Discussion Guide for "Japan and Silicon Valley: Origins, Trajectories, and Implications"

A discussion with Dr. Kenji Kushida

Organizing Questions

- What are the differences between the patterns of economic innovation in Japan and economic innovation in Silicon Valley?
- How has competition between Silicon Valley and Japan driven innovation in both regions, and how did these innovations alter the course of the world?
- Given the strengths and weaknesses of both innovation ecosystems, how might more open innovation benefit both Silicon Valley and Japanese firms?

Introduction

This lesson focuses on economic innovation in Silicon Valley and in Japan. Silicon Valley and Japan have both given rise to innovations in ways that have altered the modern world; however, they have approached innovation very differently. Japan and Silicon Valley up to this point have had a history of competition that has driven a lot of the innovation in each region. Silicon Valley has emerged as the world's center of innovation in areas related to information technology (IT) in the last two decades. On the other hand, where Japan was once positioned to become the next software superpower following up on its success in manufacturing, Japan's IT industry has struggled to remain competitive. Japan and Silicon Valley have moved away from a model of competition, towards collaboration and cooperation through open innovation. In this lesson, students gain a broad understanding of the relationship between Silicon Valley and Japan, historically and presently, and the innovation that has resulted.

Objectives

In this lesson, students will

- gain a broad understanding of economic innovation in Japan and Silicon Valley;
- develop an understanding and appreciation for U.S.–Japan cooperation and competitiveness that has been a key driver of innovation throughout the years; and
- practice the ability to absorb and process readings and a scholarly lecture, and draw upon this information to answer and discuss questions.

Materials

Video Lecture, "*Japan and Silicon Valley: Origins, Trajectories, and Implications*," online at http://spice.fsi.stanford.edu/multimedia/japan-and-silicon-valley-origins-trajectories-and-implications

Handout 1, *Video Lecture Prompts*, 30 copies
Handout 2, *Open Innovation Activity*, four copies
Answer Key, *Video Lecture Prompts*
Teacher Information, *Video Lecture Transcript*

Equipment

Computer with Internet access and a Flash-enabled or HTMLS-supported web browser
Computer projector and screen
Computer speakers

Teacher Preparation

Instructions and materials are based on a class size of 30 students. Adjust accordingly for different class sizes.

1. Make the appropriate number of copies of handouts.
2. View Video Lecture, "*Japan and Silicon Valley: Origins, Trajectories, and Implications*," by Kenji Kushida.
3. Become familiar with the content of handouts, answer key, and teacher information.
4. Set up and test computer, projector, speakers, and streaming video lecture. Confirm that you are able to play the video lecture and project sound audibly to students.

Time

One 50-minute class period

Procedures

1. Explain to students that they will learn about economic innovation in Silicon Valley and in Japan, the relationship between the two regions, and the ways in which they collaborate to produce innovation.
2. Inform students that they will view of a video lecture by Stanford Research Scholar Dr. Kenji Kushida that focuses on economic innovation in Silicon Valley and in Japan. Distribute one copy of Handout 1, *Video Lecture Prompts*, to each student. Ask students to read through the questions and defined terms and to consider the questions as they view the lecture.
3. Begin viewing Video Lecture, "*Japan and Silicon Valley: Origins, Trajectories, and Implications*." If necessary, pause the lecture at various points to allow students to complete the prompts on Handout 1.
4. Once the lecture has ended, give the students some time to write their answers to the questions, and then discuss the answers as a class. Collect the answers for assessment purposes.
5. Inform students that they will now be participating in a class activity on the concept of "open innovation." Divide the class into four groups. Distribute one copy of Handout 2, *Open Innovation Activity*, to each group. The groups are:
   - Group 1—Big firms
   - Group 2—Startups

- Group 3—Universities
- Group 4—Government

6. Read the handout together as a class. Allow the class 20 minutes to discuss the questions in their groups. At the end of this allotted time, the groups will share their answers with the rest of the class.
7. After all groups have shared their answers, pose the following questions to the class as a quick debrief of the activity and an opportunity for student reflection and informal self-evaluation.
   - In what ways do you better understand the composition of the innovation ecosystem and how these different players interact?
   - What did you learn about open innovation and how it works?
   - How might Japan use open innovation to better harness the strengths of Silicon Valley?

Assessment

The following are suggestions for assessing student work in this lesson:

1. Evaluate student responses to questions on Handout 1, *Video Lecture Prompts*, based on Answer Key, *Video Lecture Prompts*.
2. Assess student participation in group and class discussions, evaluating students' ability to
   - clearly state their opinions, questions and/or answers;
   - provide thoughtful answers;
   - exhibit sensitivity toward different cultures and ideas;
   - respect and acknowledge other students' comments; and
   - ask relevant and insightful questions.
3. Assess student preparation and performance in the class activity based on
   - ability to work with peers in small groups;
   - ability to contribute opinions and participate in group discussion;
   - ability to use specific information in making a point; and
   - clarity and effectiveness of argument.

Video Lecture Prompts

Lecture Title: "**Japan and Silicon Valley: Origins, Trajectories, and Implications**"

Lecturer: **Dr. Kenji E. Kushida**

Dr. Kushida is the Japan Program Research Scholar at the Shorenstein Asia-Pacific Research Center (APARC) at Stanford University and Project Leader of the Stanford Silicon Valley-New Japan Project. The Silicon Valley-New Japan Project focuses on understanding how large firms, fast-growing large startups, and emerging startups "harness" the Silicon Valley ecosystem, and successfully use it as an innovation engine. With the steady growth of Japanese startups in Silicon Valley and a renewed interest in the region by large Japanese firms in the context of the increased importance of innovation and entrepreneurship in Japan, the mission of the project is to provide intellectual background, analytical perspectives, and create knowledge and research while becoming a platform for interpersonal relations to enable Silicon Valley to benefit from Japan and for Japan to better harness Silicon Valley.

Please keep the following questions in mind while you watch the lecture. Answer the questions on a separate sheet of paper after watching the lecture.

1. Compare and contrast patterns of economic innovation in Silicon Valley and in Japan. What do their innovation ecosystems look like, and what are their strengths?
2. Dr. Kushida states, "Silicon Valley and Japan have a history of competition, and now we're moving towards working together." Explain this trajectory.
3. How does increased cooperation and collaboration between Japan and Silicon Valley benefit Japan?
4. How does it benefit Silicon Valley?

Defined Terms:

semiconductor—a substance that can conduct electricity under certain conditions, making it a good medium for the control of electric current. When we talk about the semiconductor industry, we are usually referring to markets like PCs, mobile phones, and other electronic consumer devices.

software—the part of a computer system that consists of encoded information or computer instructions, in contrast to the physical hardware from which the system is built

manufacturing industry—the production of merchandise, in which raw materials are transformed into finished goods on a large scale

information technology (IT)—the application of computers and the Internet to store, study, retrieve, transmit, and manipulate data, or information

artificial intelligence (AI)—intelligence exhibited by machines. The term is applied when a machine mimics cognitive functions that humans associate with other human minds, such as learning and problem solving

open platform—a software system that enables data to be accessed directly by users and also published in open formats, and is powered by technology that is available through open licenses

Japan's asset bubble burst—the burst of Japan's massive asset bubble in 1990. In the 1980s land and stock market prices had tripled due to overconfidence and the Bank of Japan's loose monetary policy. Concern about the country's growing asset bubble led the Bank of Japan to tighten its monetary policy, causing the bubble to burst, and causing the stock to plunge. The bubble burst catapulted the Japanese economy into recession, and very slow growth in the proceeding decades.

Great Tohoku Earthquake—a magnitude 9.0 earthquake that occurred on March 11, 2011 off the Pacific Coast of Tohoku, and was the most powerful earthquake ever recorded to have hit Japan, generating enormous tsunami waves and a nuclear disaster after causing damage to reactors at the Fukushima Daiichi Nuclear Power Plant

R&D— an abbreviation for "Research and Development," refers to the investigative activities a business conducts to improve existing products and procedures or to lead to the development of new products and procedures

Open Innovation Activity

In the past couple decades, Japan's IT industry has struggled to remain competitive, and Japan is now trying to harness Silicon Valley to become more innovative and stay globally competitive. How can they do this?

In his lecture, Dr. Kushida mentions examples of how large Japanese firms and Silicon Valley startups or universities have formed mutually beneficial relationships and learned how to harness each other's strengths. These kinds of collaborations are examples of "open innovation" where firms use external as well as internal ideas. The result is the creation of innovative new products and services for society.

We see open innovation happening all the time in innovative economies. For example, in Silicon Valley big firms, startups, universities, government, and investors all exchange information and resources in a vast innovation ecosystem.

In this activity, you will be assigned to one of four groups.

Group 1—Big firms

Group 2—Startups

Group 3—Universities

Group 4—Government

As a group, please answer the following questions. You will be asked to present your answers to the class at the end of the discussion period.

1. What do you contribute to the innovation ecosystem (e.g., human resources, new technology, resources, etc.)?
2. What are some of your weaknesses in terms of growth and the capacity to produce innovation?
3. Think about the different players in the innovation ecosystem (big firms, startups, universities, investors, the government). Who would you most benefit from collaborating with? Draw up a plan that includes what you think you would achieve from this collaboration, how you would collaborate, and why this sector might want to collaborate with you.

Video Lecture Prompts

1. Compare and contrast patterns of economic innovation in Silicon Valley and in Japan. What do their innovation ecosystems look like, and what are their strengths?
   Japan first became an innovator on a global scale as a rapid industrializing country starting in the late 1800s, and then the post-war period. Industries such as automobiles and precision tools are Japan's strengths now, but originally its strengths were more in heavy industries. Japan traditionally has had a large firm-centered economic model, with big companies that do a variety of activities and provide lifetime employment for their employees. As a result, innovation is slower and more incremental. Japanese firms will work for years to continuously improve technology.

   Silicon Valley emerged as an innovation engine more recently. Silicon Valley came of age in the 1960s as the center of the semiconductor industry, then again, in the 1990s with the computer and software industry, and recently with companies like Apple, Google, Facebook, and Tesla. Today, Silicon Valley is considered the world's center of innovation in areas related to information technology. As IT becomes central to innovation in all sectors, Silicon Valley's influence will become even broader.

   Silicon Valley has a business ecosystem based on high growth startup firms, business models, and technologies that disrupt existing firms and industries. These disruptions and innovations born in Silicon Valley are much more radical, breaking apart existing firms and transforming how we think about many things. Unlike the Japanese focus on continuous improvement, Silicon Valley firms devise all sorts of software and services that they test out in different areas, and if these don't work, they pull back and try new things.

2. Dr. Kushida states, "Silicon Valley and Japan have a history of competition, and now we're moving towards working together." Explain this trajectory.
   The United States suffered through a serious economic recession in the early 1980s. At the same time, there was a surge of Japanese manufacturing firms. Silicon Valley was an area that had a lot of semiconductor and other types of factories, and during this time, many of these factories were decimated by Japanese firms, which were very good at making semiconductors. Many Silicon Valley firms could not adjust and failed. Others moved on to higher-value areas like software design, in which products and technology were designed in Silicon Valley and then manufactured in places like Taiwan and China. U.S. firms reformed themselves and moved towards open innovation, where they received products and services from outside the company. This shift also brought a lot of turnover in Silicon Valley companies. Up to this point, U.S. firms had looked a lot like big Japanese firms with lifetime employment. Then, in the 1980s, large companies fired large numbers of employees, providing a large workforce for entrepreneurs in Silicon Valley who built an ecosystem of high growth startups.

   In the 1990s to the late 2000s, there was a U.S. resurgence centered around the computer industry, and some large firms regained their global competitiveness while a lot of new firms simultaneously emerged. Simultaneously, Japan's asset bubble burst in the 1990s. The United States had now positioned itself as a big competitive threat, and had set the precedent for a model where the competitive advantage was in designing something well and then having somebody else make it cheaply. The Japanese model had a lot of difficulty competing against and adjusting to this new

paradigm, and this is where we currently are, with Japan trying to adjust to this new innovation model.

3. How does increased cooperation and collaboration between Japan and Silicon Valley benefit Japan?
   Japan was once a global tech powerhouse, but Japan's IT industry has increasingly become uncompetitive. Silicon Valley is today considered the world's center of innovation information technology, an area where Japan has not been able to innovate effectively. For Japanese firms to remain globally competitive, it is important and necessary for them to figure out how to harness Silicon Valley's innovation ecosystem. Increased collaborations with Silicon Valley companies, universities, startup development programs, etc., have the potential to transfer a lot of the innovations that occur in Silicon Valley to large Japanese companies. These collaborations can also produce new kinds of innovation.

4. How does it benefit Silicon Valley?
   Japanese firms are able to provide their manufacturing expertise to Silicon Valley researchers, which opens up the potential for the creation of new algorithms for artificial intelligence, robotics, etc. Japan's traditional focus on incremental innovation and continuous improvement of technology and products also makes Japan a place where services can be improved significantly. Google and Apple both have major research and development operations in Japan. Furthermore, by pairing up with Japanese firms, Silicon Valley firms can expand their consumer base.

Video Lecture Transcript

Dr. Kenji Kushida

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Silicon Valley and Japan are essentially two very different but incredibly important areas of economic innovation. They produce all sorts of products and services and they have very interesting histories that have really altered the course of the world, but they've approached this basically from opposite ends.

So, Japan's innovation comes mostly from its background as a rapid industrializing country, starting in the late 1800s and then the post-war period. And now we think of industries such as automobiles, precision tools and things, and those are Japan's strengths, and originally it was more in heavy industries and places like that.

And Silicon Valley is newer, much newer, mostly in the post-war era, and historical innovation from semiconductors and then software, and more recently things like Apple, your iPhone, Google for search and web services, and Facebook for social networking, and Tesla for electric vehicles. So this is the Silicon Valley side. And right now, really in most of the world, Silicon Valley is considered as the world's center of innovation in areas related to information technology, IT. But as IT is now increasingly in basically everything, and it will expand into other areas, the reach of Silicon Valley innovation is going to hit all sorts of walks of our life. And in Silicon Valley and Japan terms, they have a history of competition, and now we're moving towards working together.

In many ways, in the following sense, they've started as the opposite model. Silicon Valley is a business ecosystem of high-growth startup firms—business models and technologies that disrupt existing firms and industries. The disruptions and the innovation are more radical, they break apart existing firms, they transform how we think about many things. It's an exception to the U.S. model, pretty much, and it's the center of current U.S. innovation and growth.

And Japan is traditionally a large firm centered economic model. They've got big companies that have a variety of activities that employ people for a long time and the innovations are slower, and they're incremental, but they're for bigger things. So, if you think about how complicated an automobile is, it has let's say about 30,000 parts, each of those parts goes through years and years of improvements and it's this kind of complex product that have nonstandard interfaces that a big Japanese firm like Toyota that works with thousands of suppliers, works over years to make better and better which is a very different development paradigm from, let's say, Google, where they come up with all sorts of interesting software and services that they test out in different areas and if it doesn't work, they pull back and they try radical new things. And just a couple of years ago, they announced, okay, well we're going to actually try to make autonomous driving vehicles that will drive themselves, and they started the project very quietly but they're interested mostly in the software development area.

Historically, around the 1980s, following the 1970s oil shocks, the U.S. was actually overall in a pretty big recession. There was inflation, unemployment went up, and U.S. manufacturing took a big hit. Factories were closing, people were demonstrating, and it was just at this time by the time the 1980s hit, that there was a surge of Japanese manufacturing firms that came in. This was the first surge of Japanese autos like Toyota and Nissan and these folks. The Japanese surge

into global markets, this included Silicon Valley. So Silicon Valley which—maybe there's a map available—but basically Silicon Valley is the area south of San Francisco Airport including the area of Stanford and then down into San Jose. These days it's expanded up into San Francisco as well, that we call the Silicon Valley economic ecosystem is basically the San Francisco Bay Area. There were a lot of factories in this area. A lot of them were semiconductors and other types of factories. These got largely decimated by Japanese firms that came in in the 1980s: NEC, Fujitsu, these firms made semiconductors, they were very good at it. But then Silicon Valley firms that could not adjust, they all basically died. The ones that could adjust moved towards high-value things like design, and designed here and then manufactured elsewhere like using Taiwanese firms in China, et cetera. So if you think of a current Apple product, it's designed in Cupertino which is in Silicon Valley, manufactured in China. So, this was a paradigm to combat and to overtake the Japanese model that came as a surge of high quality manufacturing products.

So then we got into this adjustment where large U.S. firms until then used to look a lot like current big Japanese firms: they had long-term employment, things like IBM called the IBM way, you know, pretty much once you join IBM, you're there for the rest of your career, the HP way, Hewlett-Packard way, similar arrangement. They were very stable, long-term companies that worked with their in-house research and development and they moved along predictable technological trajectories. But then after this massive difficulty in the '70s and then really in the 1980s, these firms had adjusted, moved towards a model of open innovation where they got products and services from outside the company. They also did away with their long-term employment, so people who used to be expected to be there forever were basically thrown out. IBM famously cut almost 40 percent of its workforce and then all these—a lot of these people were very skilled people who had interpersonal networks and deep knowledge of various areas—they were thrown out of the companies. This provided a workforce for entrepreneurs in Silicon Valley, who then built this whole ecosystem of high growth startups, this was a workforce for them.

So then, now, if you look at what we have, is we have a situation where from the 1990s to the late 2000s, there was a U.S. resurgence centered around the computer industry where large firms did regain competitiveness at the same time lots and lots of new firms emerged. A lot of new firms were bought by large firms and a lot of large firm people left the large firms to make new companies. And what we see at the same time in the 1990s, Japan's asset bubble burst in 1990 and 1991. So then just as the U.S. and Silicon Valley was shifting the way that they compete against Japan, Japan was losing some of its extra cash that was created through the asset bubble and then they were confronted with a big competitive threat. So instead of making things and the value being in being able to make something well, it was in designing something well and then allowing somebody else to make it at a low cost. So then the Japanese model had a lot of difficulty competing against and adjusting to this. And that's pretty much where we are now with firms like Intel. For a long time if you had a computer, you didn't really care who made the computer. It was important that it ran Microsoft operating system and Intel processor, "Intel inside." And then Google, Facebook, Cisco, Oracle, these firms emerged from Silicon Valley.

Overall, we now have very contrasting models that were initially fairly similar but then Japan outcompeted Silicon Valley and lots of the U.S., then the U.S. adjusted, and then now it's Japan's turn to slowly adjust to try to figure out how to harness Silicon Valley. So as I mentioned, initially Japanese firms came in as competitors and now there are all sorts of efforts to figure out how to make use of the innovation engine that is Silicon Valley through open innovation. So how do we get a lot of the innovations that occur here and bring them into the large Japanese companies? How do you take the resources that large Japanese companies have and bring them

to Silicon Valley that will benefit people here but also benefit the Japanese companies?

So there's some really exciting developments recently, such as Yamaha Motors that's famous from its motorcycles and other engines for boats and things like that. In 10 months, they made a humanoid robot that drives a motorcycle. It's fully automated so the thing revs up. And there are advantages that if you're going to buy an automated car, you have to buy a new car that's automated. There's AI [artificial intelligence] in there. But most things you might not want to re-buy. What if you just have a robot that will drive your car for you? And the human interface is important because there's a steering wheel and the pedals. Well, actually a lot of things are human interfaced, your lawnmower, aircraft, all sorts of things. So why not just make a robot that's good at that one thing? That's what the people at Yamaha Motors thought when they established the Silicon Valley branch. So, a radical idea like this at home [in Japan] was met with sort of laughter—"Oh, we can't do this kind of thing." But then they said, "Well, watch us," and they were able to secure funding beforehand and said that we're pretty much autonomous use of this fund. And they partnered with SRI, which used to be Stanford Research Institute, that has a lot of robotics and artificial intelligence engineers and scientists there and they made the thing in 10 months at a very low budget. And that's partly because a lot of the Silicon Valley researchers didn't have other big companies that were going to make something based on their research. And Yamaha came in and when they decided to do this, they came up with something that was about 90 kilos heavy. But then through the Yamaha manufacturing expertise, they were able to cut the weight in half. So, there's a lot that the manufacturing expertise can still give to Silicon Valley, and some of the potential here to create the new algorithms for artificial intelligence, the robotics, et cetera.

And so another firm, for example, Komatsu that makes large equipment for mining and construction sites, big diggers and very big bulldozers and dump trucks. So, they've actually been doing fully automated dump trucks for large mining operations since 2008. And so nobody needs to ride them, it's terrible working conditions, it's hot, it's dangerous, but they've been able to automate that. And now they're working on construction equipment where they take drones to map out the topography of the construction site and then do all the background calculations to figure out, well, if you're in a big hurry, we need this much equipment and it will take you this long. If you're in less of a hurry, you need less equipment and more time. And this is all based on information that they gather from, say, drones. They don't make drones themselves. They came to Silicon Valley and found a couple of companies that make drones and then made deals with them and acquired other companies that make sensors, et cetera, to bring it into their core expertise of this.

So, the way they approach artificial intelligence, for example, is that you can also augment people. Very difficult construction equipment, moves that take let's say 10 years of experience, they're able to do it by building intelligence into the machine, somebody that has very little experience, maybe a year or so, can do these very difficult operations. And so, in order to do that kind of thing, they send in researchers into top universities like Stanford and U.C. Berkeley to study artificial intelligence but they also bring their own expertise in the manufacturing know-how and the workflow knowledge. And so right now, what they're doing is to make an open platform, not operated by them, owning and not without their name on it, they'll be completely open to connect all equipment in any construction site anywhere. And their strategy is well, if you can connect all the devices because sensors are becoming cheaper, information processing will be cheaper. If you connect all these devices, then everything will become much easier, much lower cost and by the way our machines are very good at making use of this but they don't need to go take all the information for themselves or brand their platform. And where do you make an open platform like this? Well, Silicon Valley. This is a place for a lot of that happens.

So, in this kind of way, we also have Silicon Valley startups that see a very large market in Japan. And Japan is also a place where services can be improved significantly. So Google has major research and development operations in Japan and some of the services that they created like people finder so after a natural disaster, people can check in and you can check in who's checked in so you can figure out if your family or friends are okay after a natural disaster. Some of this was made in direct response of the March 11, 2011 Great Tohoku Earthquake and tsunami disaster. And Apple, two years ago, just created—one to two years ago, just created a major research and development center in Japan to use their high-end R&D personnel to create their next generation products. And say the note-taking service Evernote they found their first big consumer base in Japan when they partnered with the big Japanese company. So, from the Silicon Valley vantage, Japanese firms bring interesting manufacturing and technologies here and they bring in a big potential market for firms from here that want to go there. So that's sort of the brief overview of the history of Silicon Valley and Japan and a trajectory of where they're going.