THE BROOKINGS INSTITUTION

TECHNOLOGY AND THE INNOVATION ECONOMY:
HOW TO HARNESS NEW ENGINES FOR GROWTH

Washington, D.C.
Wednesday, October 19, 2011

PARTICIPANTS:

Introduction and Moderator:

> DARRELL WEST
> Vice President and Director, Governance Studies
> Director, Center for Technology Innovation
> The Brookings Institution

Panelists:

> JUSTIN RATTNER
> Chief Technology Officer, Intel
> Director, Intel Labs
>
> ERIC NAKAJIMA
> Senior Innovation Advisor
> Commonwealth of Massachusetts
>
> KEVIN RICHARDS
> Senior Vice President
> Federal Government Affairs for TechAmerica

* * * * *

P R O C E E D I N G S

MR. WEST: I am Darrell West, Director of Government Studies and Director of the Center for Technology Innovation here at Brookings. And I'd like to welcome you to this forum on Technology and the Innovation Economy.

Technology is a great enabler of innovation in the education area. For example, technology helps us to personalize learning and assess students in real time.

In the healthcare area, we are now seeing the emergence of data sharing networks that allow physicians and hospitals to share records and save money and cut down on treatment errors. And for the economy, in general, technology has fueled economic development and long-term prosperity.

But, what are the new advances that will stimulate growth and job creation in the future? What can we do to sustain innovation and what are the lessons that would enable us to continue progress in a variety of different areas?

Today, we are putting out a paper that looks at the link between technology innovation and economic prosperity. Each of you should've gotten a copy as you came in. If not, there's a copy out in the hallway.

There's a clear link between technology innovation and economic prosperity. For example, a World Bank study of 120 nations between 1980 and 2006 found that, for each 10 percentage point increase in broadband penetration, that it added 1.3 percent to the gross domestic product of the typical nation.

Many countries are investing large amounts of money in digital technology in order to jump start their economies, yet, the interesting thing is, when you look at polling data, many Americans are skeptical of our future. An international survey conducted a couple of years ago by News Week and Intel found that Americans are more pessimistic than the Chinese. For example, only 41 percent of Americans thought that

our country was ahead of China on innovation while 81 percent of Chinese felt that U.S. was ahead. So, even though we're doing very well, people are worried about the future. They think we're losing our edge. They're worried that other countries are catching up with us.

So, one of the goals of this panel is to think about the policies that will encourage innovation and what we can do to make America do better and also make Americans more confident about our economic future.

In the paper that we put out, we suggest that there are a variety of policy actions that would help on the innovation front. One would be making permanent the research and development tax credit. This is something that congress seems to prefer to reauthorize on an annual basis and basically torture everyone in the process of will they or will they not at a particular point in time. That creates uncertainty which harms investment. There's really no reason for that because there is a bipartisan consensus this is something we need to do and we just need to get that done.

Secondly, universities play a vital role in innovation, but yet there are some stumbling blocks in the path to commercialization of ideas generated on college campuses. We have another project that I'm not going to talk about today, but we'll be doing some additional work in the future on ways that universities can speed up the commercialization of knowledge.

Getting adequate numbers and trained personnel in the stem field, science technology, engineering and math is absolutely crucial. We're at a point where Americans seem not as interested in getting advanced degrees in these fields and that creates a real problem for us. And then, simultaneously, our immigration policy is making it more difficult for foreign nationals who come here to study to stay if they end up wanting to do that.

So, we think that there are a variety of policy changes that would help sustain our technology edge and allow us to undertake the innovation that will maintain our economic future.

To help us understand how we can leverage technology in a variety of different areas, we have brought together an outstanding set of speakers.

To my immediate right is Justin Rattner, who is the Chief Technology Officer and Director of the Intel Labs. In those capacities, he directs and Intel's global research efforts on microprocessor systems and communications. Justin joined Intel in 1973 and was named its first principle engineer in 1979 and an Intel Fellow in 1988. He was named scientist of the year by R&D Magazine for his leadership in computing. He's received several Intel Achievement Awards for his work in high performance computing and advanced cluster communications architecture.

Eric Nakajima is Senior Innovation Advisor for the Commonwealth of Massachusetts, so he can help bring a state perspective to this topic. His current efforts include a major super computing center to be jointly operated by MIT, Boston University and the University of Massachusetts with some corporate partners.

From 2007 to 2010 he served as Senior Policy Advisor for the Economic Office of Housing and Economic Development for the Commonwealth of Massachusetts. Prior to that, he worked as a senior research manager for the University of Massachusetts Donahue Institute, which is the University's Public Service and Economic Development arm.

Our last speaker will be Kevin Richards who is a Senior Vice President of Federal Government Affairs for TechAmerica. He was named to that position in January of this year, and in that role he leads the association's efforts in terms of getting congress and the administration to adopt various kinds of policies.

Previously, he served as a senior manager at Symantec Corporation where he managed the Federal Government Relations program. He also worked for more than 13 years on the staff of the late U.S. Senator, Ted Kennedy. So I'd like to start with Justin. What do you think is the most effective model for technology innovation and what can we do to improve cooperation between Government, industry and academia?

MR. RATTNER: Well, thanks Darrell, and it's a pleasure to be here. That sort of a question, I get up every morning and ask myself. We've, I think, prided ourselves at Intel in trying to take an innovative approach to, I guess, what some people refer to as the triple helix of innovation that involves industry and Government and academia. And I think, in the many decades I've been involved with it at Intel, we've gone through iteration after iteration.

We've recently embarked on a new experiment, primarily in industry university collaboration for innovation. We took a bit of a queue from the National Science Foundation. They, from time to time, have these science and technology centers, which are supported to the tune of multiple millions of dollars a year over a period of five years or so. And we essentially created our own fleet of these centers -- we call them Intel Science and Technology Centers -- here in the U.S. We've announced five. We plan to have two more we'll announce later this year, and another one in the first quarter.

And I think you can view ISTC. The reason I bring it up as sort of what we believe is the best thinking that's available to addressing the comment you made about how do we become more efficient, more effective, more successful bringing the best ideas from the academic sector into the commercial sector; and I'll just cite a few of the learnings.

First of all, you have to bring serious money to the table. You know. A

small grant, as we also do -- you know, $50,000, $100,000 a year doesn't get the

necessary attention. When you walk in and you talk about spending several million

dollars a year or more, as is our case, then you get lots of attention.

MR. WEST: That would get my attention.

MR. RATTNER: That would get your attention. So we knew we had to

bring serious money to the table. We wanted that money to go largely to the universities,

to the researchers, I should say, you know, and not get gobbled up in overhead, which is

often the case.

We wanted an open IP policy, which has often been, I think, a stumbling

block for industry academic collaboration. So all of the work -- we actually ask the

universities to make a dedication in the public interest of all the results of their work, and

we put all of the software into open source.

You know, a lot of people question that -- even within Intel -- question the

reasons for doing that. But we really view the university as the best place to do the long

range work. I'm talking about work that's, you know, that's five or ten or even more years

into the future. That's very hard to do inside a company. You know, I can't speak for

everyone here, but I think it's true at most companies that R&D always suffers from

what's called the tyranny of the urgent, right? There is the product for next year, you

know, for back to school or a holiday or whatever it is, and resources just get, you know,

just get taken away from the longer-term stuff.

Another thing we felt was very important, was part of the innovation here,

was having Intel researchers on campus. And you can talk to Jared Cohon at CMU. You

can talk to any of our academic partners and they will tell you that's about the most

important thing from their perspective, that this isn't a check-writing effort as so much

support from industry has been to the universities where, you know, somebody writes a

check; the money just disappears; some graduate students do some research work and

not much happens after that.

You put industry people on campus working side by side with faculty

members and students, both undergraduate and graduate students, and that's when the

magic happens. And they will -- I think all of our university partners will tell you that the

presence of real live industry people on campus makes all the difference.

We then took it upon ourselves to try to create innovation communities.

So, rather than funding a single university, we actually ask a particular university -- what

we call the host school -- to engage let's say four or five, maybe six other universities in

the research. And I can tell you that this is driving a level of collaboration that's really

unprecedented.

Professor Pat Hanrahan at Stanford is the co-PI, is the Stanford PI --

there's an Intel PI at our visual computing center at Stanford -- and he will tell you his

email traffic went exponential, even before this was publicly announced, because people

who had wanted to collaborate for many years, but had just never had the right

opportunity or the right funding model, were suddenly given that opportunity, and the

excitement was palpable.

I remember sitting in an open-air restraint in Palo Alto, you know, with

Pat just bubbling over with the excitement. And at the SigGraph, the big graphics

conference last August, that center and that community of researchers really dominated

the conference.

And I guess, the last thing is, you have to think of your people -- this is

from the industry perspective -- your on-campus people as really part of your research

organization and your innovation practice. So they actually report in to, in our case, you

know, a set of vice presidents that run various research divisions under me as part of

Intel Labs. And, you know, they're viewed and they're measured just like any other working researcher. So, that's done to make sure that these people become the conduit by which the new learnings, the new ideas, the innovations come out of the academic sector and come into Intel, and we're best positioned to fully exploit them.

MR. WEST: Okay. So, it sounds like the university rule is crucial, and then critting the innovation communities, kind of clustering people, getting a critical mass that can help promote innovation.

MR. RATTNER: Absolutely.

MR. WEST: Eric, you advise the Commonwealth of Massachusetts on innovation policy, so can you describe, in a moment, what you're doing and what is it that you have found makes for a successful innovation?

MR. NAKAJIMA: Thank you very much. I think this is a good time to actually talk about Massachusetts innovation policy. It's something we don't typically come together and describe in detail what we're trying to do in innovation. But one of the reasons why I'm happy to do so is because we believe that, in recent economic trends, there are performance coming out of the recession in many ways relates to the economic strategy that Government Patrick has pursued investments in education, infrastructure and innovation.

If you look over the -- right now we have a 7.4 percent unemployment rate in the state, well below the nations. We've added 70,000 jobs since December 2009, which is a 2.2 percent growth rate. And by a number of measures, whether you look at the Milken Institute or The Koppen Foundation or even CNBC's rankings of the best states to do business, Massachusetts ranks in the top 10 or even higher, closer to number one. So, we think we're doing some things right, and innovation policy has been at the heart of the work we're doing.

For Massachusetts, it's actually pretty easy for us to focus on innovation because, the only real natural resources we have, once the cog fishing was depleted, is our smart people, our talented work force. But if you really think about what it is that we do that's special or secret, it's not actually based on the people. It's based on our ability to invent new industries, reinvest ourselves and transform our economy over time. That's been true since textiles, pioneering trade with China, computers or even robotics today. The Massachusetts economy is not the same as it was 50 years ago or 100 years ago or 150 years ago, and that's always based upon innovation and the institutions that help spur that innovation. So, it doesn't happen naturally. It does happen through Government intervention.

I think a great example of that is -- it's hard to imagine Massachusetts without the Massachusetts Institute of Technology, but if you think about its roots --- and you probably know what the routes are -- they came out of the Moral Land Grand Act signed by Abraham Lincoln. And then, if you think about the impact it's had on our economy, the transformational one that was largely spurred, or certainly goosed by federal R&D spending in World War II and during the Cold War So --

MR. WEST: So the Federal Government is still relevant to this.

MR. RATTNER: So Government -- this is exactly -- you got the message. Government absolutely plays a role. So the question is what's Massachusetts doing? Our focus is on supporting the pipeline of innovation from ideation to advance manufacturing, and there are five basic ways that we're doing that.

The first is through investments in research and development. So, we're investing in facilities throughout the state, highest level we've done, both at public and occasionally public and private universities together. We're also focusing on new investigator grants because we know that we need to have -- even though we have a

very competitive position right now in innovation, we need to get the next generation of smart folks choosing Massachusetts as a place to do their work.

We're also seeding research and development through collaborative matching grants, particularly for industry collaboration and through federal support as well. We're doing that with our Life Sciences Center, Clean Energy Center and others. So, that has been a real focus because, if you think about it, that's a fundamental enabling infrastructure of a lot of the ideation that's in transmission and commercialization that occurs.

One of the great things we're doing, I think too -- and it follows up on your comments -- is we're focusing on supporting collaboration. So, you had mentioned in the introduction the high performing computing center that we're developing with MIT, Harvard, BU, Northeastern UMass, and with support from Cisco and EMC. And part of the intentionality of that -- apart from the fact that it's a great shared-use facility; it's going to improve the competitiveness of these institutions -- it was also to spur a conversation between the corporate sector and the universities between each other to incent collaborative research.

And as a matter of fact, just this fall, those universities have developed a seed fund to support collaborative research between those universities, particularly in the areas of hyper (inaudible) computing and efficiency or applications and virtualization that affect that as well, which was something obviously of great interest to Cisco and EMC as well.

The second big area is in moving those ideas into the marketplace and supporting technology transfer and entrepreneurship. There are a couple of different ways we're doing that; some through support for prototyping, through catalyst and accelerator support for proof of concept as well, as well as also through work we're doing,

frankly, mostly with the private sector around supporting mentorship opportunities for people who have start-up companies or ideas, either coming out of the university or students or folks who interact with systems. A lot of times that's in Boston, but we're supporting that work, also in the central and western part of our states as well.

The third area is growing companies to scale. And for that, we have programs that are both sector-agnostic through our Massachusetts Growth Capital Corporation which was formed last year, as well as, also, through our Life Science Clean Energy Program and the Massachusetts Technology Collaborative, which provides tax incentives, subordinated loans and other investments to help companies accelerate, particularly ones that have already significant private sector investment or some level of proof or validation from SBIR/SCTR grants as well.

And then, the two other areas I'd briefly touch upon are, one; workforce development. We have a fairly ambitious stem plan in the Commonwealth of Massachusetts which is focused on not only improving the quality of stem education, also rationalizing it because we've frequently had, through our companies and foundations, sort of a thousand points of light and a number of good ideas; many very, very worth while. And the question is how do we have impact across the Commonwealth in a way that provides a little more efficiency and rationality to it, but also it gives a signal to foundations in the private sector that their money is being used well.

A particular area of focus on that is also trying to encourage women and minorities to choose stem fields because they know there's a great gap in terms of their adoption of stem careers, and we want to do that. And that builds upon the educational reform effort we're doing outside of stem and technology to close the achievement gap. There's a pretty significant effort we're doing there and the governor, in fact, has increased education funding during the recession and, as we can talk about, that's a

choice. It's something that he did consciously because he knew it'd make a difference to our economy as well as to the welfare of people in Massachusetts.

And the final area is also focusing on taking those ideas and designs when they're made and bringing them to the marketplace through production in Massachusetts. That's not a settled question, in terms of how to do that the best we can, but the fact of the matter is Massachusetts has a robust precision manufacturing sector that is already producing world-competitive medical devices and defense technologies and IT products. And so, we are working with our MEP and with Association of Employers in manufacturing to think about ways of supporting (inaudible) certification, workforce development and other efforts that could help them continue to compete and grow and also connect to growing innovation fields and reduce that barrier between the leading R&D work that we're doing, and the capabilities that are, in fact, in the back yard of those great research centers.

One final point I'd want to make is really about the method in which we approach this work. Governor Patrick, from the beginning when he entered in office, believed that we didn't have all the answers. He came from the private sector. Our secretary also came from the private sector. So, we look to partner with and leverage the insights and resources of people in academia as well as, also, industry through organized collaboratives.

We've done that with the creative economy and life sciences and digital industries and advanced manufacturing. And we think that, as a number of virtues among them, the fact that we can get a lot of policy consensus around the work we're doing, we also can unearth good ideas that can make a difference in growing our economy. It also does provide leverage because, frankly, the resources we have in this state are a drop in the bucket compared to what we can leverage, if we can create the

right partnerships, frankly, outside of our doors, and that's worked very, very well for us.

I think there are a couple of good examples of that. One is an effort called 12 by 12 that came out of our tech hub collaborative in which venture capitalists and serial entrepreneurs in Massachusetts are working to mentor young startups, as well as also provide some investment and sit on their boards. Another is Mass Challenge, which I think is fairly well-known, which is a global startup competition which also provides mentorship and various opportunities to meet and approach funders, which is in its second year in Massachusetts. Those things are really privately led, but the state was a catalyst or a seeder for those efforts. And so, we're happy to be at the table and we're happy that they're taking the lead.

Another area in which we're, I think, more aggressively involved is the computing center that you mentioned earlier in which it is not only a great resources facility, as I mentioned; it's enabling conversations between a set of stakeholders who, at these great universities, have never collaborated in the way that they're currently doing. But also, frankly, it's an investment in the western part of our state in one of the poorer cities in the commonwealth, but it's called Holyoke, Massachusetts which has low-cost power and great connectivity. This is probably the largest private investment outside of a shopping mall in 100 years since its founding, and it's something that we believe is a building block to anchor a connection to the innovation economy from Kendall Square and Longwood and the great places we have in the eastern part of the state out west.

MR. WEST: That's great. It sounds like you have lots of exciting initiatives taking place in Massachusetts. Kevin, TechAmerica, a few weeks ago, put out a report on the IT industry and job creation. And here at Brookings, we like data. So, can you tell us a little bit about what you found, what the employment patterns are and what's going on in that area?

MR. RICHARDS: Sure. Well, thank you to the Brookings Institute for having me here today. Having been raised in Massachusetts and grown up and raised and born in a town next to an Intel manufacturing facility, I feel right at home at this panel.

In terms of, you know, what is the state of job creation in today's innovation economy, by far, the high tech job creation is really nearly growing four times faster than other sectors of our economy.

TechAmerica releases an annual Cyberstates report. We released our latest report on October 5th, and this report relies on data from the U.S. Bureau of Labor Statistics. And the report provides a national and state-by-state data on high tech employment wages, establishments, payroll, wage differential and employment concentration.

And in the first six months of 2011, we saw a slight dip in 2010, about a two percent decline in high tech employment. But in the first six months of 2011, we gained those jobs back already. We gained 115,000 high tech jobs in 2011.

High tech employment in the U.S. is a total of 5.7 million jobs. And the average high tech wage is 93 percent higher than the average U.S. private sector wage. The average high tech wage is about $87,000 versus the average private sector wage of $45,000. And high tech accounts for one out of every $10 in the U.S. payroll for a total of 499 billion.

The leading high tech states in employment in 2010 were California, Texas, New York, Virginia and Florida. Michigan actually led the nation in net-tech job creation in 2010, adding about $3,000 jobs. And we also saw large gains in the District of Columbia, West Virginia, Utah and South Carolina.

And also, for the six straight years, I hear locally, Virginia led the nation in concentration of high tech workers in 2010 with 98 high tech workers per 1000 private

sector workers. Also, high tech has accounted for 50 percent of total venture capital funding over the past four quarters. To give you an idea of the scope of that biotech and medical devices combined, comprise about 25 percent.

And a little bit about what are the enabling factors for high tech job creation at TechAmerica -- we refer to them as the four Ts; technology, talent, tax and trade. On the technology front, we really need a robust federal investment in basic research to create the scientific base that companies use to produce new products and innovations, and also, I might add to technology, investment in the broad board infrastructure. So, communities in rural areas, like in western Massachusetts really have the ability to connect to the rest of the world and sell their products globally.

In terms of talent, we need to invest in stem education to provide our children with the foundation of math and science that will prepare them for high paying careers for the 21st century.

And in terms of tax, we really need corporate tax reform. Right now, the U.S. has the second highest corporate tax rate at about 35 percent. Other nations are becoming more competitive and competing against us. Our research and development tax credit, we'd recommend making it permanent. The on and off again nature of the credit doesn't allow companies to do the long-term planning necessary to take full advantage of the credit. And a lot of our companies were not around when the tax reform happened in 1986, so imagine how much the economy has changed since 1986 from email to the ipad to all the innovations that have come along.

We really need to modernize our tax codes and incentivize job creation in the U.S. A lot of other countries are doing it and getting ahead of us and becoming more innovative in how they approach tax reform.

And trade, opening up new markets to U.S. products and services.

Congress took a giant step forward by approving the free trade agreements with

Columbia, Panama and South Korea. The Congressional Research Service estimates

that that will create about 370,000 U.S. jobs. So, we believe those factors are enabling

factors to helping spur U.S. job creation and I'm happy to answer questions.

MR. WEST: Okay. Thank you very much. Justin, there's been a lot of

debate in this country about the pros and cons of investing in green energy and green

technology. So, I'm just curious from your standpoint, what type of opportunities do you

see in this area? Is there much evidence in terms of possible economic impact?

MR. RATTNER: Oh, absolutely. I think the potential impact is really

enormous. I think, you know, both, in terms of what it can do from an environmental

perspective -- and I'll give you an example in just a moment -- you know, as well as what

it can do to stimulate economic growth and, I guess most importantly, to create new jobs.

We have a pretty active effort in energy assisting ability. Research, as

well, as a very active effort to make our manufacturing facilities as green as possible.

Intel's the number one buyer of renewable energy in the United States. It takes lots of

power to run a chip plant. And we work extremely hard to make sure that the water we

release from the plants were also water-intensive, you know, is as good or better than the

water that comes in the plants.

But let me come back to the research side and what's going to drive

innovation. We've particularly focused on something we call personal energy

management, given our history and background in personal computing. And I think this

may be something that, you know, the folks at DOE haven't quite dialed into yet. At least,

they haven't been actively funding this work.

But, you know, we think if you can empower the individual with real-time

data about how they're consuming energy or allocating their energy budgets -- however

you want to think about it -- that on an individual basis, they can make great

improvements in how they use energy. And, you know, it's not a huge amount on an

individual basis, but if you could get, you know, 1 percent of all U.S. households -- that's

about a million households or about a little over a hundred million households in the

United States -- if you could get one percent of them to save in the range of, you know,

15 to 30 percent on energy, they'd lower their energy bills, first off, you know, about $470,

$475 dollars. But, you know, you wouldn't have to build a couple of coal fired power

plants, peaking plants. You would save about two and a half million tons of coal. It

would be the equivalent of taking half a million cars off the roads. And -- I don't know;

how many people own a prius or a hybrid vehicle? Well, I did own two. I just sold one,

so my daughter still drives the Prius.

But I tell you -- I mean, if you're trying to relate to this, you know --

whenever I get in her car, the screen that up -- it was true when my wife drove her Lexus

hybrid -- the screen that's up is the energy screen. All the other screens, you know,

telephone screens, and what have you, no. It's always the energy screen and you're

always focused on, "Gee, you know, what's my instantaneous fuel economy; what's my

long-term fuel economy?" And the more you can turn that into a game -- and if

somebody has a question, I'll elaborate on this -- but if you can make it competitive -- and

it's different in different cultures around the world. But in the U.S., we're very competitive.

And we like to know, you know, what our neighbors are doing, how they're consuming

energy; anonymously, of course, respecting their privacy, right? You know, "Hey, Bill,

you know, you're really, you know, burning up too much power." No; if you can do that

anonymously, you know, they'll compete with your neighbors, they'll compete with their

neighborhoods and so forth.

So, by introducing, I think, the game element to it, we can really take

huge strides in the way we do it, and we can gather so much data -- and this is how you monetize it -- gather so much data -- you know, understanding how people use energy and how people save energy becomes a database that's really worth mining. And the data products that come from that allow entirely new businesses to emerge. I mean, just one, you know, is like home appliance maintenance. We have a censor technology called West, which is wireless energy censor technology.

MR. WEST: I like that, by the way.

MR. RATTNER: It's a little block, it plugs into the wall outlet, and it has a little processor in it, a little computer in it, and a wireless connection. And it monitors the power-line behavior in your home and can tell you which loads are turning on and turning off. It does it using pattern recognition. And every, you know, light-bulb -- every appliance has a unique signature. It's like a fingerprint.

And as we've continued to refine the technology, we're to the point where the researchers say they can actually tell you the model number of the refrigerator or the air conditioner that just turned on or just turned off. Well, now you think about that and you say, "Wow." You know, "Wouldn't the appliance makers like to have access to that data to understand how that's used. Wouldn't service people like to do that?"

Because the other thing we've discovered, or another thing we've discovered is, as the machines begin to fail -- as those appliances begin to fail, their signatures change.

MR. WEST: Hum, interesting.

MR. RATTNER: Right? The compressor, the electrical transient the compressor puts on the line isn't quite the same when the compressor's about to fail. So, you know, suddenly, you've enabled all sorts of new opportunities in home maintenance by collecting this data and making it available to a whole variety of industries.

MR. WEST: Actually, I think this smart appliance example is a good illustration of what's emerging in terms of machine to machine communication. I mean, we're kind of used to thinking of technology and innovation as people to people but, you know, through appliance censors and other things, there's going to be a lot of innovation that takes place at that level.

MR. RATTNER: Oh, yeah. And if I could just add to that --

MR. WEST: Sure; go ahead.

MR. RATTNER: I mean, the perfect observation, right? This is -- you know, this is the emergence of the internet of things. And I really want to underline internet of things because most people hear that and they think internet of 'things'; they get all focused on the things and they forget about the internet. It's really the internet of things that's important because those things are going to talk to one another, but they're also going to create literally a title wave of data.

I mean, you know, when we talk to the big cloud computing companies, whether it's Google or Face Book or Amazon or Microsoft, you know, whomever -- you know, Baidu, if you want to go outside the U.S. -- their storage requirements are actually growing faster than their computing requirements. They're being inundated by data.

Now, a lot of that, you know, is pictures of the birthdays and, you know, the weddings and all of that. But as the internet of things begins to grow, they're going to be inundated by a different kind of data, which is the censor data that I was just talking about. And we have yet to invent the architectures that can aggregate that data and present that data in a way for it to be mine. The money is in the data. And this is a huge opportunity for the U.S. to really step out in front, I think, of countries elsewhere in the world.

You know, we created the internet. We invented cloud computing, for all

intense and purposes, and yet, within Intel -- you know, when we compare how our researchers in the U.S. are doing compared to our researchers in China, the Chinese are moving very quickly here. Some of my best internet of things -- people are actually in my Beijing lab and there's tremendous encouragement by the Chinese government on this topic. And, you know, it's something we -- it's a huge opportunity, means millions of jobs potentially, and we've got to stay on it and not get behind it.

MR. WEST: No, I agree. Data analytics, you heard it here.

MR. RATTNER: Yep.

MR. WEST: It's the equivalent of plastics in the 1960s.

MR. RATTNER: Yeah. You should've said data instead of plastic.

MR. WEST: Eric, what do you see as the biggest barriers to innovation? I mean, for example, in Massachusetts, what are you doing either through policy or other devices to overcome particular barriers?

MR. NAKAJIMA: Well, I mean, if you listen to businesses and you listen to people at our universities, the conversations I worry about, about pipeline and stem pipeline. And if you look at the trends over the last 20 years, we're really great a producing smart people, but also frequently, those smart people end up leaving and going to California or elsewhere. And so, we have to make a concerted effort to improve the connections between young people who are coming out of our universities and job opportunities. We're doing that through internship programs. We actually have a great internship program at our Life Sciences Center that matches students from the community college level straight up to the graduate level. We have paid internships with companies that also then match that funding. We have done in the last couple of summers with over 100 young people each summer, but now we're starting to do it in the fall as well. And we're also doing it through exposing young people to stem careers as

well and improving the experience between translating what they learn in school, whether it's at the college level or at the youth K12 level, to what they experience in companies to encourage them to go into stem careers, but also to get better awareness to Massachusetts' rich diversity of potential future employers and sort of envision themselves in those carriers.

I think another area that we are working on is supporting research and development capacity. I mean, when you, again, listen to both companies as well as universities, there is a great, great concern that federal support for research and development is going to either be stagnant or weaned in the coming years. And Massachusetts, particularly -- as great as we are in a lot of things we're doing, the reality is, we are incredibly dependent in terms of our innovation pipeline on funding that's coming out of DOE and NIH and NSF.

We get, I think, our disproportionate fair share of funding out of NIH area. I know it was 11 percent of all national funding a couple of years ago. Now that's competitive, so this is stuff that's being earned by the great institutions we have. But the fact of the matter is, in the absence of that funding, that pipeline of ideas is going to be more difficult to come by, even though, obviously, many of our great discoveries come out of people who are in private companies or who are consulting on their own, so that becomes critical as a critical concern.

What we're doing, as I mentioned earlier, is trying to bolster our support for research facilities, investigators and also matching funds for university-based, and sometimes industry and university-based responses to federal solicitation.

So, one thing we are doing right now is trying to put in place an innovation fund, a restriction development (inaudible) grant fund which would be a $100 million fund that would support collaborations between either public or public and private

research institutions in the state, so responding to federal solicitations or opportunities to collaborate with industry.

We're doing that marker down precisely because we believe, if our institutions are collaborating, it'll make them more competitive for federal solicitations. It's also, frankly, break down silos that'll accelerate innovations out of the universities or connecting with our companies. And so, that's another area that's forthcoming and in our future.

MR. WEST: Okay. A question for Kevin, and then we'll open the floor to questions and comments from you. There's been a lot of talk about America losing its competitive edge. And, in fact, you referenced that in your earlier comments. First of all, is that really true? And are there lessons that we should be learning from other countries in terms of what places like China, India or various European nations are doing that we're not doing?

MR. RICHARDS: Sure. Well, I think, in terms of the U.S., it's not so much a question of whether we're losing our competitive edge or not. The question is, is the rest of the world catching up to us, and I think the answer to that is yes. It is certainly a more competitive landscape than we've seen in years past.

I think that our great college and university systems, such as in a state like Massachusetts, is really our competitive advantage versus the rest of the world. And I know China is trying to replicate the U.S. education system, and they are also making great investment in their infrastructure overseas. They're going to have -- I think it's more high speed rail than anywhere in the world; it's projected by 2015. So, they're really making a sustained investment in their infrastructure. Their education system also in intellectual property and patents. They are also buying a large number of patents.

But I really think that the U.S. today leads the world in the innovation

economy because of our intellectual property and our investment in that area and research, and development from years past. Symantec, the corporation I worked for before joining TechAmerica was founded through an NSF grant in 1982. Many innovations in the ipad have come from our national labs.

And I think that we are the envy of the world. I think a lot of other nations are trying to catch up to us in terms of intellectual property. You'll see a lot of struggles between U.S. corporations and Europe in terms of the areas at IP, for example. I think the free flow of information is with cloud computing in other areas is certainly in an emerging area. The U.S. has a chance to lead the world in cloud computing.

TechAmerica Foundation recently released a report. We had 71 cloud commissioners from 71 of the leading U.S. cloud providers, at the urging of the administration released recommendations around cloud computing and how we can continue to man our competitive advantage there.

So, I guess the short answer is we really can't stand pat. I think that congress and the administration needs a forward looking administration policy. I think that congress' approach to innovation is very parochial. There are several committees that have jurisdiction over technology and innovation policy, so it can be a struggle to have laws keep up with the pace of innovation.

I think it was Andy Grove at Intel that said that high tech operates six times faster than your average business and congress operates three times slower than your average business, so that's a nine percent gap in how those areas operate. So, I think that the rest of the world is becoming more competitive and the U.S. needs a more sustained investment in research and development. We need to do a better job protecting our intellectual property and we need to open up new markets because 95 percent of the world's population resides outside the United States.

MR. WEST: Okay. Thank you. Let's move to questions and comments

from the audience in the back row, right there. There is a microphone right behind you.

If you could give your name and organization affiliation. And we'd ask if you'd keep the

questions brief just so we can get to as many people as possible.

MR. WINDERS: Steve Winders, local researcher. Since we're here in

D.C., I'd like to ask about the innovation culture at DARPA. Now, that seems to be rather

unique. I know other countries have tried to copy it. Is that something that could be

generalized to other places in the U.S.?

MALE SPEAKER: Well, I'll take -- well, I've been a DARPA PI and I have

a DARPA contract right now. I'm not the PI on it, however, so let me kick that off and let

everybody else chime in.

Yeah. I think -- you know, DARPA has a remarkable history, as I've said

publicly on other occasions. I'm not sure that they're doing what they used to do. And, in

particular, it's creating these communities of researchers, really the best and the

brightest.

You know, when I was a DARPA PI, it was back in the last 80s and early

90s. The community of researchers that DARPA assembled was clearly second to none,

globally; extraordinary collections of people. I think that has certainly weaned in several

decades since then.

Part of our motivation in the science and technology centers for insisting

that the universities create communities of researchers around the topics of interest to us

was driven largely by our experience with DARPA a few decades ago. Our belief that

that is an extraordinarily powerful model and one that needs to be reborn, if you will, in

the U.S. And, you know, if we have to do it from the industrial side -- if the Government's

not going to do it, we're going to do it because it's so important. And the benefits not only

Intel. I think it benefits all of American industry. I'd really like to see that notion flower once again at DARPA.

MR. WEST: Okay. Right here on the isle, up front?

MR. FALL: Hi. Chris Fall, Office of Naval Research. You know, efforts at the state level and maybe an initiatives from congress' side at the executive branch, we really don't have innovation and infrastructure to speak of for long-term planning. What do you stay to -- and sometimes by design. You know, maybe industrial model, ground-up is better. What do you say to people who say we shouldn't have models like the Fraunhofer in Germany and closer coordination between industry and the Federal Government?

MR. RICHARDS: Well, yes. I guess I'll start off. I think that, in terms of an industry point of view, we find the public/private partnership extremely valuable. I don't think that any -- the Government can't recover the economy and the private sector can't do it alone either.

And I think that, for example, when you look at the relationship with research and development, for every one dollar the Federal Government invest in research and development, it gets five private sector dollars returned to the economy, and the private sector needs access to that off the shelf technology as well. I'm not the technologist on this stage, so I'll defer to you about that relationship. But I find the partnership -- and we do truly see it as a partnership because the Government can't do it alone and the private sector can't do it alone. And I think based on the U.S. model, I think it's an extremely important relationship.

MR. NAKAJIMA: I think it's an interesting case about how you organize the Federal Government to do this. I mean, sitting in here Brookings I think is a perfect place to talk about regional innovation clusters. And a model that basically says that the

condry of people that you would bring together to have that conversation and forge that

partnership is most likely to exist in regions of the country, as opposed to someone who's

across states, because within states, as opposed to at a national level, doesn't mean

there's not a purpose for national level policy discussions. But I would say that, in terms

of the work we're doing -- I hinted or directly stated this in my comments earlier that, apps

in collaboration with industry and voices in the investor community and academia, we

would frankly not be able to wisely spend whatever state resources we have or, frankly,

have a proper view into the directions in federal research and, initially, trends that would

allow us to wisely partner. And frankly, along with that though, I would argue -- again, as

I mentioned earlier, the opportunities for leverage are also there as well.

You know, if you think about how we typically view of Government -- and

maybe this is true in state or municipal governments, more than federal -- people tend to

think of agencies providing direct services so there's a need out there and you want to

find the need and you want to go out there and you want to solve the problem, and so

you look to government try to figure out how to solve that problem. Our philosophy, and

particularly on innovation-based economic development, is that our role oftentimes is to

deal with the foundation, infrastructure and education -- broadband, stem education,

things like that -- facilities that we need to have at our campuses, which are absolutely

critical to whatever those people in those buildings are going to end up doing with it.

But, frankly, when it comes at a center point of ideation and of

commercialization, we know that the people in the private sector or the investigators

know better than we do and they're at that leading edge. And so, frankly, our role at the

table is, oftentimes, is a convener and as a catalyst and as a seed-funder more than it is

anything that's being directed. And I don't know how you do that, my point is, unless you

bring people together and forge that partnership and have that collaboration. You don't

have the conversation if you're not listening. There is no way you can come up with the policies that can greater facilitate that private sector success.

MR. RATTNER: I'm going to take a flyer on this one and suggest what would really be useful coming from the Federal Government, in particular, is one or more -- I would just take one; I'd be happy with one -- vision for the future.

You know, we always cite any discussion about innovation. We always cite, you know, Kennedy's declaration about, you know, putting a man on the moon, but that was a vision and you cannot over-state the impact that that vision had on just about everything we did in those days. I mean, that vision inspired a generation. You know, that -- you know.

I mean, my interest in science and technology rose geometrically, you know, when the thought of putting a man on the moon was first articulately, I guess, by Kennedy in the earlier 60s. I don't understand why the Federal Government -- you know, it doesn't really cost a lot of money to do this -- you know, can't articulate these visions, you know, whether it's in energy, you know -- why don't we have a vision for energy independence?

You know, don't tell me it's this solar cell versus that solar cell -- you know where that goes -- right? But having a vision of energy and independence, I think would be of enormous value. You know. It would just inspire the academic sector, the industry sector -- you know, I think the nation at large, just as Kennedy's Apollo vision did.

We have an effort underway at Intel to get a conversation going about the future. We call it the tomorrow project. And you may have seen it's had some recent coverage in the media. And there are a series of dialogues with thought leaders from all sectors about their vision of the future. And these visions are so important because the

future is not this thing out there that, you know, we're just sort of treading water and the future will over take us.

You know, Alan Kay, a very famous computer scientist said some time ago -- Alan says I make him sound really old when I say that, but he's a good friend of mine. Alan said, "The best way to predict the future is to invent it." I mean, the future that we will live in will be the one we create. It's not coming, you know, by Federal Express from some office in the sky. And I think we, as a nation, you know, have to engage in that dialogue. What future do we want? And then we can set about the business of inventing that future.

I can't think of any better role, you know, for the Government or really the leadership of the nation than providing the venues to have that conversation, and then for identifying these visions and advocating these visions -- you know, more than money. I think powerful visions of what we as Americans want as a future would do more than anything else to spur innovation, to spur investment, to create jobs and to give all of us a new sense of purpose.

MR. WEST: I think that's a very important point. But as I listen to the presidential debates, it's like this stuff isn't on the agenda.

MR. RATTNER: No.

MR. WEST: You know. Those are not the questions that are being asked, but you're right, those are the questions that should be asked. Up front, Mike Nelson over here has a question.

MR. NELSON: I wanted to start by saying I was really glad to hear the discussion of vision. I had a privilege for working for Senator Gore both in the senate when he was vice president and the vision of an information highway along with $300,000 spent on the White House website. Did a great deal to push the agenda.

MR. RATTNER: Someday I'll tell you about trying to get Intel connected to the internet back in the 80s.

MR. NELSON: My question was about information policy. I was a little bit depressed when he went through the first round. Then I heard all the standard things that we talk about when we talk about innovation policy; education, technology policy, research policy. So I was overjoyed when Dr. Rattner bought up data and information.

I'm working on a report right now on how companies can develop a transparency strategy and how they can dump more of their data out on the web and they can foster innovation ecosystems by sharing data. But there are all sorts of barriers and problems and challenges here. There are privacy policies, intellectual property policies, government data policies.

I'd like to challenge the panel and ask how you would try to foster the kind of open innovation that we're seeing. Yesterday some of us heard an incredible talk by Chris Anderson, the editor of Wired Magazine. He's created an open-source drone company. He puts out blueprints on these automated drones that you -- anybody anywhere can pick up the blueprints, can see what they're doing and build their own. But that's a totally different model, but it's based on sharing, it's based on transparency. So, how would you foster that alternative model? How would you make this data available? You gave a great list of things you could do with this data, but companies are holding on to it really tightly. Even government is holding onto their own data and making it impossible for us to leverage it effectively.

MR. WEST: Great question.

MR. NELSON: Thank you.

MR. WEST: What do you think? Don't everyone speak at once; it's very rude.

MALE SPEAKER: Well --

MR. RATTNER: You want to go?

MALE SPEAKER: No.

MR. RATTNER: Oh, all right. Hey, I'm not trying to dominate here, but -- no. I obviously think -- the whole question about data is an absolute and critical one. There are challenges that go beyond just the proprietary interest, let's say, that people have in their data.

And just as an aside on that, you know, sometimes you -- when you asked the question about why that's their policy, they don't have a good answer, right? It's sort of like, "Well, we've always done it that way, so, you know, why would we do anything different now?" And by the way, that's one of the key questions that innovators often ask. "Well, you know, why do we do it this way?" Right? "What about other ways to do it?"

But to come back to this point, the technology -- particularly the censing technology, as I said -- is going to generate tremendous amounts of data. That data can be used for both good and bad. And, I think, as we amass these datasets, we're going to have to give first order of thought to security of that information, the privacy of that information. So while -- yes -- sort of in general, I think though, the broader access to that data is to be encouraged to be allotted.

We're not where we need to be in terms of ensuring the privacy of that information, the ability to anatomize that information in such a way that those controls cannot be circumvented and, you know, and really to guarantee individual privacy. So while I completely agree philosophically with it, I know in our own work in the area of context to where computing -- you know, we're very concerned that we will have literally terabytes of data on every person on the planet and, you know, and you can imagine the

kinds of things people might do with access to that data if we didn't institute the proper controls on it.

So, it's a big data. It's a big technical challenge, a big engineering challenge, and one that has to be solved within a social context. Because, as we know -- I mean, my children, your children are much more willing to put that information in the public -- you know, us old folks -- you know, "Don't tell them we're not going to be home this weekend --" you know, that kind of stuff. So there's almost a new social contract that needs to be innovated to really unleash the power of data.

MR. WEST: Actually, we put out a paper in our issues in technology innovation online series that looked at that, because a lot of expert controls right now are focused on the export of physical items as opposed to digital information. And so, we really need to kind of rethink export policy in light of the digital world.

MR. RATTNER: I was going to add -- I mean, it's interesting, the order of magnitude of the challenge you posed with your question initially confounded me.

I mean, one of the things that, internally within our government, we actually have difficulty accessing the range of records that we have that would allow us, frankly, to do -- I mean, I'm a guy that comes from doing economic analysis in my background. I'm obviously doing policy and projects now, but I know for a fact that we have datasets that are, by the way, confidential -- and confidential for a very good reason -- with which we could do an extraordinary regional economic modeling and analysis in which it wouldn't be -- you wouldn't be guessing anything. You'd actually absolutely know what was happening. And that would be a fantastic thing to be able to do, but it's very, very hard to get the protocols set and the agreement set, and sometimes the law set to be able to do that, and that's on that macro scale that you're describing.

I think, on a smaller scale though, it's something that we are trying to pick

up the challenge to do in sort of demonstration projects in a couple of areas. One, we're currently working our way through an economic development strategy, a formal one that was mandated by the legislature, so we've kind of had a strategy, but now we're going to have a strategy.

But it's been good to generate a conversation, because one of the things that a lot of entrepreneurs over in Kendall Square and Cambridge have told us is, "Look, there has just got to be a way to incent more innovation on applications that can use datasets for real-time information for public health, for traffic, for any number of things on a municipal level or on a state level." And so, one of the things we're thinking about doing is putting challenges out there and partnership with some of our regional entities, as well as, also our municipal entities to get people to be able to be creative about how they can aggregate some of that information and make it more usable to the public or interactive with the public.

Another example of that is -- again, out in Holyoke, Massachusetts -- I'm doing a lot of work in Holyoke these days -- as an outgrowth of our computer center, there is a municipal utility that runs the hydroelectric dam and a number of other things in Holyoke that, for one thing, is 60 percent green. Its lower cost than other places in Massachusetts, so it's one of the reasons why there's an advantage to being there. But it's also a very innovative and forwardive-looking municipal utility, and so we are now actually urging of MIT President Hockfield and Joe Tucci from EMC and others, convening a workshop in Holyoke, bringing together people from MIT and UMass and some folks in the private sector, as well as Iceland and New England to do a workshop to think about how to make that micro-grid a demonstration cite for the application of novel technologies.

But one of the biggest things that came out of those conversations was

the desire of Iceland, New England and of the utility to organize and mine that data.

They're thinking about how do we understand better how we traffic power over the load.

And interestingly enough, they're actually less interested in -- we thought they were going

to be really fascinated by sort of consumer behavior. They're actually more interested in

the aggregate flow of power and making it more efficient than they are necessarily at the

consumer level. But that's something where, again, is a demonstrating project. It has a

lot to do with accessing and managing data, but also challenging our universities and

entrepreneurs to think about how we can do that better, and then ideally, transmit that

knowledge elsewhere.

          MR. RICHARDS: I guess that I would add to that point -- I think

information is the life blood of today's economic. I think the administration's open-

Government initiative is a good thing.

          Your question is a complex one because it flows into so many areas.

You look at the cybersecurity. You look at the cloud. We're apparently working with

congress to update the Electronic Communications Privacy Act; what's law enforcement

access to information that resides in the cloud?

          A lot of the agencies, with their cloud policy, what they're doing is they're

having their own cloud, which kind of defeats the purpose of the cloud model because

they don't want other agencies to see their information or necessarily share it.

          I think, greater solicit engagement with the Government is a good thing

and transparency is a good thing. But also, you know, the Government is a massive

repository of the public's information, and they should be good stewards of the public's

information.

          And right now, if a breach occurs at a federal agency, they do not have

to reveal that breach of the individual's personal information that they've breached. They

would be reported to the US-CERT. But I think it's important to keep in mind the

Government and their responsibility for the information that they do have, and take good

care of that information.

MR. WEST: Okay. There is a question right there, this gentleman right

there.

MR. WOLF: Hi. My name is Rob Wolf from Pepperdine University. My

question is regarding immigration as it relates to highly skilled workers in innovation

facility through visas like the H1B, the J1 and the O1 Visa.

The Brookings actually released an article entitled: Creating a "Brain

Gain" for U.S. Employers: The Role of Immigration in January. That in mind, to what

ends do we push brain gain when essentially creating a brain drain for emerging markets

like that of India, which is seeing an exodus of many of its high skilled workers?

MR. WEST: I'll address that because that was my paper. And I also

have a book on this subject entitled Brain Gain. The reason I make that argument is that

there are a lot of foreign students who are coming to the United States, who are getting

educated. They're getting PhDs in the various science fields. They would like to stay

here. And these are the people who've actually created some of our finest companies.

Now, when you look at many of the new technology companies, in terms

of which ones had an immigrant founder or a cofounder, it's like -- you know, it's a who's

who of company names.

We're giving those people virtually no opportunity to stay here right now.

If they happen to be able to get a job right away and they're employer can sponsor a Visa

for them, then they can end up staying.

There is a trade-off in terms of them staying here versus going back.

Interestingly, between the combination of our restrictive immigration policies and just the

double digit economic growth that is being experienced in India, China and elsewhere in

Asia, more and more of those individuals are now choosing to go back. And so, I don't

see it as a complete zero sum game between us versus them. But right now, it is so far

tilted in the other direction that, between the combination of American students not being

interested in stem fields and having a restrictive policy that doesn't really encourage or

allow foreign students to stay here, that is a potentially lethal combination. I mean, we

could do well on one of those fronts and probably do okay as a country. Right now we're

screwing up both of them, and I just think -- you know, that's the reason I wrote that

paper and wrote the book.

    MR. NAKAJIMA: Darrell?

    MR. WEST: Yeah?

    MR. NAKAJIMA: I'd like to add to that. I mean, I think it's absolutely --

we're on the record at our administration that we're actually in favor of increasing the

ability of people who want to come here, and also people who are educated here to be

able to stay here. It's absolutely critical for the Massachusetts economy and I think any

high tech region of the country.

    But just on your other points, I think you're making an interesting

observation or hypothesis that there is a zero sum trade-off between the smart people

who get educated here and start companies here and back home. And my graduate

school advisor was Anna Lee Sucsanian, and just by coincidence, because of the fact

she wasn't, I got a chance to look at her research. She spent an awful lot of time

embedded in Silicon Valley and in Bangalore and in China and Taiwan working with

networks of immigrant and entrepreneur communities that, in fact, are educated here,

start companies here and then develop very, very rich and dense networks back in their

home company. So, in fact, you'll see a lot of people who are lead entrepreneurs and

company developers in India who not only came out of Silicon Valley, for example, but also still have ties back to it that are economic, as well. So, I think it's more complicated than that, but also the benefits for both countries or parties or people is richer than I think we might anticipate, otherwise.

MR. WEST: Okay. There is a question right there as well. Yep.

MR. LADEN: Hi. Thank you. My name is Tim Laden. I'm from the International Labor Organization. Sort of along the same lines as the question that was just posed; last week the OACDE released a report that basically showed, since 1999 -- although the U.S. has remained the number one technology services exporter and provider, and that has increased -- the level of percentage of jobs that had been created was severely disproportionate to the level of jobs in that amount of time in equipment and manufacturing that has left the country. So, I was wondering what your thoughts are as to whether or not new innovations are just going to amplify that trend and sort of create a lesser amount of high-skilled jobs in contrast to low-skilled jobs in other countries.

MR. RICHARDS: I guess, let me start off, I guess, since I offered our cyberstates reports. I think that the U.S. economy has been mostly an industrial-based economy, and we have not really made the transformation to the information age economy.

When I say that 95 percent of the U.S. population is overseas, a lot of that has to do with markets overseas and being closer to the customer. There is manufacturing overseas. There are a lot of incentives offered by companies to manufacture overseas and be closer to the customer.

But, in terms of Michigan, which has just come out of our Cyberstates report, they rank 8th nationally in high-tech component manufacturing exports, and that's one of the reasons -- and you look at the auto makers and what they're doing. And I was

on MSNBC last week, and one of my tag lines was that, this is not your grandfather's car anymore, and you look at the number of innovations going into automobiles and the ability of innovation to cut across platforms from several sectors.

From the data that I've seen, consumer electronics remains pretty strong in the U.S. But I think that our policy has to catch up with the business cycle and the transformation that we're seeing in the world economy, and we're not necessarily there.

I think that, when I talk about congress operating nine times slower than our industry, it's very true. And to add to the last point on immigration, I think -- you know, since 9/11, we've seen a lot of changes obviously in the world, and I think one of the unfortunate results of those is a fortress America mentality where the founders of several of our companies came from overseas and a lot of folks still want to come here to live their American dream. And if they're not allowed to do that, or take seven years to get a green card, I think there is a lot of incentive to go back overseas. And I think that's one of the policies of immigration that we have to take a look at to have more of a balance approach to the global economy.

MR. WEST: Question right here?

MS. STERN: Thank you. I'm Paula Stern. I have my own consulting firm, The Stern Group, but I used to chair the U.S. International Trade Commission. And I wanted to insert the question about U.S. trade policy being part of this vision as to what the Federal Government should be doing, and how we assure from the business point of view and from commercialization of technology point of that the U.S. has a trade policy in place that enhances our competitive advantage.

You mentioned intellectual property. And particularly, for smaller companies -- maybe not Intel now, at this stage in your development, but for smaller companies, the concern that they have about how to share their technology when they go

to market, particularly with regards to China. While they're members of the WTO, they

may not really, from a cultural point of view, feel the same way about intellectual property

rights protection or sharing, by the way.

So I'm just wondering about your thoughts on the 21st century trade

policy that you would like to see the Federal Government have. You mentioned these

free trade agreements. I think that's fine, but that's really your grandfather's trade policy,

and I'd like you to think big thoughts and big ideas about our trade policy in this

globalized economy. Thank you.

MR. RICHARDS: Sure. Well, if I can start off; TechAmerica foundation

is actually starting to take a look at this. We're putting together a paper. I think that our

trade policy for the future should be based on intellectual property protection. It should

account for -- it should be built around information, transported data flows and the free

flow of information. I think the transpacific partnership is starting to go that way and look

at how we modernize policy, but I don't think we necessarily have to do this in a

piecemeal approach by trade agreement, by trade agreement. I think there should be

more of an overarching philosophy when it comes to modernizing our trade policy.

When we're dealing with other countries that have a different outlook on

intellectual property -- I think such as China and some of the challenges there -- I think

that is the -- the rest of the world is looking for that edge. And I know when we're up

against market access barriers, some countries, in order for us to sell in the market, will

ask for our company's IP to reveal it, because I think they know -- that's the secret sauce

and they can't necessarily catch up on their own.

And I don't think, from a macro level, economists are cognizant of the

challenges around intellectual property in the transformation that we need to make. But

look for that paper. Where in the early stages and I think we need a forward-looking

trade policy that has to account for information in IP production.

MR. RATTNER: By the way, if my comments about open IP and university research gave you the impression we're not concerned about IP whatsoever, that -- you know, we are -- you know, we have 65 nanometer fab and (inaudible) in China. We did not disclose any semiconductor process technology as part of that agreement.

You know, there are -- I mean, it's way out of my area. Trade policy is not something, fortunately, I need to worry about, but we do -- you know, we do think there is an opportunity to be more astute about these things. In ways that you sort of don't fully appreciate it until you're in the country, I guess, is the way to say it.

A few years ago we got into, you know, quite a spat with the Chinese because they were trying to enforce a different security protocol on WI-FI. And then, WI-FI is an international standard, you know, and along comes the Chinese. I think, in fact -- I mean there was actually an individual who sort of came up with this idea, Chinese professor came up with the idea. The next thing you know, the Chinese are saying, "Okay, you're not going to be able to sell any WI-FI equipment in China unless you run the security protocol." And, you know, and we're sort of going, "Whoa, whoa, wait a minute." You know.

I mean, if you guys want to create your own wireless standard, okay, that's interesting. But don't try this right in the middle of WI-FI because you're going to shut things down. And, you know, eventually that was reversed. You know, I think the Chinese government realized that that was going to be a real mistake for them.

And so, I think, part of the trade policy is bringing them more fully -- not picking on the Chinese here -- but I think that's a good case and point. Bringing them into the world community, beyond just a WTO membership, and helping them realize that

it's a huge opportunity for them if they work in a global cooperative way to do, among other things, drive these international technology standards, as opposed to the mindset that often emerges, which is -- well, China has to have its own thing, right? And we've got to create a different standard.

So, there is definitely work to be done here and I think Intel would strongly support the efforts to encourage them to be a true global partner in these technology standards.

MR. RICHARDS: I then added earlier, too, cybersecurity is another area we have to look at in terms of trade policy. Are we going to negotiate cyber-treaties? Are we going to have a cyber-ambassador at the U.N.?

MR. RATTNER: That's why I stopped on the other question. I'm like, "Oh, boy, we could really go to the races here."

MR. WEST: Yeah, that's a different panel right there. Okay. We are out of time now, but I want to thank Justin, Eric and Kevin for sharing their thoughts for a very provocative session here. Thank you very much.

(Applause)

* * * * *

CERTIFICATE OF NOTARY PUBLIC

I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

Carleton J. Anderson, III

(Signature and Seal on File)

Notary Public in and for the Commonwealth of Virginia

Commission No. 351998

Expires: November 30, 2012