

INNOVATION TRENDS

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MAIN SUBJECT

THE US INNOVATION SYSTEM

“President Medvedev Understands the Importance of Rules”



Henry Rowen — Senior Fellow emeritus, Shorenstein Asia-Pacific Research Center, Freeman Spogli Institute for International Studies, Stanford University; former Assistant Secretary of Defense for International Security Affairs, US Department of Defense; former President, RAND Corporation (1967-1972)

In the years 1967-1972 you were the President of the RAND Corporation. Could you please tell about this experience and about the role of RAND in regard of the US innovation system?

The RAND experience was important to me. When I was quite young I was a researcher at RAND Corporation. Then later on I became President of RAND. It all was before coming to Stanford.

RAND is a very important organization. It was founded as a project at Douglas Aircraft Company in Santa Monica, California, to look at future technologies after the WWII. And in 1948 it was moved from Douglas Aircraft Company and became a non-profit organization with the help of the grant from the Ford Foundation. Being a non-profit organization it does no commercial work. It does a lot of work supported by the government or private foundations. The research there

is very broad. They do a lot of work on nuclear technology, weapons technology, aviation, but also in the social sciences — it did a lot of work on international affairs, and on game theory, which was a new field. So it works in many different fields.

Being the President of RAND, how did you measure the effectiveness of the organization?

You often can't tell. But the standard academic answer would be publications in leading journals. This how it works around here.

What about companies that were built around the ideas created in RAND?

That's one measure. But let's not confuse it. In academic world what matters are publications and prizes, such as Nobel Prize (there are quite a few Nobel laureates in RAND) or National Medal of Science. But RAND is a different matter. Some of its work was secret, some of it was not. We were less interested in publications and more interested in the quality of the ideas essentially judged by peer groups around the country or beyond.

One of the ideas that was invented in RAND, which is very important idea, was packet switching in telephones. It used to be that you had to have telephone system, a couple of wires from point A to point B. RAND came up with an idea to take the message at point A and break it up into little pieces, and within a fraction of a second all these pieces will be assembled at point B in a right order. It was a marvelous idea, and somebody in RAND had it.

What are the specifics of the innovation system in the US?

I'll say a couple of things. Our universities play a larger role in innovation system. Industry is always important in overall scheme of innovation, but leaving industry aside, we have much more on universities than most other countries do. That's one difference.

The other difference is connected to the ease with which one can form companies. It is really easy to form companies, in Silicon Valley in particular, but elsewhere as well. If you have a reasonable idea, the chances to get funding are pretty good.

How long does it takes to start a company?

The legal procedure is very short. In California you do that in a week. The more difficult part is finding the money. But this is an issue basically anywhere else. And most of these new companies fail.

What is the role played by the government?

There are 3 roles the government plays. One is that it sets the rules. When President Medvedev was here last year he talked about this new high tech zone being created in Moscow — Skolkovo. And he said there would be special rules in that zone that make it easier for companies to move forward. President Medvedev understands the importance of rules. So the government sets the rules. It's very important. And the rules are favorable to creating companies, to the private sector.

Second one is that the government finances most of the basic research that is done, research with no obvious applications. The third category which now isn't so important but a long time ago was quite important — that's the Defense Department — creating products for military use that also have civilian uses. For instance, jet engines — they are military, but it turns out also that it has civilian purposes. That's a really good example. The Internet was an interesting example. It was funded by DARPA not because at the beginning everybody foresaw the Internet but because they saw this as way of advancing computer technology and they thought military could use better computers. But then the National Science Foundation picked that up, and it ended up in Internet. Those are three national government roles. Local governments, such as State of California government, play basically no role.

Speaking about the first role you've mentioned, could you please specify some important laws that regulate the innovation process?

There is a large category of organizations "not for profit", the tax code 501C3. It could be a research organization; it could be something to help the poor etc. And universities also are not for profits, and they don't pay taxes. They have to serve a public purpose. And they do — they educate, they do research.

In terms of the money from the government — I mentioned basic research, but there is another, more applied research that is supported. There is a particular category of work that needs to be done but not a specific product. Take vaccines against communicable diseases. Maybe the drug companies won't do enough research on that. Maybe they

don't see that is profitable. It can be not very profitable in most cases. The government — the National Institute of Health — would set a program, saying: "We need better vaccines for some disease". And then the government may have a program, which would support the university or maybe drug company to develop these categories of vaccines. That's more targeted research. Or right now there is a lot of interest in low carbon fuels because of the global green house problem. There is a lot of support being given to low carbon fuels.

If there is a new idea that a group of people from a university would like to work on and they need money to develop it, where would they go?

Say, if there is a group of people here, and they think they have a good idea but it needs research, it's not ready for the market, they might try to get some money from the National Science Foundation. It depends on the field of study. If it's in biology and medicine area — they go to National Institute of Health, or they might go to a private foundations, or they may try to get some money out a university, or maybe a company but it's less likely.

What is the procedure?

There are specific procedures at government agencies such as the National Science Foundation or the National Institute of Health. It has a lot of these requests. They have panels of experts that review applications and rate them. Then they fund the best. This is done anonymously. People who submit the application don't know who the evaluators will be. No names.

People from the National Science Foundation, are they scientists or bureaucrats?

They are scientists.

Who and how assesses their work?

That's a good question. There is a small unit that is attached to the Office of President, which is an Office of science and technology; there is an outside kind of an advisory board to each of these agencies — National Science Foundation and others — they would look at it; and there are committees of Congress. The money has to come from the Congress. The committee of Congress has oversight for the National Science Foundation. They will pay attention. If they see something wrong,

they will certainly erase it. So there are several mechanisms of checking on what they are doing.

The budget for basic research grew. Do you think that's good or the government should instead spend more on applied research?

In general, I believe it should concentrate on basic research because that's where the need is the greatest because industry won't support it. And the more applied it gets the less useful is the role of the government.

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

One of the things that hinders is uncertainty about future financing. The Congress appropriates money each year. But big projects take years. Of course, the government may have a plan to fund it but it doesn't worth much because the congress decides year by year. That's a big problem.

But this is how the government works. Are there any alternatives?

I think other governments are better. Most governments have longer-term decisions.

What helps?

The legal rules are helpful. We've developed some good institutions; the university system is quite good. Something else is very good — we get smart people from all over the world. You walk around Stanford campus and you look at the ethnic mix there. You'll see people from all over the world. You might have noticed — there are a lot of Asians, a lot of Chinese, a lot of Indians, some Europeans, which you can't tell. But they are from all over the world. That's needed for a research establishment. We wouldn't be able to function if we didn't have this degree of openness to people from elsewhere in the world. It's impossible.

How does the law regulate the immigration?

Immigration laws right now are in a bad shape. In the past and to some extent still today — we are able to attract people from all over the world. They come here for schooling, and many of them stay for a while. They may go home afterwards (many people are going back to China and India — I mention these two places because they are so important here), but they stay for

a while to work. I have a suggestion for you. If you are really interested in this, take a list of the largest companies in Silicon Valley, and look at the names of the top leaders — these people came from all over the world.

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

Around here people would say information technology. But if you take a broader perspective, I think, that would be in aviation, in biology, in medicine. Maybe that's a wrong order — biology and medicine, obviously, are more important.

Why the progress happened in these areas?

Part of it was a progress in science. Advances are being made, take biology — these are big advances. A lot of them occurred here. But then they led to all kind of things happening — companies have been formed and so on. The IT story has to do with an invention in Bell Labs 1947 — the transistor was invented there. That's the basis for all communications. Basic advances accrued and then the whole industry is created.

To your mind, how important are innovation parks?

They are quite unimportant. They don't do anything. You should regard it as a market phenomenon, something that the market creates, bottom-up. In a sense Silicon Valley is an innovation park, but nobody created it. I mean nobody decided to create this place. If some politician or a bureaucrat puts a finger on the map and says: "Let's create a park here" — nothing interesting happens, at least here. I wonder about Skolkovo...

In cases where there is no innovation infrastructure, these parks might be helpful in facilitating the flow of people and ideas between research community, private companies, and government agencies responsible for innovation policy. If not these parks, who will facilitate the innovation process?

The market.

But what if the market is not mature enough?

When the government gets involved into "picky places", you can be pretty confident that it will get it wrong, in American context at least. There have

been attempts to do this. There was a call for creating a biotechnology parks 25—30 years ago. Each of them has failed.

Why?

Because it won't work if somebody says: "Let's create a park in this town, and give people a tax break and so on". That is not important. The other things are much more important.

What things?

Are there really good people? Is this a creative town? Is there someone with a bright idea? So, first of all, it's good people. And we have them here, and they are associated with the university. If you have a good university, by definition, you have good people there.

But you have really good universities that don't have parks, or, I would say, clusters. Take a really good place like University of Chicago. This is an excellent university. But Chicago doesn't have much high tech industry. Why is that? For some reason able people just never wanted to create companies and locate them there. But Boston is very good. Bay Area, Austin in Texas, San Diego in California — they are very good.

Actually there is a partial exception to what I've just said. The Research Triangle in North Carolina — Duke University, University of North Carolina. Many years ago the government of North Carolina decided it had these good institutions and it would provide some benefits for companies who locate there. It's been a moderate success. That is a partial exception of what I've said.

But in the other places people have tried and it didn't work. Sometimes even in good universities it won't work. It's tricky. There should be something that attracts smart people, which then attract next smart people, and they all are to be focused on creating companies. That is very strong around here.

But it's a part of the scene. There is also something that other countries don't have so much — it's venture capital. This is a world center of venture capital. Again, this is not invented. If you go back 50 or 70 years ago, you would see that venture capital wasn't very important around. But it developed here. That's a key element of innovation system — venture capital.

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RUSNANO Opens First Nanotechnology Factory in Moscow

RUSNANO opens a new production site for its portfolio company RMT specializing in manufacture of thermoelectric cooling devices. The total budget of the project is around 800 million rubles of which RUSNANO finances 150 million rubles. Their co-investor is the closed-end high-risk (venture) investment fund "S-Group Ventures", established with capital raised from the Russian Venture Company. This project is an example of how the research done by Russian scientists has been commercialized to a full-scale production of innovative products greatly demanded by the world hi-tech market.

www.rusnano.com

Public Transport on Yandex.Maps

Yandex.Maps offers a route planner for travelling by public transport. Now, the route planning function is available not only to those who drive a car, but also to those who use public transportation services. The route planning on the service is based on a number of factors including average traffic speed, time for transfers and waiting time.

www.maps.yandex.ru

Crossbeam and RTEC Form Joint Venture to Deliver Security Solutions in Russia and CIS

May 19, 2011 Crossbeam Systems, Inc., the leading provider of next-generation security platforms for high-performance networks, and Russian Telecom Equipment Company (RTEC), a manufacturer of telecommunications equipment, announced the creation of a joint venture to deliver security solutions in Russia and in the Commonwealth of Independent States (CIS). The new joint venture — Crossbeam RT — offers high-performance security platforms that will meet the stringent requirements mandated by Russian and regional CIS governments for highly reliable and secure telecommunications.

www.rostechnologii.ru

There Is No Innovation System in the US



William Miller — Professor of Computer Science Emeritus and former Provost at Stanford University; Co-director at SPRIE; Life Member of the National Academy of Engineering; Fellow of the American Academy of Arts and Science; Fellow of the American Association for the Advancement of Science; Member of the Silicon Valley Engineering Hall of Fame

You are travelling all around the world teaching people how to do innovations. What is the main idea you try to make people understand?

I gave talk about the developing technology ecosystems in Singapore and Korea. The main thesis here is that it's not about technology, it's about building business. Most places that try to start new Silicon Valley focus only on the technology when they should focus on the business. The analogy is that in nature if you want to have a good crop you have to have a good seed, and you have to have a good soil. Most places only focus on the seeds. They don't focus on the soil. What does it take to foster a good crop? That's what it all about.

What are the mechanism or techniques to improve the soil?

I think it's important that in the universities engineers are taught more about business. Here at Stanford we don't encourage students to be entrepreneurs. But if they want to be entrepreneurs, we have lots of courses, works, mentors who help them, advise them and so forth. I think that's important. But they usually would advise them about business decisions. There are different stages of business development. At the very beginning there is a technology decision. After that almost all the decision are business decisions. It's important to teach entrepreneurs to understand that, so that they focus on some real business aspects and don't focus just on developing their technology.

What do you think about the US innovation system in general?

We don't have one. There is no innovation system. We support research; we have favorable laws for starting companies, favorable tax laws for angel investors and so forth. Maybe that's a part of the system in a certain way. But we don't have any top-down planning of innovation.

Who are the major participants of the innovation process?

The National Science Foundation supports research. Department of Energy supports research. And the Department of Energy will have certain goals; it may give grants for the specific goals that are of interest to the government but it has to be a legitimate government interest. They don't do it just in general. Department of Energy, Department of Defense, NASA — they all support research. But companies have to compete for that. They don't just hand it to them. Many have to compete and they pick the best ones.

How important is the role of government compared to that of market forces?

The market force is the most important.

Approximately, how much the government spends on innovation support in universities and companies per year?

I don't know the number but it's about 3 percent of our GDP for research.

Do you think it's enough?

That's pretty high comparing to most countries. There are some countries that are trying to do more than that. But you would find that on a high end of it. I don't think it's a bad number to think about 3 percent of GDP, but technology people always want more. I think that the real question is how well is it used rather than how much.

To your mind, how well is it used?

I think that sometimes the programs that the government gives money for are not very well thought out. For example, in our biofuels area the government gave out a lot of money because they wanted to develop biofuels to be energy independent. But it turns out that most of those are not good ideas. I think that money was not good used. You have to expect some failures. That's OK. If you have no failures, you are not in the frontier.

How does the legislation regulate the innovation process?

Most of the legislation in place inhibits innovation; it's bad. It's removing legislation that is important. And this is understood well in Japan. Japan is a country doing the best job changing their legislation to be favorable for entrepreneurship.

Let's take for example bankruptcy laws. I don't know how it is in Russia — I used to go to Russia a lot some time ago, but I haven't been there recently — but in many countries if you go bankrupt, you can't get financing for a long period of time. Here in the US you can go bankrupt one day and start another company the next day. Bankruptcy laws inhibit entrepreneurs if they are too restricted.

Labor laws — you need to have mobile labor force. If labor laws are too restrictive, your labor won't move. And then labor does not move to its best opportunity. As for the laws on

taxes for angels, here in this country if you lose money in one year you can take that loss against gains the next year. In some countries you can't do that. That's a great encouragement for an angel investor because you are always going to have losses. And if you can offset those against future gains — that's an advantage. So there are a number of laws that are important.

How much can you offset?

You can offset all of it. If you lose a 100 thousand dollars and you have 200 hundred thousand gain later, you can offset a 100.

Are there any tax incentives for companies to do R&D?

The R&D tax credits for big, established companies — those are not very important for start-up because they don't have an income yet.

What about direct incentives such as government grants for small companies to do R&D?

There are grants for companies if the government has their own special interest, for example, for military, or for space, or some other special interests, but not in general.

How important are innovation parks?

In some places they are quite important because in these parks you generate a kind of an ecosystem that is different from the surrounding. Here in the Silicon Valley they aren't important at all. The Silicon Valley is just one great innovation place. Most depends upon the setting, circumstances. In San Diego they are not very important because the whole area is an innovative area. But in some places where there is not much broader innovation they become important. That's difficult though because they are isolated then. But they are much less important as you get a broader innovation activity going in the region.

And what about business incubators?

Again, in some areas they've been very useful. I've studied these all over the world. For example, in Brazil, down in Province of St. Catherine, incubators played an important role. Here they don't play an important role. But in China they play a very

important role to help get started. But usually their role is only important at the beginning. Once you have more innovation going and more companies going, then those incubators play a less important role.

If a research takes place at university, the university will own the IP. What are the advantages and disadvantages of such a system?

When Stanford started, the university didn't own the IP, the individual faculty members, students, researchers — they were the owners of the IP. But we formed the Office of Technology Licensing. The rule was then that it was voluntary, they didn't have to go there, but if they went to this office, they would get the patents for them, they would make decisions, they would help them to find people who will use that technology, they would look for investors — they would do all those things. And then the inventor would get 1/3 of the return, department would get 1/3, and the school (not the university), like the School of Engineering, Medicine and so on, would get 1/3. University would get nothing from that. That was very encouraging. Some faculty members earned quite a bit of money from this. That office started in 1970 and only in 1994 the university changed that, and now the university owns the IP, but they have the same sharing policy. From the viewpoint of a faculty member there is no difference.

What helps and what hinders the innovation process in the US?

Like in many places the state tries to play a role. The biggest problem is that they do not understand the risk of having a really big high tech investment. They try to play it safe, and by playing safe they don't go to the frontiers. If you go to the frontiers, it's much more risky. I think our policy is too risk averse, and that's why the private sector is a much better mechanism because the private sector understands risk, and they will take on risky projects. Some are losers, some are winners but the government doesn't like those losers because it gets criticized.

What about DARPA? Aren't they funding blue-sky research?

They don't do it as much now but they used to. Certainly there is some risky work that they do but, in general,

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Amendments to Tax Code Related to Creating a Favorable Taxation Environment for Innovative Activity

Moscow, June 10, 2011. Dmitry Medvedev signed Federal Law amending the Tax Code and certain legislative acts of the Russian Federation. The federal law aims to improve tax law provisions in order to create a more favorable taxation environment for carrying out scientific research and development work in Russia involving the development of new or improved products, goods, labor, and services, and the development or improvement of the technology.

www.en.farexpo.ru

105 Universities from Around the World Compete in International Collegiate Programming Contest

The 105 teams that competed in the World Finals of the 2011 Association for Computing Machinery International Collegiate Programming Contest in Orlando May 30 represent the top competitors from more than 8,305 teams from 2,070 universities located in 88 countries on six continents.

This year's top twelve teams that received medals are:

Zhejiang University, (Gold, World Champion, China)

University of Michigan at Ann Arbor, (Gold, 2nd Place, USA)

Tsinghua University, (Gold, 3rd Place, China)

St. Petersburg State University, (Gold, 4th Place, Russia)

Nizhny Novgorod State University, (Silver, 5th Place, Russia)

Saratov State University, (Silver, 6th Place, Russia)

Friedrich-Alexander-University Erlangen-Nuremberg, (Silver, 7th Place, Germany)

Donetsk National University, (Silver, 8th Place, Ukraine)

Jagiellonian University in Krakow, (Bronze, 9th Place, Poland)

Moscow State University, (Bronze, 10th Place, Russia)

Ural State University, (Bronze, 11th Place, Russia)

University of Waterloo, (Bronze, 12th Place, Canada)

www.cm.baylor.edu

the National Science Foundation, follows more directions of science, and so they are more interested in advancing science. From a technology commercialization viewpoint that's not as important.

What helps the innovation development? Culture? Resources?

I think that culture is dependent on the system. Cultures change. By culture I mean behavior. It depends on the system. People's behavior change when the governments change. If you look at East and West Germany, if you look at South and North Korea — they have the same basic culture but once they got different governments their behavior changed greatly. Behavior depends much on the government attitudes. But I think the attitude toward risk and failure is really important. It's OK to fail. The most important thing to understand in starting technology is that failure is OK. You learn from it. I've been investor in 26 companies: 6 are still going, 20 have either failed, or they had IPO or they were acquired. Of those 20, 12 were complete failures, but 3 were big successes, and 2 of them were pretty good successes. I'm a small investor, but the financial returns were very good. So the attitude toward failure is really important and in many places that's not encouraged. People are afraid to fail.

What are the latest trends in innovation policy in the US?

I think the strength of innovation policy in the US is that it's mostly bottom-up, doesn't come top-down. People find what there is good market for and develop technologies for commercialization. Many times you want to do research to advance science — that's a different thing. But when you are doing research for commercialization the most important question is who wants it? Who cares? If nobody wants it, there is no market — that's not good.

Is there any difference in innovation policy under the Obama administration compared to innovation policy under Bush administration?

There isn't much difference. There are small differences. But the policy hasn't changed much over 50 or 60 years. After WWII the government started supporting research. Before that the government didn't really support research at universities. It

did this whole amount of its own specialized research, and that was all. That was a big change that came in 1948 when the Office of Naval Research started supporting research, and in 1950 the National Science Foundation was established. That was a big change in American policy supporting research from the federal government.

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

I would say over my lifetime I've seen rise of biotech. And Internet is very interesting because when Internet was first developed it was thought of only as a communication tool for scientists. And then we learned how to turn it into business. Same thing happened now with social networks such as Facebook. Initially people thought it's only for entertainment. Now people are learning how to turn it into business. I think those are really important innovations.

What is your forecast for the development of innovations in the US?

There will be changes. For example, there are changes now in venture capital industry because there is less money available. I think individual investors are becoming more important in this system. Most people don't realize this, but in 2010 angel investors invested about 2/3 as much as the venture capitalists did. But they did it at a very earliest stage. And that's why it is very important. Emphasis on individual early investors has become more important. This is one kind of the changes that are happening. It's not a big change, but it's a change.

What research and technological achievements may assure a breakthrough in the years to come?

Nobody knows. If we knew — that would be easy. For example, if you asked people 5 years ago what was important in mobile IT, most would have said that the most important were the devices. But what become important is the access to content like in the case of Apple — iPhone, iPad, Google and so on. That's become more important. We didn't understand that 5—10 years ago. So it's very difficult to know what things will become the most important. And that's part of the excitement of it.

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PROTEK Group Took Participation in the Laying of a Capsule in Favor of the Construction of a Biopharmaceutical Building in MIPT

The capsule laying ceremony, with a message to future generations, was held on June 3, 2011 in the Moscow Institute of Physics and Technologies in favor of the construction of a new biopharmaceutical building of REC for the development of innovative pharmaceutical products and biomedical technologies.

This new center will be a hard core of the future pharmaceutical cluster BC Severny, the main participant and founder of which is the Protek Group. All cluster members have the necessary resources to assure a complete cycle of innovative product creation beginning with molecule development and clinical testing, and finishing with manufacturing technologies processing and product promotion in the market.

In the frames of the solemn event, the meeting of the "Medical equipment and pharmaceuticals" work team was held under the Committee of Modernization and Technological Development of Russian Economics, as well as the exhibition, the participants of BC Severny were introduced at.

www.protek-group.ru

SKOLKOVO and RUSNANO Unite Efforts for Advancement of Innovations in Russia

Moscow, June 6, 2011. The educational program "Stimulating the demand on nanotechnologic products", created by Moscow School of SKOLKOVO and the Fund of infrastructure and educational programs, has started on SKOLKOVO's Campus. The main goal of this program is to help project companies of RUSNANO form their marketing competences, that could provide successful production advancement on both Russian and international markets and could help them master effective instruments of creation of steady demand on innovations in Russia.

www.skolkovo.ru

A Culture of Gadget Gigs



Irfan Ali-Khan — Bio-Design Innovator on Early Stage Cancer Detection at Stanford University School of Medicine; Co-Founder and Co-President at AIMS — The Postdoc Link to Entrepreneurship and Industry (Stanford); University Outreach at Organization of Pakistani Entrepreneurs and Professionals (OPEN)

What is your area of research here at Stanford?

I came to Stanford to see if I wanted to be a professor, and I started a post doc in physics, which was my graduate training in quantum optics. As soon as I came to Stanford I decided to make the most of my time here. I started taking courses in the Design School, and in the Business School. I was inspired by the idea of creating a product and selling it, the idea of changing and improving the world as opposed to just writing about physical laws. I switched post doc research, and currently I'm working in BIO-X program which encourages much more multidisciplinary research in which they try to match up people from different disciplines, so that they could work together on new ways of solving the problems.

Personally, I was very interested in entrepreneurship and doing start-ups. What I found is that there are almost 2000 post doc researchers at Stanford of which 2/3 are in bio disciplines in the School of Medicine, but there was no community as such for postdocs to come together and share their aspirations and their ideas, or information on how to do a start-up? Where to start? What courses to take? What information is critical? A lot of people who were coming into the field wanted to make a change, but they were not really sure how to get started. That process didn't exist at Stanford. But at the end of their 2 to 5 years term at Stanford less than 20 percent are going to faculty positions. They are not preparing for alternative career paths. I was lucky because when I came I knew what I wanted to do, and at the end of last summer I got together with a few post docs. We created a group or a community for postdocs to help them network with each other, to share information, and to invite industry leaders and entrepreneur leaders who would just give motivation, or inspiration, or education in order to try to kick start to the post doc entrepreneurship movement.

What are the specifics of the US innovation system?

It can be a very short or a very long answer. I'll try to keep it short. There are several things that exist in the US that support innovation. I think I'll bring them up in no specific order. First, it would be patents — the ability to have your idea and protect your IP. That gives you enough confidence to experiment with various technologies, with the knowledge that if you go and open something new, you'll be able to take it to market without someone stealing that from you.

The second thing would be an appreciation for new technologies. In America there is a culture of, I guess, gadget gigs. In other words, Americans love gadgets. If you go with a new iPhone or a new iPad, you already have a customer base for it. Whereas there are other countries in which such technology focused innovation might not be of much interest to the population. But again, part of the entrepreneurship is finding an area that you are interested in, understanding how that relates to the needs or desires of your market, understanding the market. You need to be really brave and try to change people's habits in that market. This is where the most exciting disruptive technologies come from.

The third thing that America has, which is very unique, especially in the Silicon Valley, is the funding system that supports, encourages, incentivizes innovation. Luckily for us laws were made and tax policy was changed in order to encourage venture capital funding without which there arguably wouldn't have been the sort of the innovation that drives the American economy. There would have been no innovation economy.

And finally, the last thing that comes to mind is culture. There is tolerance; not just tolerance for failure, but a celebration of failure, specifically in the Bay Area, where if you go out, try something new and fail — people understand that it was just your first time. People aren't looking at your first or second venture as an indication whether you are good or not. It's not pass/fail, it's more organic, it's more natural, it's a process. There is a lot more encouragement. People would celebrate your courage because they know how difficult that is.

To you mind, how did this culture evolve? Why?

That's a very tricky question to answer. I mean, we are in the West coast, it was kind of a Wild West, there were interesting things happening in the history. It's a difficult question to say how and why, but specifically in the West coast, and specifically in Northern California, there is a tendency for enjoying the process of understanding people's emotions.

What are the major participants of the innovation process in the US? What agencies are responsible for innovation policy?

For innovation policy itself you have, of course, the US Patent and Trademark Office. Second agency, if you want to do medical devices, for example, is the FDA. You need to get FDA or governmental approval in order to gain a larger market with clinical trials. That's a very tricky process. We understand the safety regulations but, again, that tends to suck away incentives from bio entrepreneurs or medical

entrepreneurs. The third agency would be insurance companies and hospitals. If you want to make a clinical device — what the hospital's reception is going to be? What doctor's interests are? What the patients' interests are? Do you get reimburse from insurance or do you get it directly from the patients? It's customer specific. The universities, I think, play a large role in how you educate your upcoming entrepreneurs. And, of course, US taxation plays a big role in incentivizing. It influences people's decisions whether to take the risk or not. And, I guess, on the top of my head the last thing has to do with the culture. Is there a support system at least of some sort for fail start-ups?

How important are innovation parks and business incubators?

Personally, I think they are very important. They provide a space in which the community can be built, which, again, fosters the culture we were talking about, culture of experimenting. At the same time it gives people the access to tools, they would allow them to do things even if they don't have the capital. So incubators are very important. They allow people to see things that they wouldn't have seen otherwise. They just give access to that sort of a community, environment, and atmosphere. I've often heard of people who are sort of lost in life, they would go in one part, where they are not happy, and then in this whole region you can do something differently. You can have an idea and then play with it, and look for people and make friends.

What are the latest trends in innovation policy?

I do know that the immigration is becoming easier. In the Bay Area, I think, over 20 percent of the founders of start-ups are of a foreign nationality. That's been a large incentive.

In what way it became easier?

They are trying to put into law this new start-up visa in which if you have a business idea, then you can apply for a residency or something of that sort. It's not been approved yet; hopefully it will be because it sounds like a really good idea. If you have a start-up idea, there are two possibilities: either you already are in the US on H1, or you are not in the US. In either case if you have a start-up idea, if you can show that in a certain amount of years the company can potentially earn over 1 million dollars in revenue and hire between 5 to 10 employees, and that you can get at least 20 thousand dollars investment, then you are eligible to apply for this visa.

But what if the project fails? Failures happen all the time...

That's why I believe it will be more of a permanent residency track. In that case if you fail then they won't kick you out because, at least, you were good enough to get in in the first time, and then you will try again and again. So, I think, once you get this visa you are secure; you are good to move forward and try again and again.

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

Right now I want to do bio entrepreneurship innovation. I have a background in physics, and I wanted to do something that was more applied, which in some way touched upon my technical background. For me personally, clinical trials and the FDA is a very complicated procedure, it's a very intimidating procedure. There's a lot of evidence showing that it could make a lot more sense to do these trials in other

countries and to try to look for markets outside the US. In that sense, unless America maintains competitive policies, bio entrepreneurship might fall behind. That is one of the hindrances.

The other hindrance would be patent applications. Applying for patents is a bit of a complicated process and it's expensive. The process needs to be streamlined, and there should be more collaboration in trying to get reasonable new patents in place.

If a research takes place in a university, the IP rights would belong to the university, right?

Right, if you do have an idea that you come up with at the university, then it's the university's responsibility or privilege of owning that patent. But at the same time at Stanford, and other universities as well, universities are reasonable about it. So you did your research in a university, the university will own the patent but on the flip side the university will deal with the patent office and not you. You don't have to worry about it. At the same time they understand how much money they can get from you. They understand that if they take all of it, no one would ever do a start-up, because there is no money in there for entrepreneurs. So they will be very reasonable about doing that. What I was talking about previously is that if you are an employee, if you create something at your own time, then you will have to deal directly with the patent office. And that might be challenging.

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

I guess in the last 15 years it would be digital and online — the whole web space. For me, I think, it would be communication. Innovations in web space allowed for communication I don't think ever existed before. Its easy to communicate, you can transfer ideas, sometimes emotions, across boundaries.

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

Currently America is in a recession. It's a very tricky period. There's a very large deficit. The government is trying to push through an increase in the credit limit in order to continue with the stimulus packages, which are created in order to encourage buying and investment, in order to encourage the economy to continue to grow. It's very tricky because if the economy slows down then innovation is useless because nobody is buying new products. As I said, Americans love gadgets, perhaps, not as much as Japanese, but people need to go out and buy products. If people suddenly stop buying then it could be a little scary. Personally, I don't think that's going to be an issue. The American economy has been very robust. People continue to buy mac books, iPads, and iPods whatever happens. I think, and hope, that there will be significant thrust and increase in innovation and entrepreneurship in the bio sector — in ways that we cannot quite foresee at the moment. But it will, probably, be of the same impact and surprise that we had with optic fibers, followed by computers, followed the Internet bubble in 2000. So the next big thing is going to be bio. Also, there needs to be a solution for the growing energy needs, so I see a lot of innovation in energy as well.

The Building Blocks of American Innovation System



Kemper Lewis — Professor of Competitive Product and Process Design, Department of Mechanical and Aerospace Engineering; Executive Director, NYS Center for Engineering Design and Industrial Innovation, University at Buffalo — SUNY

How does NYS Center for Engineering Design and Industrial Innovation contribute to the innovation process?

The NYS Center for Engineering Design and Industrial Innovation develops leading-edge information, visualization, and simulation science and technologies for product development processes that enable companies to better compete and innovate in the world marketplace. At the heart of the science and technology we are engaged in is the notion of design, which, as Nobel Laureate Herbert Simon noted, is the process of changing an existing state into a preferred one. We focus on the process of innovation in the context of engineering design — therefore, we focus on the process of changing existing ideas, products, and systems into preferred ones.

One of the things we have focused on is the process of re-innovation, or taking a once innovative company and helping them to innovate again in changing markets with new pressures

and dynamics. We focus on the engineering design and innovation processes necessary to succeed and lead in such a market. We leverage the expertise of a number of disciplines including the engineering sciences, computational sciences, management, marketing.

We have been successful because we focus on the issues of synthesis or the issues of integration. For instance, how can information be synthesized to create knowledge? How can a decentralized decision network converge to a high quality solution? How can customer, design, and manufacturing be better connected to provide more integrated value for a product's lifecycle? These issues, among others, demand that the emerging science of design be at the forefront of our research, education, and leadership agendas.

What are the specifics of the innovation system in the US?

As President Obama has recently outlined in his strategy for American Innovation (www.whitehouse.gov/innovation/strategy), the building blocks of American Innovation are an educational system aimed at teaching XXI century skills, fundamental research leadership, and advanced physical and information technology infrastructures. These building blocks are meant to promote market-based innovation by catalyzing innovation hubs, accelerating business innovation from companies of all sizes, and promoting open markets.

How important are technological (innovation) parks?

These play a critical role as long as they are strategically developed between corporate and academic partners. The corporate parks need a strong connection to the academic knowledge-capital system not only for research leadership, but also for thought and educational leadership.

Could you dwell upon the most improved innovation parks in US?

I don't know a lot about the new parks in the US. I do know that companies such as Microsoft, Procter and Gamble, Accenture, IBM, AT&T, Computer Sciences Corporation,

INNONEWS

Ford Finalizes Russian Joint Venture with Sollers

Ford Motor Co. has finalized a deal with Russian automaker Sollers to build and sell cars and other vehicles in Russia, a key part of Ford's ambitious overseas growth plan. The two companies have lined up \$1.4 billion in long-term financing from Vnesheconombank, the Russian development bank, for the 50-50 joint venture called Ford Sollers. The venture, which includes one Ford plant and two Sollers factories, is scheduled to start operating later this year.

Russia is expected to be one of the world's fastest-growing auto markets and fits into Ford's plans to expand sales overseas. The Dearborn, Michigan, company told investors on Tuesday that it plans to increase global sales to 8 million by 2015, up 50 percent from 5.3 million last year. Much of the sales growth was expected to be in Asia.

While domestic auto companies in Russia have been struggling, the market itself has been gaining strength. Car sales in Russia rose by 30 percent last year to 1.9 million, according to the Moscow-based Association of European Businesses.

www.rdmag.com

14th Semi-Annual Russian-American Innovation Technology Week

The 14th Semi-Annual Biotechnological Russian-American Technology Week (RANIT-BIO) will start on June 23, 2011 in Philadelphia and conclude on June 30, 2011 in Washington, D.C. RANIT is the most significant semi-annual event organized by the Mid-Atlantic-Russian Business Council, which is devoted to Russian-American technology and business cooperation. It will bring together entrepreneurs, scientists, venture capitalists, and established corporations within the American and Russian technology industries.

www.events.allaroundphilly.com

Qualcomm, and Verizon have all started innovation parks recently. Also, the US National Science Foundation's Industry/University Cooperative Research Center (I/UCRC) program is attempting to provide government funding and support for these types of collaborative innovation relationships between corporate and academic partners.

What are the latest trends in innovation policy?

President Obama's recent priorities aimed at wireless initiatives, patent reform, K-12 education, clean energy, and entrepreneurship.

What may be achieved through these changes?

The hope is that innovation — knowledge capital — becomes a leading national characteristic, leading to a more effective integration of design and manufacturing.

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

Helps — capitalism, freedom of knowledge creation, mimicking the ultimate creation and design of the natural world, and a growing recognition that we must get better at solving not just problems, but complex problems.

Hinders — old models of teaching and learning, a lack of commitment to design and innovation in our curricula.

What do you mean by "mimicking the ultimate creation and design of the natural world"?

Essentially, I mean bio-mimicry, which is a new discipline, that studies and extracts ideas from the creation of nature and then imitates these designs to solve technical, environment, global, and societal problems.

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

I agree with the Former US Secretary of Education Richard Riley who said that we are preparing students for jobs that don't yet exist, using technologies that haven't been invented in order to solve problems we don't even know are problems yet. This is brilliant and must be at the foundation of any innovation system. But to think like this requires new ways to learn, to think, and to teach. Companies are

challenged to get to market faster, reduce development costs, and design better products and systems. Many times, if a company can do 1—2 of these simultaneously, they are market leaders. The sustainable, long-term, global leaders will be the companies who can be innovative to accomplish all three.

"Preparing students for jobs that don't yet exist, using technologies that haven't been invented in order to solve problems we don't even know are problems yet" seems like an enormously hard task. Why do we need to put so much effort at first place? Innovations existed in all times. Why do today we need an innovation system and all costly and complicated mechanisms to promote innovation? Is there a qualitative difference between now and then, which makes us do that?

You are correct; we have been creative from the beginning. We are all given an ability to create and innovate and that has not changed. But with the acceleration of information availability rapidly escalating, our methods to innovate and the ways we think about innovation must change. The increasing pace at which innovation can be achieved demands new models —models that capitalize on an interconnected and digital world. Our fundamental ability to creatively innovative has not changed; but our strategies, methods, and models must adaptively transform. Too many problems have not been solved by old ways of thinking for us to sit by and hope that our old ways of innovating are going to work somehow.

What research or technological achievements may assure a technological breakthrough in the years to come?

I am of the opinion that advances and achievements in the science of synthesis will facilitate breakthroughs in the engineering and physical sciences. The grand challenges facing our global societies are transdisciplinary, as they cross disciplines and demand new ways to identify problems, to pose these problems, to solve these problems, to implement the solutions, and to teach the skills to do all four.

INNONEWS

International Conference "Innovative Food Technologies in a Field of Agricultural Production Storage and Processing"

Production Storage and Processing

The 2011 International Conference "Innovative Food Technologies in a Field of Agricultural Production Storage and Processing" organized by Krasnodar's Research Institute of Agricultural Production Storage and Processing, Russian Academy of Agricultural Sciences will be held June 23—24, 2011 in Helendzhik, Krasnodar's Area. The conference will be organized to invite international delegates, to share their latest research findings on Food and Agricultural Sciences. .

www.researchgate.net

JSC Pharmstandard to Hold the AGM

JSC Pharmstandard, the leader of Russian pharmaceutical industry in R&D and production of the medicinal products, invites its shareholders/holders to its annual general meeting of shareholders on 30 June 2011. There are following key items will be discussed at the AGM: 1. Adoption of the financial statements for the year 2010 and 2010 annual report; allocation of profit and losses of the company based on year 2010 financial results. 2. Dividends for the year 2010. 3. Election of the Board of Directors. 4. Election of Audit Committee. 5. Appoint independent audit company for the year 2011.

www.chemrar.ru

14 PSI 2011 - The Ershov Informatics Conference PSI 2011

The Ershov Informatics Conference (the PSI Conference Series, the 8th edition) will take place June 27—July 1, 2011 in Novosibirsk, Akademgorodok. It is the premier international forum in Russia for research and its applications in computer, software and information sciences. The conference brings together academic and industrial researchers, developers and users to present and discuss the most recent innovations, trends, experiences and concerns in the conference area.

www.psi.nsc.ru

Unrestricted Markets and Safety Regulations: Where's the Right Balance?



James Pearson — Executive Director of the Florida Photonics Cluster)

Alexandre Fong — Senior Vice-President of the Florida Photonics Cluster

How does Florida Photonics Cluster contribute to the innovation process?

An effective innovation process has many components, including effective mechanisms for communication and partnership formation among companies, universities, and government organizations. The Florida Photonics Cluster (FPC — www.floridaphotonicscluster.com) is an important part of the innovation process in Florida and the USA since it is designed to support the growth and profitability of the Florida photonics industry through the strength of a unified voice, and to make Florida the place to go for photonics solutions. The FPC is dedicated to enhancing the photonics industry through effective collaboration by bringing together the knowledge, expertise, and service that each organization has.

What are the specifics of the innovation system in the US?

There is no “national system” for innovation in the US in the sense of having all the elements for innovation integrated and centrally managed as a single “system”. The main principles that drive innovation in the US are:

- Free market competition;
- Constant exploration of new technologies, new marketing approaches, and new management techniques for people and business (marketing, finance, etc.);
- Government involvement through a) laws and regulations where required to assure open markets (no monopolies) and product safety; b) funding of research and development in areas identified as important to the US people and both the US and international economy;

Innovation in a technology-based industry like photonics requires a number of components including the following (all of which are abundant in the US, although more is always needed):

- Continuous investment in research and development, from basic science to prototype products. This investment needs funding from private investors, industrial companies, and government at local, state, and national levels;

- Strong, effective partnerships between industrial organizations (companies and trade associations) that can bring new products to market and universities that conduct much of the leading-edge technology research;

- Capital resources from private equity organizations, lending institutions, and company funds to enable new start-up companies to form, to foster growth of small to medium size companies, and to fund expansion of manufacturing facilities and development of new markets for a company's products.

How does the legislation regulate the innovation process?

In the US, government legislation or regulation is designed to foster and promote innovation in the private sector while also preventing abuses and assuring safety. It is a continuous effort to find the right balance between free enterprise and unrestricted markets and regulations to assure fair and safe treatment of the public (consumers and investors). Laws and agencies to enforce them, on disclosure to investors, control of intellectual property (patents and company-confidential information), requirements to form new companies, product safety and liability, etc., are all in place and always being evaluated.

Other types of legislation create funding and other resources that support the innovation process. Examples include federal funding for both government agency research (e.g., NASA, National Institute for Standards & Technology — NIST, Department of Defense — DoD) and for contracts with private companies. Of particular value to startup and small-to-medium enterprises (SMEs) are federally-funded programs like Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) that fund early-stage R&D projects at small technology companies and encourage industry-university partnerships (often required to receive such funds). The SBIR/STTR program (www.sbir.gov) funding is administered through several federal agencies including many Department of Defense agencies, National Science Foundation, NASA, NIST, and others. This process helps assure innovation that serves the needs of the funding agency and that also has commercial applications.

What are the major participants in the innovation process in the US?

The list of participants in the whole USA is quite long, but the general categories are listed below:

- Federal government agencies — funding; R&D tax credits; regulations; safety rules; etc.;
- Companies in the photonics industry, from component suppliers to systems integrators — conduct and fund research and development projects;
- Regional and state economic development organizations — fund innovation projects and provide other assistance, particularly to SMEs;
- Universities — conduct research & development projects, often partnering with companies; provide educated workforce; license technology patents; provide resources to help companies such as business incubators, seminars, etc.;
- Trade associations and professional societies — create networks for communication and partnership building;

advocate for industry needs; provide education resources and assist in developing needed product and education standards.

How important is the government role compared to that of the market forces?

Both are essential to become and remain competitive in a market and/or technology area, particularly in a field as rapidly growing and developing as photonics. The government plays a very important role as outlined above, and the market forces are essential for identifying the needs, the products, and services that are required to meet those needs. The continuing and necessary dialog is what role the government and the market forces should each play, how much regulation and government oversight is needed, all of which changes as an industry or technology evolves and matures.

What are the latest trends in innovation policy?

The negative trends in the US, mainly caused by the recession, include:

- Reduced R&D funding from both private and government sources;
- Reduced education funding at all levels;
- A slow-down in hiring by technology-driven companies, although the photonics industry appears not to have been affected as much as other industries. This is because of the pervasive and increasing use of photonics in every application from medicine to energy to manufacturing to defense and security.

The positive trends, at least in the photonics industry, include:

- Continuing emphasis on photonics as one of the primary areas for investment and development. This is evident at all US government levels (federal, state, regional), at companies, and with venture capital investment. This is also evident in many other countries, which is a positive trend for the photonics field and industry, but a challenge to each country, including the US, to stay competitive in a rapidly changing technology-driven market;
- New technology being developed and new applications are being found, with reports coming out weekly;
- A current initiative by the National Research Council, "Harnessing Light II" will update a 1998 study (see www.nap.edu/catalog.php?record_id=5954) to identify and recommend high-impact initiatives that the government should take to drive the future of the US industry in the vital field of photonics (see www.sites.nationalacademies.org/PGA/biso/ICO/PGA_047366 for an independent view of the importance of this new study).

What may be achieved through these changes?

If the negative trends are not stopped and reversed in the US, the country will continue to see more jobs, products and services produced by other countries. This will lower the US standard of living and reduce the opportunities for young people entering the workforce.

The positive trends, if they continue as I think they will, will indeed make the XXI century "the age of photonics" in the same way the XX century was "the age of electronics." New photonics technologies such as nano-photonics and efficient, low-cost solar cells, and new applications of photonics in medicine, manufacturing, defense, and other applications will open new markets and continue to create opportunities for entrepreneurs to start new businesses.

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

The things that help innovation in the US include the following:

- A free and open, democratic society that values exploration and informed risk-taking;
- A democratic government, elected by the citizens, that listens and responds to new ideas and to criticism of practices and policies that hinder innovation;
- Funding for education and research by government at all levels — federal, state, county, city;
- World-leading colleges and universities for creating the workforce needed for innovation and for conducting advanced research and development;
- A commitment to collaboration among the parties involved in innovation — companies, universities, government agencies, trade and professional organizations;
- Relatively easy access to business development and venture capital resources for guiding and funding new companies and expansion of SMEs;
- Too much outsourcing of manufacturing or product development.

The things that can hinder innovation in the US include the following:

- Reductions in R&D funding — by government and companies;
- Over-emphasis on competition at the expense of mutually beneficial cooperation;
- Not enough young people electing to pursue science or engineering careers.

In which areas the results of innovation have been most impressive? More specifically, how impressive the results of innovation in your area?

Although there are many areas of impressive innovation, in my opinion, photonics is at the top of the list for both technology advancement and new products. Of course, I may be a bit biased with this opinion, but photonics is now found in almost every application you can name, including energy, biotech/medicine, computers and information technology, defense, manufacturing, consumer products, and others. Here are some specific examples of where innovation in photonics has made a great impact, and will continue to do so:

- Telecom is perhaps the most widely recognized application area with fiber optics and laser sources and detectors as the fundamental, enabling technologies;
- Defense: night vision equipment, laser target designators and range finders, laser-guided bombs, vision systems for remotely-piloted vehicles (RPVs);
- Aerospace: fiber optics on aircraft (replacing copper wires in control systems) and photonics sensors for speed control, engine control;
- Consumer products: LCD and plasma TVs and other displays; traffic lights; CD and DVD players and recorders; data storage devices for computers; displays for cell phones; remote control devices (e.g., TV remotes);
- Semiconductor manufacture: light sources for lithography used in making all types of chips and devices, and enabling ever-smaller devices and the continuation of Moore's Law;
- Energy: LED light sources; solar cells; large mirrors for collecting and focusing the sun's rays into thermal generation of electricity;

- Astronomy: ground-based (like the Keck and European Southern Observatory) and space-based telescopes (like the Hubble) using large, segmented primary mirrors and adaptive optics to control the telescope and remove atmospheric turbulence distortion;
- Medicine: surgery (radial keratotomy perhaps the best known, but other surgery also like vascular, and other minimally invasive techniques); diagnostics (small cameras, displays, specialized sensors for analysis, etc.);
- Manufacturing: lasers used for welding, cutting, hole drilling in almost any high-volume or specialized manufacture such as automobiles, jet engines, etc.; automatic inspection and sorting equipment.

How important are technological (innovation) parks?

Technology (or innovation) parks are another essential resource for innovation. They provide easy and affordable access to facilities and to business resources such as financial and strategic planning. The parks are often located close to major universities in the US, which provides easy access to consultants, facilities, and new employees. They are also a key resource for new startup companies, particularly spin-offs from universities.

Could you dwell upon the most improved innovation parks in the US?

There are many fine examples in the US, but the one I want to speak to is in Central Florida. This innovation “park” has a number of components, which are relatively new, but have rapidly become world leaders and a benchmark in innovation. I rank Central Florida as one of the most improved innovation “parks” in the US. Here are the elements that support and drive innovation in many areas, including photonics:

1. University of Central Florida (UCF) — www.ucf.edu
2. CREOL — The College of Optics and Photonics — www.creol.ucf.edu
3. UCF Business Incubation Program — www.incubator.ucf.edu
4. UCF Venture Lab — www.venturelab.ucf.edu
5. Florida High Tech Corridor Council (FHTCC) — www.floridahightech.com
6. GrowFL Economic Gardening Program — www.growfl.com
7. Florida Virtual Entrepreneur Center — www.flvec.com
8. Metro Orlando Economic Development Commission (MOEDC) — www.OrlandoEDC.com
9. Enterprise Florida Inc. (EFI) — www.eflora.com
10. Florida Research Consortium — www.floridaresearch.org

11. Florida Photonics Cluster (FPC) — www.floridaphotonicscluster.com

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

The elements of the US innovation “system” discussed here will continue to develop and evolve. The history and tradition of the US in being a leader in technology development and deployment will continue and grow even stronger with time. The current innovation “parks” will continue to develop and evolve as new technologies are discovered and new companies to commercialize the technologies are created, and new “parks” will be created.

What research or technological achievements may assure a technological breakthrough in the years to come?

Many people have said it in different ways that “It’s hard to make predictions — especially about the future.” But my “fearless forecast” is that breakthroughs in photonics will produce the most significant changes in our world in the next 10—15 years. Some of the areas to watch are the following:

- Nanophotonics, perhaps “picophotonics”. Research in this area will impact nearly every application of photonics, but perhaps most significantly in life sciences — medicine, artificial limbs, artificial intelligence, robotics;
 - Solar cells for energy generation. New and renewable energy sources are a critical worldwide need that will only increase with time. Solar energy is the future for meeting our energy needs;
 - Application of photonics in medicine and life science areas;
 - Biophotonics and Medical Diagnostics — new optical techniques such as optical coherence tomography and multi-spectral molecular assays for analyzing tissue structures and biochemistry both through molecular analysis of samples and in-vivo will both expedite and improve the accuracy of diagnoses thus improving patient outcomes while lower associated costs.
- And in closing, watch Florida continue its development as a leader in technology innovation, including photonics. Although the past isn’t a predictor of the future, the rapid and world-leading developments of the past 10—20 years in Florida will continue. This is demonstrated for the photonics field by comparing the Florida photonics industry in 1998 to what it was in 2008 (all numbers from a survey and study funded in 1998 by USF’s Office of Economic Development and by the FHTCC in 2008 — www.floridaphotonicscluster.com/files/PhotonicsClusterStudy2009.pdf).

Here are the comparisons:

Item	1999	2009
Number of companies	148+	271+
Photonics-specific annual sales	Over \$2B	Over \$3.6B
Impact on Florida annual sales	Over \$4B	Over \$7.2B
Number of jobs produced	11,000	27,000
Number of optics professionals	3,400	5,700
Annual university research funding	\$12M—\$15M	\$20M+

Venture Capital: No Opportunity for Exits



Valentine Livada – Senior Lecturer, MIT Entrepreneurship Center; founder of Weybridge Partners

Mr. Livada, you have a lot of experience in the area of innovation. What is your sphere of specialization in particular?

My involvement in this whole subject of innovation has 2 parts to it. One is that I've been a consultant for over 35 years now in the area of innovation. I used to work for regular consulting companies before Weybridge Partners started, which is a private group that I've organized and that I'm running. But the focus of my entire career has been to work with companies and to help them realize commercial value of their technology efforts. For the first 20 years I worked exclusively with very large companies, what you may call "the Global 300" — General Electric, General Motors, Siemens and so on. These are the companies with very large technical capabilities, but they are looking how to maximize efforts that they are putting into research and development, in creating new products, in doing businesses etc. And then I started Weybridge Partners and continued to do a lot of work with those very large companies. But I also have done more work with start-ups and entrepreneurs in very small companies, emerging technology companies. That's one component of my business and my involvement with innovation.

The other part is that for 20 years I have been affiliated with the Sloan School of Management at MIT, which is the business school at MIT, working on issues of management of technology and innovation. I now teach a course called "Corporate entrepreneurship", which is looking at how large organizations struggle with idea of entrepreneurship and innovation. The Sloan School has been really the pioneer in the issues of innovation and entrepreneurship. The work that the Sloan School has done started in the early 1960-s and it has been going on ever since.

You are the judge of Innovation Competition organized by the Massachusetts Technology Transfer Center. How important are these competitions?

I've been involved with several innovation competitions and believe that competitions are very productive activities. They attract the interest of people, they are fun and they create

interesting social networks. They make people participate and think creatively. We started at MIT what is now the 100 K competition many years ago. The first one was, actually, 10 K competition. Over the years it has been a spectacular event and one of the most interesting things about it is that students run it. Is it the main driver for entrepreneurship? — No, it isn't, but it's a wonderful activity that attracts people, and results are very good in terms of proposals that are being put on the table. With my limited experience of what it did in Eastern Europe I again think it was a good start for bringing attention to innovation, getting young people excited and involved, and an opportunity to do something fun, and also to benefit in a relatively simple way. So I am a strong believer in these competitions. I think they work and we are seeing a proliferation of them all over the places.

Being the judge, how do you choose between different projects? How do you measure the quality of projects?

As far as judging you have to have a good deal of discipline, which means that there has to be a very strong process in place that allows you to go through a very large number of proposals and select a few finalists in an efficient way. Once you select a couple of them for the final round, there is a kind of intuition that helps judging. Also, it is important that you have judges that have experience in entrepreneurship.

So you need a combination: you have to have some rules of the game on how you go through the first round when you deal with very many proposals and select 10 percent of them. But once you get 10 percent, you try to get it down to 2 or 3. Then there are fewer rules while judges' knowledge and intuition are more important. You can't really pick with a 100 percent certainty a winner.

You have been working primarily with large corporations. To your mind, how big is the role of companies compared to that of government?

That's one of the really intriguing issues here. I don't think that anybody really knows what the answer is. And by the way, I worked with global companies but my real knowledge and expertise is mostly on the US system. In the US there is now a growing debate on what is the role of the various components of this system — the role of the corporation and the role of the government. How can they be complementary? We are trying desperately to figure out what even these components are? Because when we track some numbers, we don't really track good enough numbers. It's got to be complementary. There is no question about that.

In the US when you talk about research and development, the two largest components of it are the private corporations and the government. But until recently we only tracked very large private corporations. We are beginning to better understand this. We don't have the data because we track research and development as a single number as opposed to separate research from development. We know what the government is doing in the two areas, but as far as large corporations are concerned, we have never separated R from D. But what it looks like at a very crude level is that the private corporations have the largest role in development, but in research it's got to be an interesting balance between what the government supports and what private industry supports.

I think that here have been some significant changes in the last 20 years, particularly in the US corporations, that we don't understand. I do think that the percentage of research out of total numbers has dropped significantly, which makes an interesting issue for the government to decide on where they are putting their money. So it's got to be balanced, it's got to be coordinated. You have to understand all of the components of the innovation economy. And it's not just large corporations and government. In this country we have a very robust venture capital industry, which is both institutional, as in venture capital funds, and the individual investors. When you total the numbers — the total investment in innovation from these two sources is close to 50—60 billion dollars a year. That's an enormous amount. And then you have a real unknown component here in the US — we don't really know what the small and medium size companies' role is in innovation and entrepreneurship. We try to come to grips of that. So it's a very complex puzzle — multiple pieces that have to fit. We have a bit of the understanding but not a very good one.

How did the economic crisis influence the venture capital market in the US?

It had a significant impact on the venture capital investments. What has happened is that at the beginning of the crisis the venture capital industry faced the issue of having portfolios of companies they were supporting with no opportunity for exits. The venture capitalists make their returns when the company they invested in either bought or goes public. And that was not feasible in the last couple of years. The venture capitalists faced very few opportunities to exit their investments. Therefore, whatever money they had left in their funds were reserved for supporting the portfolio companies. As a result, the amount of money that was available for new companies went down significantly. It didn't go down to below the 1990s level, which was less than 10 billion, the investment dropped from roughly 35 billion to 25 billion. But a lot of that was invested into existing companies. The new companies — the early stage companies, the startups — have suffered significantly in the last couple of years. Money has been less available from the venture capitalists, particularly institutional venture capitals — the venture capital funds. The angel investors have remained fairly steady in their investment. So private individual group angel money has continued to flow into the start-up world. But, overall, we've seen a really hard time comparatively in the last couple of years but it appears to be improving lately.

To your mind, when the venture capital market will be able to recover?

I actually think that they are beginning to recover right now. In the latest quarter the venture capital industry has raised a very large sum of money, which indicates that investors are willing to put their money into venture capital. We are beginning to see the early stages of global recovery and capital flowing into new ventures and a more robust pace. I think that next 3 to 5 years is going to be a very good time for that kind of investment.

What are the current trends in innovation process?

This is my own opinion. I could be completely wrong, but I think that there has been a significant but sudden change in how the innovation system works, particularly in the US. The reason of that is as it follows. The innovation and

entrepreneurship, but particularly the innovation ecosystems, over a hundred or more years were driven by the efforts of very large corporations through their corporate research and development organizations. But in the last 25 years or so we started seeing corporate laboratories being basically taken apart. They are being decentralized; now they are being closer to the business units as opposed to corporate structures. The US companies in particular have embraced an approach that we call Open Innovation. That seems to be a part of large corporations' behavior when it comes to innovation. Simply put, Open Innovation says: "We are not going to invent everything; we are going to aggressively search emerging technologies from the outside, and we are going to one way or another have access to those technologies". A lot less emphasis is put into research, not development but research. Many think that there are other places that are going to be responsible for the early stages of technology development. The "other places" then become the universities and research institutions. And then the other component is entrepreneurs and emerging companies. It's kind of a collaborative approach between large companies, universities generally, and entrepreneurs and emerging companies. The question is how those 3 components can work together really well.

How does the legislation regulate the innovation process?

Generally speaking, the US government has been very supportive and very responsible for a lot of research that is going in this country in universities and other organizations. The government has supported with research and development money and a significant amount of money. These are the efforts in various areas, and they are trying to spread it out quite nicely among various universities and various other organizations.

The amount of federal dollars that are going into R&D is absolutely critical to the whole innovation infrastructure. There is a program that we call Small Business Innovation Research (SBIR), which is grant money that is being provided for start-up companies, sometimes in collaboration with large companies or universities. It is also extremely important to particularly the early stages of innovation. Every department in the US government spends money on R&D, and has to allocate a percentage of that for SBIR/STTR grants, which particularly in the area of life sciences are supporting the most of the early stage research. Most of the small companies have been very influential in creating all this activity here.

Also there are taxation issues. There is a lot of debate on what is the importance of the tax policy, R&D credits and so on. I think the government has a huge role to play, particularly not slowing down the pace of innovation.

Is there a specific government department responsible for the innovation policy or this mission is shared between different agencies?

There is a debate about the centralization of the policy. But right now every department in the US government has some responsibilities. I mean, they all support research and development. That's number one thing. As they support research and development, then they obviously have to put a percentage of the money that they allocate towards emerging companies and start-ups. But each of them manages their own programs, and the programs are relatively different. National Science Foundation, National Institutes for Health, Department of Defense, Department of Commerce — they all

are slightly different, but they align pretty well together. Each one orchestrates its own program.

The White House has the Department of Science and Technology and tries to establish some kind of vision, strategy, but there is no centralized approach to the whole thing. And I am a great fan of not centralizing all the activities in the area of innovation because innovation is not managed through very specific engineering approaches. You've got to allow for a bit of chaos and confusion. It's better to have separate, collaborative, overlapping policies from various directions that have one main direction.

In which areas the results of innovations have been the most impressive?

It depends on how you describe the areas. The thing that has driven a good portion of the US economy in the last 40 or so years has really been the emerging companies, the start-up companies, which are primarily technology-driven companies, the kind of spin-offs that you've seen from universities like MIT, Stanford, and so on. That has been the most intriguing aspect of the innovation system. We still don't really understand why it has happened, but it's been a dramatic change. If you are a part of Boston economic community for the last 40 years, the difference in the economy in this area between 1960s—1970s and now is unbelievable, and it's all due to this really large activity of start-ups and entrepreneurship.

To your mind, how important are technological or innovation parks and business incubators?

In the Boston area we tend to think of us as of a small city being one big technology park and incubator. But we don't have real incubators and technology parks. The economy did not grow with those kinds of things. It just spread all over the place and mostly spread around MIT, Cambridge and so on. There is a close proximity to each other; it's a small area. But we've never really paid much attention to creating incubators or technology parks to attract people to a certain area because they were here. They came out of MIT, walked across the street and started a little company in Cambridge.

We have one major incubator in Cambridge now, which is nothing more than a building right next to MIT campus. It has about 100+ something companies but it's primarily just offering them a place to start. In other parts of the country, like Research Triangle in North Carolina, incubators have had a significant impact on creating a community of innovators. But in Boston the community of innovators was originally MIT, and now it includes all the major schools in a small city of less than 3 million people.

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

What you are going to see is a continuation of what I call collaborative innovation, where it's going to be a very interesting network of large corporations, universities and start-ups that interact between each other and create even bigger dynamic of innovation. What's happening now is that the large corporations are looking for new technology on the outside, willing to spend a good deal of money both directly and supporting research in various places.

Most of the US universities are now very focused on technology transfer. In other words, they focus on commercializing the fruits of the research. There is a lot of effort put into licensing activities and spin-off activities. The

faculty members of most of the major research universities are very much commercially oriented. They have gotten the message that they can be both academics and entrepreneurs. That's changed the university system dramatically in the last 20 years. You are seeing a lot of universities doing some really significant research and then developing spin-offs and licensing new technology. Faculty is very interested in those kinds of things.

And then you are beginning to see an evolution of entrepreneurial systems in other parts of the country. It used to be an exclusive domain of Boston and Silicon Valley but it's not the case anymore. It's happening everywhere where you have centers of technology that are working with large organizations and you have entrepreneurs nearby, and you have venture capitalist nearby, and it all then works together to create this dynamic, which is very critical.

The other thing that is important to remember is that you can have technologists and entrepreneurs but you have to have the infrastructure that supports them just as much. The infrastructure means that you need to have the capital; you need to have the entrepreneurs, individuals that are interested in starting and running emerging companies. But then you also need bankers knowing how to provide capital and how to take care of the emerging companies, the lawyers and also the policy people that are supportive of all this. All of that supports entrepreneurs, and if this is in place, it supports very nicely. If it's not in place, it makes it more difficult for an entrepreneur to succeed. In places like Boston, Silicon Valley and now interestingly in Triangle Park and, maybe, in Austin, Texas — those ecosystems do exist and they are growing.

What research and technological achievements may assure a technological breakthrough in the years to come?

It's a very difficult question. You may look and see what areas today are very active. Biotechnology, and a lot of different life sciences, and robotics are beginning to be very important.

I will tell you what my theory is. What you have in the world right now is that you have an enabling technology, which is information technology that allows you to manipulate enormous amounts of data. And because of information technology we can do things that could never do before. But that's an enabling technology and you also are seeing another very powerful trend — real understanding of matter and the nano-level. Between the ability to manipulate enormous amounts of data and accelerating understanding of the building blocks of nature, what you have is an opportunity to do a lot of different things. So we are talking about advanced materials in almost every aspect, everything that has a physical nature is being impacted by nanotechnology. Life sciences is nanotechnology too — the understanding the cells, microbes and etc. I just think that it's a very broad space with applications across the border.

The venture capital industry is presently investing heavily in software/IT, social networks, digital media, looking for the next Facebook and understanding that in those sectors the investments needed are relatively small and the results can be quick. Beyond that, clean technologies and alternative energy technologies are getting a lot of attention but they require large investments and a long time horizon. In the Boston area for obvious reasons, life sciences, both therapeutics and devices are very popular and so are advanced materials and robotics.

The Innovation Road Map: 15 Steps to Success



Richard Bendis — President and CEO of Innovation America

Mr. Bendis, you were one of the invited speakers to V International Forum «From science to business» that was held in St. Petersburg on May 11—13. Tell us about the Forum and your participation in it.

National Research University of Information Technologies, Mechanics and Optics in St. Petersburg organized V International Forum “From Science to Business”. They invited several speakers from Russia and abroad including Oleg Alekseev (Skolkovo), Oleg Strelkov (Rospatent), Ivan Bortnik (Foundation for Support of the Small Business Enterprises in the Science-Technical Area), Thomas Beacon and Torsten Clive (Muenster University of Applied Sciences, Germany), and many others. I was invited as well as a representative of the organization that I founded — Innovation America. Also we had some people from other regions around Russia that were interested in learning about developing innovation ecosystem. I did a workshop for a full day on how to build an innovation ecosystem and develop an innovation roadmap.

There seems to be a lot of communication and collaboration going on right now in the sphere of innovation and commercialization ...

Yes, there is also an interesting project between an organization in the US — American Councils — and Russian universities called EURECA. They are matching up Russian universities with US universities around technology research and commercialization.

How does Innovation America contribute to the innovation process?

Our organization is privately funded. Its goal is to advance the innovation economy of the American and global innovation environment. Innovation America has 5 full missions. The main one is an advocacy mission. That is to help advocate with the Obama administration as well as the US states' leaders on how to be more engaged in entrepreneurship and innovation. So, basically, Innovation America is a public advocate that encourages both the public and the private sector to be more innovation engaged and aware.

Beyond that I am the editor of a Newsletter called Innovation Daily. There are 25 new articles every day from

around the world about innovation, entrepreneurship, venture capital and innovation based economic development. The Newsletter is designed for practitioners around actual practice, implementation strategy and best practices rather than just theory.

Also, I am a global speaker on these topics (the texts of speeches I gave can be found on the innovationamerica.us website, as well as the Power point presentations; plus there are over 11 thousand articles in the database now, so it is a great source of information and best of all — it's free).

In addition to that Innovation America has a consulting team that helps cities, regions and countries develop their innovation strategies. And Innovation America has created a 15-step proprietary innovation roadmap process, which is the following:

1. Innovation roadmap process
 2. Literature Review of Comparables
 3. Key Stakeholder Interviews/Recommendations
 4. Asset Mapping/Cluster Analysis
 5. GIS Innovation Mapping
 6. Innovation Benchmarking/Index (Peer 2 Peer)
 7. Innovations and Entrepreneurship Resource Identification (Entrepreneur Resource Guide and Database)
 8. Innovation Economic Development Organizational Analysis and Matrix
 9. Innovation & Commercialization Gap Analysis (programs & services)
 10. Innovation Ecosystem Public Policy Recommendations
 11. Develop Strategic Plan
 12. Organizational Leadership and Staffing
 13. Operations/Implementation Plan and Program Portfolio
 14. Branding/Marketing Strategy and Market Research
 15. Economic Impact Analysis
- Celebrate Success

You work all over the world and you can compare. What countries or regions are most interested in innovations?

Western Europe of course (there are a number of countries within Western Europe, but especially Scandinavia), Canada, United States, South Korea, Singapore, India, China. And there are about 18 countries that have developed what they call innovation strategic plans and those are the ones that, probably, most dedicated to innovation.

What are the key actors of the innovation system in the US?

The key actors would be government at the federal, state and local level, academia, industry, foundations and non-governmental organizations.

When you look at government, you have all of the National Research Laboratories, which the federal government funds. Then there are also a number of private research facilities. These are focused on both basic and applied research, with an increasing emphasis on translational research.

The federal government also tries to stimulate innovation through a series of cluster programs that are supported by a bureau within the US Department of Commerce called Economic Development Administration (EDA), Small Business Administration (SBA), and the National Science Foundation. These agencies all have innovation as a part of their mission.

Another way that the federal government supports innovation

is with a program that has been around almost 30 years called Small Business Innovation Research program (SBIR). It is an annual 2.5 billion dollar program, which supports innovative SME's in America. That's the government level.

The university role is to do basic and applied research, and create new innovative ideas that can move from proof of the concept into the commercial market place. But in order to do that, they need to interact with the private sector and industry. Universities traditionally do not do commercialization well around the world. They do much better when you match their research capabilities with people from the private sector — entrepreneurs and experienced business people.

Industry or the private sector has a major role because most of the major innovation that gets commercialized in the US comes from private business, whether that would be large business, or SME's, or entrepreneurs. Their role in innovation is primarily to get products into the market place to be commercialized rapidly and find a way to make them profitable, so that they can reinvest in addition in new innovation.

Another key actor that is emerging to play a greater role right now is what I classify the non-profit charitable foundations. Charitable foundations are starting to make investments in innovation and the innovation based economies within the

Dole act. The Bayh-Dole act gave the rights to universities to own the intellectual property, which was develop utilizing federal grants or research money that was given to them by the federal government. That enabled the universities to take the leadership in commercializing technologies, and also incentivized the faculty members to be more entrepreneurial.

Russia created its program a couple of years ago, and they are just in the implementation phase to try to create similar incentives for the Russian scientists and researchers in the universities.

I would say the Bayh-Dole act was one of the most important pieces of legislation that the US passed to stimulate innovation in the universities. Another one would be the Small Business Innovation Research Program (SBIR).

Before the Bayh-Dole act, who would own the IP rights?

The government would control the IP for the things that they funded. Basically that was transferred to the universities.

What are the latest trends in the innovation policy in the US?

The Obama administration focuses a lot on Regional Innovation Clusters (RICs). Competitions have been conducted for regions to compete for federal grants to help grow clusters around specific industries or technologies within their regions. That has been a new trend under the Obama administration. And the Department of Energy, the Department of Commerce, the Economic Development Administration (EDA) and other federal agencies have all participated in these trends. The Obama administration is also trying to increase the research budgets of the research based federal agencies. Of course, there are significant budget challenges within the US at this time but the Obama administration is supportive and understands the importance of the research, entrepreneurship and innovation economy.

Federal Law 217 was modeled after the Bayh-Dole act. The Bayh-Dole act gave the rights to universities to own the intellectual property, which was develop utilizing federal grants or research money that was given to them by the federal government. That enabled the universities to take the leadership in commercializing technologies, and also incentivized the faculty members to be more entrepreneurial

regions where they exist. Also, their missions for existence might be related to trying to come up with innovative solutions and cures to potential medical problems or diseases, or to try to stimulate their regional economy by creating jobs within certain US regions.

Another key actor would be the financial or the investment community. And that would be all the way from individual private angel investors to venture capitalists and the public sector at the state or national level. A lot of the states in the US have direct investment programs to support innovative SME's.

So you can see, it takes all these actors, which we talked about — government, industry, academia, foundations and the investment community — working together to create a real robust innovation ecosystem.

On the governmental side, what were the most important legislations that influenced innovation policy and promoted innovations?

Probably, one of the most important laws was the 1980 Bayh-Dole act, which is similar to rule 217 that was passed in Russia in 2009. Federal Law 217 was modeled after the Bayh-

Are there any figures as of how much the government spends on research and development per year?

There is a National association called the American Association for the Advancement of Science (AAAS) which tracks all dollars the US government spends by federal agency every year, and it has been tracking it for years. As a matter of fact I just spoke at their annual conference about a month ago. If you go to their website you will see a break down of the federal expenditures for research and development over the years by the US government.

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

Let's talk about what hinders innovation. First of all, it is culture. The federal laboratories that do research tend to focus more on basic research and mission specific research for their agencies, and have not been as successful in developing innovative commercialization research or transferring technology.

The universities that do innovation and research also have not experienced as much success as they could in technology transfer and commercialization. And that's due to the different

types of incentives and leadership priorities that are established within their individual universities because university research priorities vary from institution to institution. Some of them are very proactive in innovation and others are not.

Another thing that is a challenge right now is early stage investment capital. There is not as much money to invest in early stage ventures today as there used to be, and venture capitalists tend to be investing in more mature companies or later stage companies rather than in early stage companies. We have a much wider and deeper "Valley of Death" in the early stage investment world today.

The other thing that hinders is really the short-term investment mentality and philosophy. Big business is focused on short-term returns because

the Silicon Valley or Boston. There are many regions in the US that are very innovative but unfortunately most people around the world only focus on the things that they know the best, which are Route 128 in Boston, Silicon Valley, and Research Triangle, and, maybe, Austin, Texas. But a lot of the regions in the US are very innovative. And they have to be more innovative because they don't have access to all the venture capital, or they don't have Stanford, MIT, or Harvard in their backyard. That means they have to be more creative and they have to leverage resources more effectively.

What are these places?

There are many of different places in the US: the State of Utah is very innovative right now, with many spin-offs that are being created out of the

Now, the positive to that is that big businesses are actually acquiring or doing joint ventures with smaller businesses, which creates an opportunity for SMEs to interact with big business. Big businesses are looking at the SMEs to potentially do a lot of the research and development; they want to do it outside their large companies rather than inside. That is a positive development for SMEs in innovation in the US

they have to look at quarter-to-quarter profits, which means that they don't focus as much on long-term research as they did in the past.

Now, the positive to that is that big businesses are actually acquiring or doing joint ventures with smaller businesses, which creates an opportunity for SMEs to interact with big business. Big businesses are looking at the SMEs to potentially do a lot of the research and development; they want to do it outside their large companies rather than inside. That is a positive development for SMEs in innovation in the US.

I think one of the biggest aspects of positive elements is that a lot of the innovation is stimulated at the regional level and the state level. Most of the innovation is occurring regionally in the cities or major regional areas across America, and it's not just in

universities; Cleveland, which is north-eastern Ohio, has been very innovative in bio-science and clean technology area; the State of Pennsylvania has been very innovative for almost 25 years now because they created an Innovation Based Economic Development program called Ben Franklin Program; the State of Kansas has the Kansas Bio-Science Authority, which is only 6 years old but it has been very effective as an innovator in their region; Georgia has a program called Georgia Research Alliance which has been one of the leading States for eminent scientist recruitment, etc.

In closing, I believe Russia has an excellent opportunity to accelerate its own innovation strategy and global position, if it develops its own innovation roadmap that leverages its greatest assets and resources.

INNONEWS

Gazprom Innovative Development Program Until 2020 Approved

The Board of Directors approved the Gazprom Innovative Development Program until 2020. The Program was elaborated in accordance with the assignments given by Russian President Dmitry Medvedev and aimed at developing the innovative activities and raising the technology level in companies with state participation. The document contains a package of measures on developing and adopting new technologies, innovative products and services in Gazprom at hydrocarbons production, transmission and processing facilities, power plants as well as measures to create favorable conditions for the intense innovative development.

An emphasis is placed on the need to create novel energy-saving and eco-friendly technologies as well as raising investments in the R&D sector. The Program stipulates a pro-active approach to cooperation with corporate and independent research institutions as part of the R&D activities as well as with higher education institutions in joint studies and staff training.

www.gazprom.com

International Green Student Conference

International Green Student Conference (IGSC) will be held July 1—13, 2011 in Moscow. IGSC is biennial international student conference that creates networks across cultures in order to understand, and generate solutions for, some of the world's greatest challenges.

The cornerstone of IGSC is the student paper presentations. There will be about 30 student presenters, 6 presenters per subtheme. In addition there will be student produced video documentaries around the themes. Each student paper presentation will be judged by a panel of judges and awards will be given.

www.caleidoscop.org

Generation X — the US Secret Weapon



Tamara Carleton — President and Founder of the Innovation Leadership Board LLC; Fellow of the Bay Area Science and Innovation Consortium

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 been 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 Millennials 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.

Why Does the Silicon Valley Need Large Companies?



Richard Dasher — Consulting Professor at the Department of Electrical Engineering, Stanford University; Director of US-Asia Technology Management Center; Executive Director of the Center for Integrated Systems; member of the Board of Directors at Tohoku University

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

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

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 it's 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 longtime. 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 1800-s 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 businessmen 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.

Universities and Large Companies: Forever Friends?



David Weitz — Mallinckrodt Professor of Physics and Applied Physics, Harvard University; Director of the Materials Research Science and Engineering Center; Co-Director of the BASF Advanced Research Initiative at Harvard

Mr. Weitz, being the Co-Director of the BASF Advanced Research Initiative at Harvard, what can you say about this project?

5 years ago BASF was interested in establishing a research initiative in the US. They have done this in other countries, and sometimes they have done this in universities. We convinced them that they should do this at Harvard. Since then they have bought several companies that had large research presence in the US, and now they have several laboratories based in the US from those companies. But at the time, it represented an important opportunity for them to do research here, and for them to have presence at one of the major universities in the US, and at an important research environment. So they wanted to establish that effort in Harvard.

The BASF Initiative is an innovative model for university-industry collaboration, closely partnering researchers at BASF and Harvard. But in addition to funding research in the university, the BASF team regularly visits the Harvard campus to work together with academic researchers. This provides students with an opportunity to benefit from early exposure to industry. Also, Harvard faculty members retain the freedom to distribute and publish findings from the Initiative, while BASF has the opportunity to further develop discoveries for possible commercialization.

Who would own the IP rights in this case?

This is accomplished through Harvard's standard procedure for IP. Harvard files for IP before publication of the results, and BASF has the first right of refusal to negotiate an exclusive license for the IP. In addition, many times, BASF researchers are part of the IP, in which case Harvard licenses its share of the IP to BASF in the fields of interest to the company.

BASF Advanced Research Initiative is an important part of Harvard but it's not by any means the major source of funding.

It represents a lot of support for research and innovation but it's not the only avenue for getting support here. Still it's viewed as a very important component because one company in the School supports so much research.

What are the specifics of the innovation system in the US?

There are a lot of things. Where to start? I would say that there are 2 or 3 things that make the US unique. One is that not everything is successful in innovation if you are doing risky things; many things fail, but in the US it's accepted that things fail. People don't like it but it's not viewed as something negative, there is no stigma attached to failure. Instead, people are allowed to fail and then move on to something else, provided they learn from the experience. I think that is a very important aspect.

The other aspect is that people in the US are naturally encouraged to think outside of the box, to think differently, to look for different solutions. You are never satisfied with the status quo; you always look for new opportunities. These are the things that are, probably, the most important, cultural aspects of why innovation is so successful in the US.

How does the legislation regulate the innovation process?

Legislation does not get in the way of innovation, does not discourage innovation. It's not a place that particularly helps innovation through legislation. Most of the innovation comes from the private sector except for one thing. That is that the research enterprise in the US, in the universities primarily, but also in the National Laboratories, and to a lesser extent in some companies, is very large. The federal government actually puts a lot of money into research. And the real heart of innovation comes from all the research that gets done. That's very important.

How much the government spends on research per year?

National Science Foundation spends about 7 billion a year, the National Health Institute about 35 billion a year, there is a lot of money in Department of Defense, Department of Energy, and there are other agencies, so the total would be in the range of 50—60 billion, maybe more.

What are the major participants in the innovation process in the US?

There are several important participants in the innovation process in the US. It probably starts in the universities, where the largest amount of basic research is carried out. Universities have been encouraged to pursue innovation and pursue commercialization by the federal government which gives universities ownership to IP created by federal funding within the university, provided they try to commercialize the results. In addition, there is a fairly large venture capital enterprise in the US that funds development of research results, the next essential stage in the innovation process.

How important are innovation parks?

They play a small role. I don't think that is critical. But they are helpful. I think where innovation parks exist they are successful. But what actually is more important is the location in the country. If you look across the US — a large number of innovations occur only in relatively few cities. In the San

Francisco area, there is a huge amount of innovation. But if you go further away to the middle of the country — there is much less innovation. Same thing on the East coast — Boston is very big in innovation in biotechnology. But if you go to different parts of the country, it's much less.

What about Harvard? Do you have an innovation park?

Not really. There is a discussion of having one but there isn't one now. So, most of the innovation that does occur depends on the people doing it. Thus taking advantage of the expertise within the surrounding Boston and Cambridge area really drives innovation here.

You work at a university, but how important is the government role compared to that of the market forces?

I think that in the US it's market forces that are the most important. The government doesn't do as good a job. It does provide grants that people can apply for to help promote innovation, but, I would say, most successful innovation comes from private sector support. The ideas come from government support but once the innovation process starts, relatively little of that, as far as I can tell, is done with government support.

What are the latest trends in innovation policy? Were there any changes under the Obama administration recently?

Obama is basically a university professor. So he intrinsically understands and accepts the fact that good ideas can come from universities. And much of the policy that has been adapted recognized that ideas come from universities. Obama also understands himself the importance of science education and research in terms of the wellbeing of the country and the importance to the country's economy. Nevertheless under Bush, certainly, there was still support for research in the federal budget. Now that the budget is becoming very constrained, having a President who understands the importance of research will be helpful.

What hinders the development of innovation system in the US?

Interestingly the structure of the American capital system can actually be a hindrance to innovation because

funding of small companies tends to be determined by a relatively small number of people who operate fairly large investment funds. So they are much more interested in taking huge risks where the payoff is extremely big. As a result they don't tend to support companies that are smaller and need smaller amounts of capital where the payoff is not going to be quite as large. I think there is a range where companies should be supported where they have difficulties raising money because they are not large enough to get the attention of venture funds. There are, however, other ways of funding. Therefore it's not that they can't get funding, it's just more difficult.

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

These days, I would say, in IT, computers, software, biotech, and in green energy.

How do you explain it?

In IT and in software, it is because of the huge and very rapid pace of technology change. New companies were formed that didn't exist 5 years ago. Google has been around 10 years and it is one of the biggest companies in the world and there are many companies like it. The whole economy is changing because of changes in technology. That's, I think, why software particularly but also hardware are getting investments.

Biotech is getting big investment because this country, as do most countries, spends a huge amount of money on healthcare, on supporting basically the lives of old people. So there is a huge market that companies try to capitalize on. Equally important now is a sort of a revolution in medicine that is slowly happening through use of our knowledge of genetic information. That has become more important. Medicine will become personalized. So, again, technology is driving a very important aspect of the economy. That's why there are so many opportunities.

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

Innovation is essential and this whole country is built on innovation. I think that, if anything, it will play a larger role in the kind of science that gets done. This science will ultimately lead to the new innovative that occurs.

INNONEWS

INNOPROM 2011

International Ural Exhibition and Forum of Industry and Innovation will take place July 14–16, 2011 in Ekaterinburg. Supported by the Government of the Russian Federation, INNOPROM 2011 is the first Russian specialized exhibition dedicated to industries, technologies and innovations, offering unique opportunities for exchange of experience and positive interaction of representatives of federal and regional authorities, major domestic and foreign companies, small-and medium sized innovative businesses, scholars and experts. INNOPROM 2011 Exhibition will present Russian and foreign industrial developments, innovative projects and also projects of modernization of Russian leading industrial enterprises.

www.eng.spb-venchur.ru

II National Youth Innovation Forum "IIC "Sistema-Sarov — 2011"

Youth Innovation Centre "Sistema-Sarov" announced June 1, 2011 the beginning of accepting the applications for participation in the II National Youth Innovation Forum "IIC "Sistema-Sarov" — 2011".

www.i-russia.ru

IRF International Road Congress: Innovation in Road Infrastructure

IRF organises a three-day conference about the important theme of "Innovation in Road Infrastructure". The Congress will be organised within the framework of the Russia Transport Week 2011, taking place November 21–26, 2011 and supported by the Ministry of Transport of the Russian Federation.

The deadline for the submission of abstracts for the IRF "Innovation in Road Infrastructure" Congress has been extended to July 1, 2011. Abstract submitters will be notified by August 1, 2011 of whether their abstract has been accepted.

www.irfnet.ch

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