which looks at medical applications and advancements, has had a big boost in federal funding to explore new areas related to health and medicine. This agency has been helping drive an ambitious research agenda for many research labs and medical centers.

I would also add DARPA, which stands for the Defense Advanced Research Projects Agency, which find and funds big ideas in technology, often for military applications. My research at Stanford looks at why DARPA has been so successful for so long. Since 1958, the agency has followed a government mandate to pursue high-risk ideas, ideas considered highly disruptive or radical. Over the years DARPA’s funding has led to the Internet, the GPS navigation system, aircraft stealth technology, the earthquake monitoring system, and more. All of these technical inventions have impacted society in incredible ways. Can we imagine a world now without the Internet or GPS? My research with DARPA looked inside the agency’s “black box” to discover how DARPA innovates and what processes have been consistent over the agency’s lifetime to produce these amazing advances in technology. Some of these processes make DARPA quite special and it’s good to see the US government support agencies like DARPA, plus spinoffs of DARPA created in recent years like IARPA, ARPA-E (for energy), and Homeland Security ARPA. All of them are trying to imitate the culture of success at DARPA. DARPA is an excellent role model for other countries to look to because the agency has had such a long track record of success for radical innovation, a big impact on society, and ultimately created the right conditions for all its stakeholders to achieve their mission of innovation.

Are there any approximate aggregate figures of state funding?

I don’t know off the top of my head. While it’s important to look at the government’s role, government also needs to encourage industry to take a role. There are also annual R&D scorecards that track the amount of research dollars that companies are putting toward innovation efforts.

You mean government gives money to companies as well?

They can. These scorecards actually track overall budgets for R&D for companies, like Coca-Cola or IBM and so on. I think it might be interesting to look at leading institutions within industry — for example, the Battelle Institute produces an R&D scorecard, and R&D Magazine compiles another. All of this data can affect the way the government thinks about their policies to enable company growth.

How important are innovation parks?

Innovation parks can be useful because they bring together like-minded individuals. Often these parks aren’t very active because there are few places where people can congregate informally — cafes, terraces, little park areas. You want to encourage spill-over between an office and what is often called “a third place” — neither home, nor office but a middle ground that people create. The belief is that a neighborhood cafe or pub allows this territory in informal creation. Typically technology and innovation parks don’t create that physical environment and these spaces for people to come together, so they often feel like a sterile hospital or cold desolate building. You want to feel there is warmth, a reason to come back, and a sense of group comfort. I think often soul is missing from a lot of innovation parks around the world.

There is also a belief here at Silicon Valley that the entire region itself functions as an innovation park because there is an ecosystem in place. By ecosystem, I mean multiple players working together like an ecology. We are all interdependent, and Silicon Valley is a large ecosystem, so there is a fair amount of inefficiency and chaos happening. There is a lot of fails but at the same time there are more chances for other things to be created. Ultimately the net result is that innovation occurs because there are so many little experiments happening at the same time. What people often forget is that Silicon Valley is not a geographic place; you cannot find it on a map; there is no town or a city called
Silicon Valley. It’s a shared concept that people recognize and define regionally in vague terms. All the local areas are parts of a bigger agglomeration that creates a cluster effect.

**Silicon Valley as a concept, did it originate from Stanford?**
Stanford played an influential role. Actually, Silicon Valley started in the area between Stanford and Mountain View. In the early 70s the name Silicon Valley was coined by a reporter who was trying to describe the rise in the semiconductor industry here where all this silicon was used to build into semiconductors. He called it “Silicon Valley” and the name stuck, and part of the irony, of course, is that over the years Silicon Valley has lost or closed down almost all of its semiconductor business. The landscape has shifted, and we do more light manufacturing, but the name still stands and it’s symbolic now.

**Where do rookie entrepreneurs go to, is it incubators?**
Classically you would work out of your garage like Hewlett and Packard did. Today, some budding entrepreneurs have a chance to work on the Stanford campus, say in the new engineering building. In the building’s basement Stanford has recreated the Hewlett & Packard garage so that you can see how these two guys and the idea started. Now because properties are so expensive in Silicon Valley, fewer people own a garage that can serve as a workplace, so there came some creative solutions. While there are a few incubators here in the Valley and broader area, that is not the first impulse that many entrepreneurs think of. Instead they get together and work out of their home or at a cafe. Going to Starbucks for a price of a cup of coffee is cheap rent; you can stay for two or three hours without worrying about the usual office bills. And you don’t have to go to an incubator to find people because here you can find people everywhere. That brings us back to the belief that the Valley is in itself a giant incubator. In contrast, Sweden has an amazing system of incubators: almost every university has an incubator or two across the street and they have a national system that brings them all together in a much more structured and formalized process. I think that is working for Sweden but you can see how different Sweden’s system is compared to the US and in particular to Silicon Valley.

**Why are people here more autonomous so that they believe they do not need support which in Sweden they find in incubators? Is it because the Americans have more entrepreneurial skills?**
I think it comes down to a difference in community and culture. In Sweden it’s often harder to find other entrepreneurs like yourself, to find a right community, and part of it comes to the culture as well. There is a Swedish belief called lagom, which translates as “not-too-little, not-too-much”. It’s not that everybody accepts a mediocre solution; rather, it’s a mutual understanding that you should serve the common good which is right for everybody, it’s a very stable response, and works well in a group setting. However, applied to the context of entrepreneurship, you want to do something different, change something, and you don’t want to go along with the status quo because you are looking to break it or transform it in a way that may make others uncomfortable.

In Sweden the culture traditionally did not allow that kind of change to happen. When you come to Silicon Valley, you are always expected to talk about new ideas. You want to lead or produce change.

**What are the major trends in the government’s innovation policy?**
One big trend is modeled after industry, and the US government created the position of a chief technology officer. There is a real push in Obama’s administration to create a kind of a chief innovation council member — I don’t remember what the latest title is, but essentially functioning as the CTO of the US government, looking at what the US can do to find and grow its technology leadership and investment. It’s a symbolic role that can help emphasize and bring back a lot of positive energy around technology and engineering in the US. Many Americans from the older generation can point back to the moment when Sputnik was launched because that created a real decisive movement in the US history to evaluate our funding and priorities for science and technology and make a change to catch up with Russia. Now I think there is renewed interest to find what is the new Sputnik moment, that another Sputnik is needed to transform the way the US government prioritizes its investments and its support for technology.

**Of two types of research — basic research and applied research — what is the government priority to support moneywise?**
I would say at the moment there is a greater support for basic research, and often universities rely heavily on the government to provide that funding. In addition there has been a trend in the last few decades for companies to rely on universities to provide their knowledge and energy in basic research. I think the US government can do more around applied research, not necessarily in funding but by creating policies that allow for a range of tax breaks, different types of commercialization, and transfers of technology to occur. Apart from R&D credits, there are other ways the government can enable innovation activities to occur, such as supporting small businesses in certain industries and sectors where we know new developments in engineering and technology occur regularly. For example, an idea could be for new businesses less than three years old can write off a certain amount of their expenses because the government knows that these businesses are in the formative stage of innovating. The government should do all that it can to allow more of these businesses to be created, and ultimately these businesses will produce opportunities and new jobs to support growth in the American economy and economies around the world.

**What helps and what hinders the development of the innovation system in the US?**
Many of these topics have a dark side as well. Government policy absolutely influences and also creates obstacles for innovation to occur. The State of California has been cutting back tremendously on education. These decisions have an impact on the opportunities that students in California might be able to pursue, and also on the research work for the faculties.

Immigration is another critical area. US immigration is distributed differently, and when I looked at data for venture funded start-ups in the US, I found that the highest proportion was funded here at Silicon Valley, led by foreign entrepreneurs. This region relies on talented immigrants to be able to come here, become excited, get involved with the local community, and create new companies.

A sense of serendipity is important to innovation. Consider Google, which was founded by Sergey Brin who has Russian
roots. He came to work on an early notion of online search at Stanford and then he was able to take his idea and turn it into a business with support from Stanford. This is just a little example but this case is something that could easily be lost if we didn’t have an ecosystem in place to allow it to happen. Not always to actively find a new idea or help it, but just allow it to happen in some way on its own time.

If a student comes here and obtains a degree at Stanford or any other university is he or she allowed to stay and work here for some time, several years perhaps? I’m asking because in the UK the government is going to cut short their stay in the country after graduation, and people involved in innovation consider it a big mistake.

This is where the US federal government takes a conservative approach. If it was up to Silicon Valley, of course, there is a greater recognition that foreign talented people are needed, who build new companies, give back to the community, and hire locals. Right now, if students are here on a student visa, they cannot stay past graduation unless they are able to find a company to sponsor them to continue working here. I know some companies’ executives — from Intel, Sun, and Microsoft — are incredibly vocal in lobbying the government to change its policies, so that any student who has a diploma from a US school essentially gets a working visa staple to it. Right now, that doesn’t happen and it is a lost opportunity.

In what areas the results of innovation have been most impressive?

It’s an interesting question and depends on if you interpret impressive as importance, impact, or even boldness. I’d like to come back to DARPA because the agency’s efforts have had a big impression on society: the agency is focused on the US, but the various inventions it has funded have influenced new solutions, services, and user populations around the world. DARPA is great at introducing audacious visions that create the innovation spark, and then the program managers use funding as the fuel for different implementation groups. For example, DARPA funded the GPS navigation system, and we now see the technology in cars, mobile solutions, and elsewhere around the world. Also, sending a man to the moon has been an impressive and symbolic event in American history.

As more recent changes, I think we’re right at the point where we’re going to see a hand-off between the American generations: the Baby Boomer generation are now in positions as role models for the next generation. There is a fair amount of attention placed on the Millennials generation, born roughly in the late 1970s to the early 2000s, and they are a huge, massive population in the US looking to step into roles that can make change in organizations and government. This group represents the rise of innovation workers in the US. But there is also a little generation squashed in between, called “Generation X”, and they tend to be overlooked. Gen X is actually the sweet spot for where a lot of innovation occurs. The Kauffman Foundation, an American think-tank in the Mid-West that studies entrepreneurship, studied the average age of entrepreneurs and found the age to be — what do you think it is? — 39! At that age, a person has had enough time to gain life and work experience, try some ideas, understand more about the nature of business, and develop expertise in a particular domain. Well, a 39 year old fits right into Generation X, and this is the age that they will be innovating, that they feel comfortable, have confidence, and have the resources. In short, it’s their life moment. This is the age group where I wish the US government would encourage more because the current attention is on quantity. The Boomers and the Millenials are simply very big population groups, but at the same time, if we use the lens of quality, then Gen X will have a considerable amount of influence and may be a secret weapon for the US in terms of its innovation power.

What is your forecast of the development of the US innovation system in the future?

Forecast is a tricky word because nobody really can forecast the future, even weather forecasters. I think we can make several educated guesses. There is something called a naive forecast, which is a term used by futurists to say that what happens tomorrow will be the same thing which happens today. In many ways that is true: some things don’t change as fast as we think. Certain aspects about society remain constant; what Shakespeare wrote about, what the Greeks captured in their comedies and tragedies — still hold true today in many ways. I certainly think there are some trends that we can follow, such as areas of investment, certain preferences around educational priorities, demographics, elements like that. Take California. You can predict that the state’s educational system will worsen tremendously due to heavy budget cuts and other factors. I think it is more interesting to ask, are we teaching people what they need to know for the future, and are we providing people with the right tools to plan for the future? Even if we can forecast that it will be a rainy day are we giving them the umbrellas they need? In other words, are we giving people the materials they need to survive wherever they go? That’s part of what we are doing in our program at Stanford in long-range planning and foresight: helping people to understand how do they prepare long-term, search for opportunities mid-term, and ultimately connect the action that they need to take today to their vision of the future. Stanford is a wonderful test-bed for developing and teaching these foresight and innovation tools, but people outside Silicon Valley want to learn these tools and philosophy too. For example, I’m going to South Africa next month, and I have more trips planned to Finland, Sweden, Germany, and South Korea, and all this is to help bring our knowledge and experiences to those countries, plus learn from them too. This global network is all around sharing our insights and practices in foresight knowledge and innovation strategy.

What entrepreneurial and management skills will you be teaching?

We teach about a dozen different foresight and innovation tools to help senior managers, entrepreneurs, and all types of practitioners, even people involved in government, to understand how they find and plan for opportunities in the future. A big emphasis is on understanding innovation as a system, and how different stages of planning and doing complement and influence the other stages. I am now developing an innovation workbook that companies around the world can use to boost their innovation capabilities, and this project is funded by Tekes, the Finnish funding agency of technology and innovation. Every little step helps.