THE BROOKINGS INSTITUTION

INVENTION AND THE MOBILE ECONOMY

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P R O C E E D I N G S

MR. WEST: Good afternoon. I'm Darrell West, Vice-President of Governance Studies and Director of the Center for Technology Innovation at the Brookings Institution, and I'd like to welcome you to our forum on Invention and the Mobile Economy, and this is part of the Mobile Economy Project, and we appreciate the financial support provided by Qualcomm. And we are webcasting our event live, so we'd like to offer a warm welcome to our viewers from around the country and around the world.

We have set up a Twitter feed at #TechCTI, so if you wish to post comments or ask questions during the forum, you are welcome to do so. And during the question and answer segment, we will take questions both from our virtual as well as our live audience.

Today's event is going to focus on the key role that inventors play in the mobile industry. We're going to look at the factors that encourage invention, how different countries handle invention, and the barriers that need to be overcome in order to do a better job in the future.

When you look at a range of inventions in terms of cellular networks, microchips, batteries, and antennas, invention always has been a big part of the mobile technology story. It has created an industry that has become a major driver of economic development. The mobile industry contributes significantly to job creation, both in the United States as well as around the globe.

Indeed, in many countries, mobile has become among the fastest growing business areas.

This afternoon we are putting out a paper on invention as it relates to the mobile economy. We looked at examples of mobile invention and ways to encourage

invention.

And briefly, I argue in the paper, that we need to pay greater attention to several different factors. One, we need to invest in research and development. There are many roadblocks today in terms of university technology transfer and the need for better metrics. So, we need to figure out better ways of aligning the money with the process of invention.

We need better STEM education. Too few of our students today are focusing on science and technology, and so we need to pay greater attention to getting those students in that scientific pipeline so that we can end up continuing the inventions that we have had in the past.

We need immigration reform. Most of the major high tech companies and many of the mobile technology firms still have difficulty recruiting high-skilled workers and so immigration is a way in which we can fill that.

And we need sound patent policies that reward inventors. So, those of you who want greater details on the arguments that I make, you can pick up a copy of the paper out in the hallway outside the auditorium.

Today we welcome a panel of distinguished guests to explore how to understand how progress has been made and how government and business can facilitate continued development.

Adam Mossoff is Professor of Law at George Mason University School of Law, and he's Co-Director of Academic Programs at the Center for the Protection of Intellectual Property. He teaches and writes in the area of patent law, trade secrets, property law, and Internet law.

He's published extensively on the theory and history of how patents and other intellectual property rights are fundamental property rights and he has articles that

have appeared in the University of Pennsylvania Law Review, the Cornell Law Review, the Boston University Law Review, as well as a number of other publications.

He has presented his research at many conferences around the country.

We're also pleased to have Jesse Russell with us. Jesse is a superstar in the world of invention. He has a very distinguished career. He currently is chairman and CEO of IncNETWORKS, a broadband wireless communications company that focuses on fourth generation wireless communications networks. But he has over 30 years of professional experience in directing research and development.

He led a pioneering technologies with Lucent Bell Labs and AT&T. He served as Chief Technical Officer for Lucent Wireless Business Unit and the Chief Wireless Architect with AT&T.

He's a member of the National Academy of Engineering, a fellow of the IEEE, and a fellow of the International Engineering Consortium, and he holds over 75 U.S. patents on communication engineering.

Walter Valdivia is a fellow in our Center for Technology Innovation at Brookings and he studies innovation policy and technology transfer. He has expertise on the university aspects in regard to innovation and invention. He has written extensively on the Bayh-Dole Act, which governs a lot of the work in this area, and he also focuses on ways to improve technology innovation around the globe.

He is the co-author of a report that we put out this year entitled *Smart Policy: Building an Innovation Based Economy*.

So, I want to start with Adam. What do you think are the factors that enable invention?

MR. MOSSOFF: Thank you, Darrell. And that's an interesting question and it's tempting to be reductionist in thinking about what the answer to that question is,

but I think it's important to recognize that there are a lot of heterogeneous factors that go into having a culture in which there is lots of invention and success and lots of innovation as we've experienced in this country.

And I'll just quickly identify three starting with the more particular one and going to broader levels of abstraction. I think the first, and obviously the most obvious one, the one that most people think of, is you do have to provide a strong system of intellectual property protection, especially in the context of technology it's very important to have strong patents and trade secret rights be made available for inventors and innovators so that they can know that if they -- when they make those massive amounts of ex ante investments in coming up with the new technology, that they'll have the fruits of their labor secure to them. But even more importantly, not just that they'll have their fruits of labor secure to them by obtaining a patent, but that they can take that patent as a property right, rightly secure to them, into the market and commercialize it like other property rights.

So, it's very important that patents have long been secured as property rights and therefore they have been secured to the patent owners in the same way that other property right owners have, and therefore they have been able to go into the market, obtain venture capital, and to innovatively create a lot of the new commercial and legal distribution mechanisms that convert that new invention in the laboratory at Bell Labs into the innovative technology like the smart phone that we all as end users can enjoy and benefit from.

But having strong patent protections and other type of IP protections, I don't think are sufficient. You also have to nest that IP system within a broader legal institutional framework where you have a respect for the rule of law, and therefore patents are treated similarly to other types of property rights in the same way. You don't

have arbitrary distinctions or discriminatory treatment of patent owners vis-à-vis other patent owners or other property rights owners made by the institutional actors or by other citizens, again, because it's properly incentivized inventors to know that they will be treated accordingly and will be able to secure the fruits of their labor once they come up with their new invention.

And lastly, it's not sufficient just to have a patent system and a patent system that is one part of a larger legal and political system that respects the rule of law, I think you also have to nestle both of these within a broader sociopolitical framework in which you have social norms that respect what it means to create new innovation.

So, you have to have a society where innovators and inventors are recognized as important, the work that they do is important, and that people respect and support both the institutions and other types of social norms that make invention and innovation possible, easy knowledge transmission, social mobility, geographic mobility, the ability to acquire information when necessary, and things of that sort, the types of information, I think, that Darrell, you were mentioning about the importance of STEM education.

And I don't think it's a surprise or a coincidence that all three of these factors have been hallmarks of the American approach to invention and innovation from the birth of the United States in 1790 with the patent system and other types of intellectual property rights protections, and I think that is why the United States has been so successful historically as a place where great inventions and innovation has occurred.

MR. WEST: Okay. Thank you. Jesse, you have been on the frontlines as an inventor. You have those 75 patents that I mentioned earlier. So, I was wondering if you could tell us, what propelled you to the success that you had in the invention process?

MR. RUSSELL: Yeah, I think the key from a process point of view is really to understand the American innovation ecosystem. Many of us that are not inventors that don't live and breathe it, I've spent my entire professional career doing nothing but operating within that system, and so I'm fond of making a comment that it akins to our American governance system where we have sort of these three branches of government and that when they work well together, we get transformative activities created from it.

And I'll just give you a couple examples and then I want to draw a parallel to this system that I've spent most of my career operating in, which is the American innovation ecosystem.

But if you take a look at when you got the right resources assigned to that sort of government and sector, you get great things happening like the Social Security Act, you get Medicare, you get even the new Affordable Care, so there are great things that happen, but what you have to recognize, it's a team sport, whether it's governance or whether it's operating within the American innovation ecosystem.

But if you move it over to the American innovation ecosystem, you say, well, what's the parallel -- a lot of people don't like my analogy here, but let me just share it with you anyway, it's that when you look at that system, one of the things that's very unique about it is the flexibility of it, number one, and I'll come back and just make some points about the flexibility of it, but it's really how the education system, how the industry sector works, as well as how government -- and how they work together.

And many people don't pay much attention to that because when they work well -- right now there's a lot of complaint about the sort of governance system in terms of dysfunction, but today, the American innovation system is somewhat dysfunctional because of the way -- and we can spend a lot of time talking about why I

think it's dysfunctional and what things can we do to change it and make it more effective, but what we have now is we have universities where they look to fill seats as opposed to really providing the kind of in depth growth in academic that we think we need.

It's not just at the university. It starts all the way back to pre-K through the university. That system needs to be reanalyzed, revamped, rethought.

You also have the private sector, which is the industry sector. There, where I grew up, during the time I grew up, it was the most important thing to me was to work at Bell Laboratories when I was at the university as an undergrad. And when I got to Bell Laboratories what I found was a rich culture of not just very bright people, but people that would challenge ideas and stimulate you to think of how you can improve the quality of peoples' lives. And we spent a great deal of time just thinking about -- it wasn't so much what you did as a specialist, but your ability to interact with other people within that system.

And from a finance or resource point of view, we got all the resources that we needed to do that.

The government sector -- had an opportunity to visit some of the government laboratories, I chose to want to work in Bell Laboratories, but the real key of that system, it's about the talent. It's simply about the talent. And that the type of talent you need to create transformative innovation, it's the talent where people are born with this ability to see the future before the masses see the future and to be able to transform and try with the sort of vision and passion to pursue that.

But you cannot do that unless you have the resources required to implement that. And what -- and the way I was talking about, that innovation is a team sport, it's when the government, sort of basic research work is done and funded properly, when the private sector also engages in not just applied research, but basic research as

well, in terms of finance adequately, and also providing the right funding to universities that are leading in specific technology areas.

When you do all of those things -- and now these very, very unique talented people cannot just say, go to the university and pursue their vision and dream, but they could go to the private sector to pursue their vision and dream, or they could go to the government sector and pursue their vision and dream.

When you create a system like that, which is what I tend to think the American innovation system has been like in the past, I think it's changed a lot now because we don't get the resources in all of those sectors at adequate levels to do what we did, say, in the '60s, in the '70s, in the '80s. But if we can get back to that, I think the ability to do transformative innovation -- I want to just give you some examples of what I mean by transformative innovation. If you take a look at what the government sector has done, like putting a man on the moon is a transformative thing, and the outgrowth of the kind of innovation, thinking, and so forth, that went into that.

Or if you look at the creation of the Internet and how it has transformed our society, is another way of which the government sector has played in this sort of innovation team oriented environment.

Or if you go and look at the private sector, the creation of silicon technology as -- the creation of mobile communications, which is what we're talking about today, has transformed our society in so many different ways.

If you look at the university sector, you look at some of the social networking technologies that have emerged, the search engine technologies that have come out of that sector.

It's when those systems are working well together where very, very talented people can go to any one of those sectors and be effective, then you have a

very, very energetic innovation system, and that's what we've lost. And hopefully maybe we can spend more time to get into some of the details of those systems and what's wrong today and how we can fix it.

MR. WEST: Walter, there's a debate over the role of market competition in invention. Does competition help or hinder invention?

MR. VALDIVIA: That's a very good question, Darrell, and picking up from what Jesse, I like this analogy of the innovation system with an ecosystem, like an ecological niche, because it is a number of species, different types of organizations, firms, universities, laboratories, combined in different ways, that will produce a faster rate of innovation and will make innovation to be at the service of social goals.

One of these elements is this applied creativity invention, and the question is, what kinds of configurations of the ecosystem will foster the possibility of having this extraordinary talent in many areas of the innovation system apply their creativity into solving specific problems. It is -- one of these configurations in certain sectors of the economy, is towards monopoly or oligopoly or concentrated industries, and on the other hand you have a different sort of configuration, more competitive markets, and that is, perhaps, an interesting experience of the mobile telephonic sector.

You could compare, and there is some evidence that goes beyond the (inaudible), that high competition spurs not only more invention in the sector, but invention that is -- that increases the quality of products or reduces the prices of the products in the market.

Going back to the analogy of the ecosystem, consider the things that come in play in the mobile sector -- service providers, device manufacturers, and developers of -- well, now, apps and developers of content.

If they adequately interact in this ecosystem, it has been competition that has driven the most interesting inventions. So, responding to this question it seems that we have some evidence that suggests that competition promotes invention in certain particular ways, but this is not to deny that more concentrated market structures also do have invention and promote invention under a different economic model. In this case you could think of the pharmaceutical sector, for instance, and there is innovation in this sector, although it follows different lines and patters.

And picking up from what Adam said on the importance of the patent system, you can see the patent system as a very important element of this ecosystem, playing different roles in the different configurations of the market, and therefore having different effects, not a unique effect of invention. In areas in which the final products are generally consisting of one or few patents, patent protection becomes a very strong mechanism to protect investments in R&D.

In other sectors in which the final product needs to assemble a number of different inventions, a number of different patents, the necessity of combining very different patents from different lines of -- or from different organizations or different pools of ownership, may actually deter invention.

So, it is important to understand the role of competition and the institutions that we have within the ecosystem of innovation, such as patents, to understand and respond to the question whether it promotes invention. It depends on the sector and the particular configurations of the innovation sector that we're talking.

MR. WEST: Okay, now, several of you mentioned what you called an American approach to invention in some of the changes that we've seen over time. So, I want to go back and kind of compare how the United States handles invention versus what we see in other countries in their particular approach. And I'm just curious, what do

each of you see as the most promising models for invention when you look around the world? Are there other countries that are doing it better than the United States? Are there ways in which the United States should make some changes that would improve the system? Adam, we'll start with you.

MR. MOSSOFF: Okay. That's an interesting question and the -- you know, I think it bears noting that as an historical matter, in the past 200 years, the United States has been the most inventive and innovative country in the world. The majority of the technology that the world now enjoys has either come out of the United States, or if it wasn't invented in the United States, it was the United States where the invention was converted into practical, applied, innovative technology.

And I think our intellectual property system played a very important role in serving as that transmission mechanism from idea to success technological product that's used by consumers and end users in the world and in society.

Because the United States, very much from the beginning, broke with English and other continental approaches to intellectual property when we started our intellectual property system in the very early years of this country. This is my area of focus. I do a lot of my research on the history of the American patent system and especially in the era from 1790 up through the late 19th century, and the things that I have found is that the United States actually took seriously the idea of what it meant to secure both, initially, patents and then, eventually, trade secrets, that evolved in the 19th century as property rights, as distinguished from the personal privileges that were granted under either the English crown or in France, which were deemed to be -- which were personal to the inventors, were inalienable, you could not go into the market with them and license and transfer them to other people. The United States took very seriously that you had the exclusive right, as secure under the Constitution, was a property right, and as a

property right, it was secure like all other property rights.

And so what immediately developed in the United States was a secondary market and the trading of patents as commodities, whole innovative venture capitalists arose in supporting inventors, so, for instance, Elias Howe, the inventor of the lockstitch, was -- not only received an investment to actually support his licensing activities, because he never manufactured, he was solely a licensor, but he also received financial investments, actually, to bring his lawsuits -- that he had to sue infringers, Isaac Singer being one of them, so he was actually an innovator in third-party financing of lawsuits as well through the patent system.

But the patent system also let Isaac Singer, another patent owner, some of the elements that went into the sewing machine in the 1850s, to then innovate commercially and figuring out ways to come up with new ways to sell his sewing machine, so he invented the rent-to-own programs, he invented trade-in programs to deal with the price point issues, the difficulty that sewing machines were so expensive, and that this was the type of commercial innovation that follows from the recognition that a patent is what secures a property right, and what that means is that you had the exclusive right to use and dispose of this in the marketplace as a way to secure your fruits of your inventive labors to you, and that's exactly how the courts viewed it and that's how Congress viewed it in the early years of this country, and I think that's what laid the foundation for what we now take for granted, in the patent system, up through the 21st century, is a system in where people can come up with inventions and then they can take them into the market, work with market specialists, sell them or lease them or sign them to or license them to firms who can then make the millions of dollars of investments to create the innovative distribution mechanisms that make possible the technology we all enjoy.

MR. WEST: So, Jesse, I know you've done work in Asia, you've done work in Europe. How would you compare the U.S. model of invention versus other countries? What do we do well? Where do we need to improve?

MR. RUSSELL: I think the thing that we do well is to allow our institutions, both our research laboratories within the government sector, within private industry, as well as at the university, to share information among those institutions. I tend to think when you compare us to -- and a lot of that has changed, I should preface what I'm about to say with this, is a lot of that has changed recently because of the exploitation of -- as Adam was speaking about -- patents and by others that without giving due ownership and right to the people that invented originally, but that withstanding, I think it's the freedom of information movement between these institutions, the ability to allow ideas to be challenged across a whole sector of very talented individuals coming from government, coming from university sector, coming from private industry laboratories. That's one thing, I think, is -- which is just movement of information and ideas.

The other thing that I would say that is how we agree to divide up the workload. If you look at long-term basic research, government laboratories have led, universities have done some of that, maybe more now, but basic research done in government laboratories is very important because you're not trying to make the quarterly results, and as a result, you're willing to take a much longer view, I think, is one key factor.

I think the ability for allowing technology to flow out of the government sector into the private sector freely where they can capitalize on the work of the government basic research and to move it into applied research and development, I think, is a unique piece.

When you start to look at, at least based on my experience in Asia, it is

really more about how quickly can we produce something. But that's changing. If you take a look at the investment that's going on in China, as an example, compared to the U.S., and look at the number of researchers that they are producing, as well as the amount of investment, it is going in the opposite direction in terms of what's happening in the U.S. They're putting more money into it.

If you take a look at what we were doing in the 60s, at the height of American innovation and exceptionalism, we've actually changed that. If you look at the amount of investments that's going into R&D in the United States as a percentage of total spending in terms of discretionary spending, it's probably gone down by close to 50 percent, where the other -- like Asia, has actually gone in the opposite direction, and they are on a path where they might surpass what we're doing in the United States even though we have some of the best research oriented universities in the world. But we're not investing in those universities, we're not really putting the money in for long-term basic research into those universities as we did in the 60s and the 70s and so forth, and I think those are the things that we have to change, as well as not walking away from some of our government research laboratories in terms of giving them adequate funding and support from an R&D point of view.

MR. WEST: Walter, how would you compare how the U.S. handles invention versus other countries?

MR. VALDIVIA: I agree with the view that the robustness of the American innovation system is, by far, the best or the strongest in the world, but I also agree that there are certain lesson that we can learn from other countries or ways to think of how to reconfigure the innovation system that may help improve the robustness of the system, but one thing I want to recognize is that the decentralization of the innovation system in the United States is a strength and this is important to bear in mind because

we are thinking oftentimes of countries like China that have a more centralized system of not only innovation, but governance. Vis-à-vis a decentralized system, the decentralization, the allowing for different types of institutions and configurations to emerge create systems that are much more resilient to shock and, again, that is a virtue of the American innovation system.

Now, on the things that could be brought from experiences abroad, I'm going back to my point on competition and fostering competition, there are sectors that could benefit from competition. We would need -- yes, I agree that we can strengthen the patent protection system at the same time recognizing the limitations of the use of patents, and fostering ways of using patents in systems that -- or sectors of the economy that could benefit from cooperation, for instance, fostering the creation of patent pools.

At the same time, a stronger check of antitrust is important to have in a free market economy, particularly when you identify the certain amount of ballistic configurations may deter innovation in certain sectors.

At the beginning of this conversation, Darrell also mentioned two other dimensions, education and immigration that could be very important ingredients, and here we can learn a few things from, in the case of immigration, the experience of Canada or Australia, having an immigration system that prizes talent and recruits talent from abroad by creating a system of points in which people with the qualifications or merits are granted an invitation to work and bring their talents to the country.

In terms of education, I think there is an appropriate emphasis on what is called STEM fields, science, technology, engineering, and mathematic fields of science. There is an appropriate stress that we need to improve our quality of education provided in this area, but something also to keep in mind is when we talk about invention, this applied creativity -- creativity comes from combining different sources of thought, different

-- it's flexing the intellectual muscle by doing different kinds of exercises. Education in mathematics is important, but the creativity will be spurred by combining with other forms of education.

Here's an example. In Finland, children who score high in math achievement, but also in classics, and combining education and mathematics with other areas would create and nurture the talent that Jesse was speaking of in those ways that produce students and entrepreneurs and businessmen and even government officials who have a broader range of ideas from which to draw on creative solutions.

MR. WEST: Okay. Thank you. So, I'll throw out a question and any of you on the panel can address it. There's been a lot of tension lately about smart phone litigation, and some people describe this as a war while others dispute that notion and say that it's overblown, it's really not that much worse than what we've seen in the past.

I'm just curious, for each of you, how you think the current litigation has affected invention, especially in the mobile space.

Don't everyone talk at once.

MR. RUSSELL: I'll let Adam go first.

MR. MOSOFF: I can go first again. Well, yes, the smart phone war -- it's very nice, Darrell, that you refer to it as smart phone litigation as opposed to the well known -- more well known term, smart phone war. Something that a lot of people don't realize is actually that patent wars have existed from the very early years of our patent system. And, in fact, were called patent wars.

I mentioned the sewing machine earlier in my remarks. That was, in fact, the very first massive amount of patent litigation and it was referred to in the 1850s in newspapers and by the people at the time as the sewing machine war, and as you mentioned that the solution to the sewing machine war was conceived of by the patent

owners themselves and it was the very first patent pool in U.S. history where the different owners -- the war arose because there were different patent owners on different elements of the sewing machine.

It's hard for us to realize this, but in the 1850s, the sewing machine was the equivalent of their smart phone at that time, it was a very difficult, complex technology, it took about 100 years for it from when the people were first starting to do the work on it, to investigate it, to try to invent it, to it becoming a final, successful, commercial product.

It was the product of incremental and complementary invention by different people, and so different people had patents on different elements of it, which is what led to the massive amounts of litigation, and the solution was a patent pool, which was the very first patent pool in U.S. history and it was conceived of by the patent owners. They recognized that it was in their interest to, instead of litigating with each other, to join together, cross-license, so they could get down to the business of manufacturing and licensing this very important new technology.

And since then, patent wars have been a very common feature of the U.S. invention and innovation landscape, as have patent pools, and so there were patent wars when the automobile was invented, when the telephone was invented, when the radio was invented, when the airplane was invented. If you talk to patent lawyers today who worked in the 1980s, they will regale you with stories of what patent lawyers refer to as the diaper wars of the 1980s. Little do you know that there was massive amounts of patenting innovation in disposable diapers, as anyone whose parents know for certain, it's a very important technology.

And it went on for ten years, it involved hundreds of millions of dollars in judgments and various lawsuits, whole companies were put out of business in

bankruptcy. They will also tell you about the stent wars of the 1980s and the semiconductor wars and other types of patent wars.

So, patent wars are a very common feature and economists such as Zorina Khan and others who have looked at patent litigation rates from 1790 to 1860 and compared them to today have found that actually, surprisingly enough, when you hold constant for the number of patents that are being issued, patent litigation rates today are essentially the same as they were in the early 19th century.

So, patent litigation holding constant for the number of patents issued was around, on average, about 1.5 percent, and today patent litigation is approximately 1.6 or 1.4 percent, in that range.

So, now a lot of people are kind of talking about how -- there's a lot of sky is falling type of rhetoric that one hears about the smart phone wars and the patent system today, but in fact I think what we're seeing is the workings of the patent system as it's always functioned, and in fact, we know that innovation has continued through all of these periods and that we are, in fact, experiencing incredible innovation in our cell phones and tablets despite the fact that this patent war is existing.

MR. WEST: Jesse? Can you top this on the disposable diaper premise?

MR. RUSSELL: No, I'm not going to talk about patent law. That's not my field. But what I will say, though, if I reflect back on my experience inside of Bell Laboratories many, many years back, I mean, this is a scrimmage, not a war, right, I mean, just to be very candid with you. You know, we -- what made Bell Laboratories unique, if I can just -- I don't want to sound nostalgic, but what made Bell Laboratories unique was not so much that we had, as I said earlier, a lot of bright people that worked there, but we could engage in intellectual debate, which stimulated more and more creativity and that I think that the scrimmage that we're talking about now is not going to

do anything but drive to the next envision of the cell phone.

And when I speak doing some of the talks -- I talk to young people to try to inspire them to pursue careers in science, engineering, and technology, one of the challenges that I put out to people is to say -- and this was a big battle between, say, Nokia and Apple, Nokia had a whole group of cell phones, Nokia was probably one of the best technology innovation companies that I had seen in terms of their ability to understand demographics, to understand user communities and groups, and to be able to design cell phones that sort of matched those unique groups on a global basis.

And then all of a sudden Apple comes out with one phone, so I asked people the question, well, how many phones did Apple create, and most people -- the obvious -- well, they created one phone. No, what they did was they took the work that we spent close to 40, 50 years on, of building unique cell phones and decided to make a computer roughly the size of a cell phone. And that -- the number of phones they created was roughly 300 million different cell phones, not one, and it allowed -- but this whole battle of --

MR. WEST: Because it allowed people to install apps.

MR. RUSSELL: Because it allowed people to install apps. So, you can create your own phone. If you look at what our company is doing today, and we're challenging the entire cellular industry by saying that why is it that private industries or private companies can't own their own enterprise cellular networks, and we're doing a great deal of work with small cell technology, self adapted, self learning radio systems that will allow you to own your own cellular network in your home or your own cellular network within your enterprise. And we're leading the country in terms of -- we've been able to get the FCC to even look at allocating spectrum to do that.

So, this battle, if you look at it from our vantage point, we believe that

you should have wars about the phones because we think that the phones should be self adaptive, they should be moving more towards software-defined radio technology, cognitive radio technology, that's not in the phones today and they're more restrictive.

So, I think the battle is good that they're having because it will bring about the next generation of cell phones that will allow this new emerging industry of enterprise cellular networks to start to grow as opposed to being more restrictive, which is where it is now, because you can't get devices that you can have and own your own cell phone, to find what network you want that phone to connect to, independent of the carrier and you can decide when you want that to happen. That's frightening to people, to say, the larger carriers, but that's really the direction that the technology is going and I tend to think -- what I think today is a scrimmage, I think it will be a war later when they start to build phones that can attach to any network and attach to multiple networks at the same time, and I think you can do that with smart RF front ends that are dynamic and that automatically can tune and change bandwidths of channels and things like that.

That technology is being held back because we're not having the war, at least the scrimmage -- this is a scrimmage, because we're not having the war, which I think is what we need to have.

MR. WEST: Walter?

MR. VALDIVIA: It is true that litigation will -- one of the affects of litigation is creating signposts for new innovators and new companies coming into the market to pursue different paths of innovation. There is some research that has shown an increasing trend of firms in the telecom sector acquiring, by means of mergers and acquisitions, not only companies, but their portfolio of patents, not because the portfolio of patents is highly valued, but as bargaining chips to enter or negotiate further new developments in the market.

If this would be the case, if certain patent proposals are acquired not for the purposes of using the portfolios, but to anticipate this kind of litigation, then that would have a negative effect on invention in the sector.

So, the additional effect of litigation or the effect of litigation could be ambiguous in that both it creates a clear sign that alternative paths of innovation have to be used in case of certain forms of abuse of intellectual property rights by new developers, but it may deter incumbents in the industry from having a foot in the door and trying to innovate.

So, it would be interesting to see how excessive litigation could be tempered in order to promote an increased number of new companies enter at every new generation of technological development into existing sectors to create what in Schumpeterian economics is called creative destruction.

It is good to see both sides of litigation when we think of invention in these times.

MR. WEST: Okay. Why don't we open the floor to questions and comments from our audience? So, if you have a question, you can raise your hand. Up front, we have a microphone coming up right behind you. So, if you can give us your name and your organization.

MR. ALTMAN: Okay. Fred Altman. I'm a private citizen, retired.

We have a big philosophical difference, there's one side that says, we need to get more money just back to the private sector and they will use it to develop inventions and move forward, and the other side says, we need more government spending to promote this, and I wonder, is there any feeling which way might be better or what your feeling is on the topic?

MR. RUSSELL: Well, let me just -- because I grew up in a time in Bell

Laboratories where we did get quite a bit of funding from the federal government and that we did engage in developing fundamental research and development on behalf of the federal government.

I tend to think that with any system you need balance, and that I would argue that we're spending a great deal of money in the United States on R&D. I think we're probably in the tune of $400 million or so, somewhere around that. If you compare us to maybe the next closest one might be Europe, then China is behind that.

I tend to think that what we need to ask the private sector to do is what AT&T did with Bell Labs many years back, is to make it a requirement almost that they reinvest -- and their stockholders should be pushing for that, that they should reinvest in the future of their company by putting more money in basic research, not just applied research or development, and what's happening today is that a lot of those institutions that made America great in the innovation space has disappeared.

If you look at the Bell Labs that I knew that drove many of the innovations that we take for granted today, barely exists today, barely exists in terms of the kind of fundamental research that we used to do. And I think that's because the private sector is not investing. And they're saying, well, the government should invest. Well, I think that should be matched, right, if you demonstrate that you're willing to invest not just in applied research, but in basic research, then the government will complement or support that, as opposed to the government giving you money to do basic research. I think the government should do more basic research because they have a much longer-term view of really how that -- and then that fundamental research can be distributed out to the private sector, and to allow new innovators, the smaller companies, to come in and be able to leverage that government research as opposed to just the larger companies leveraging that government research.

MR. WEST: Okay. Right there's another question.

MR. FREEMAN: Peter Freeman, emeritus professor, Georgia Tech. Would we have more innovation if we had a less restrictive patent system and/or less control by a very few major corporations?

MR. WEST: Adam?

MR. MOSSOFF: Well, I don't quite know what you mean by less restrictive patent system because the patent system serves two functions and it serves those two functions fairly well. The first is, it's the classic quid pro quo of the patent system, which is public disclosure, and in fact this was one of the key features of the success of the U.S. patent system from the get go, it was contrary to England and other countries, our patents were very easily accessible by any citizens starting from the get go in this country as opposed to like in England, it was very hard to even locate the patents.

And so they took very seriously the idea that, no, you receive a patent right, it's a property right, but in exchange for that, you have to publicly disclose what that invention is such that people can study it and work to design around it and try to figure out ways to compete with you even during the term of the patent, but then when the patent term is over, the information effectively falls into the public domain such that it can be used by the people from having just read and practiced the invention from the patent.

So, you have public disclosure of the information and that permits information sharing, and in fact, it was the information sharing of the U.S. patent system, which is one of its -- a very good key successful feature of it.

On the other end is the patent system is not about hoarding, it's about developing the technology, licensing, going out into the marketplace, and this is -- this is every successful American inventor starting at the beginning with Samuel Colt and Charles Goodyear -- Charles Goodyear, by the way, who never manufactured a single

piece of rubber, he's not associated with the Goodyear company. The Goodyear company was formed about 50 years after he died. He was a non-practicing entity, what we call now, he solely licensed his technology because he was crazy about rubber. He wrote a 2,000-page treatise which just listed everything you could do with rubber. It's cutting edge reading in 1850.

So, you know, and even our most famous inventor, the man that we all just admire and hold up as the inspiration for everyone today, Thomas Edison, you know, he ran an invention factory in Menlo Park. He didn't manufacture anything. I mean, he put his name on everything, but, I mean, he effectively licensed his technology and his patents to other companies who then deployed it in the marketplace. And this is, for instance, Apple builds their phones -- I mean, Apple has the patents on some of their phones, but they don't build those phones. Other companies build them or they license to those companies so that they can build them.

You know, Google licenses the Droid technology, Samsung licenses its technology. So, you have active licensing in the marketplace, which goes to the patent aggregation issue that, you know, a lot of these companies are aggregating and achieving economies of scale and efficiencies for the same reason that aggregation of research and development achieves economies of scales and efficiencies on the front end. On the back end, on the licensing side, you can achieve similar types of efficiencies.

MR. WEST: Jesse, you want to jump in?

MR. RUSSELL: Yeah, I just wanted to comment, I mean, being someone that has created patents or -- I think for someone to utilize your patent is the ultimate flattery of your creativity, in my judgment. So, I tend not to think that we should hoard or restrict patents. I think that they should be a lot more open.

I think what we need to do is to move into a (inaudible) where the legal system ensures that if you want to use it; you properly compensate people that came up with the original idea.

If I were to point to one unique thing about -- and I hate to spend all my time talking about Bell Laboratories -- but one of the unique things of Bell Laboratories was that it wasn't so much that we produced a patent a day or whatever their verbiage was, it was the synergy of having a host of very bright people interacting and challenging each others' intellectual capability. And we constantly created an idea that, in my judgment, was better than the previous idea.

And that process continued. And I think that Bell Laboratories, as an institution, was one of the primary reasons that America led the world in innovation, in my judgment, not putting -- saying anything negative about our university system, I think we have one of the greatest university systems in the world, but in the private sector where someone like myself -- where I could see my idea not just be an idea, but brought to life because we take it from the conceptual idea all the way to producing the product as opposed to simply writing papers about the idea.

And that was incredibly rewarding to people that did that for a living, and I happened to be one of the people that did it for a living, right, so that's why I don't think the patent system is all that restricted. I think it needs to be more open and I think that as a result, as long as we can make sure the inventor is properly compensated, we should get the idea out and let people out and let people challenge the idea and see if they can come up with a better idea.

MR. WEST: Over here we have a question. There's a microphone coming up from behind you.

SPEAKER: I believe there is a difference. Today's non-practicing

entities are a little different from Edison and Goodyear. Many of them -- there's a lot of -- in a lot of cases, many of them did not either create the patents in the first place, nor do they license them, nor do they put them into practice themselves, they just try and collect rents from them. How new is that from a historical perspective? And does that imply we ought to be making any changes in our patent system?

MR. MOSSOFF: I have some perspectives on that, but I don't -- I mean --

MR. VALDIVIA: Please go.

MR. MOSSOFF: Well, yeah, I've done some research on this and, first of all, it's important to recognize that there actually was a very vibrant secondary market in patents from the get go. What I mean by secondary market is that patents were traded as commodities, so if you read old *Scientific American* journals from 1830s and 40s, they had classified ads in the back of them. Do you guys remember classified ads? Something we've lost with newspapers and the Internet. And there were always great ads, you know, I need a dynamo, what they called an engine, and I have a patent on a locking mechanism for a fence. I'll trade that if you give me a dynamo.

And, in fact, in the sewing machines war there were significant trading and purchases of patents on the various elements of the sewing machine. Singer loved to purchase patents from other people and he was licensing them.

So, you know, you say, well, they're not -- Edison and Elias had a license, today they're rent seeking. Well, you know, one person's rent seek is another person's licensing.

Non-practicing entities are not suing people as a business model. Suing people is not a successful business model. No one wants to be in lawsuits. But their business model is licensing and they only bring lawsuits because people don't pay them

the royalties that they've requested.

A great story I love to tell is, you know, Elias Howe, as I said, he didn't manufacture his sewing machines, he licensed his technology in lockstitch. He had to go to Singer personally to request his royalty. Singer had an infamous temper and threatened to kill him and throw him down the stairs.

Today Elias Howe would receive a very hotly worded email, right, after sending his -- FedExing his license request. So, those days, they actually had to risk life and limb to be on the receiving end of Isaac Singer's infamous temper who (inaudible) -- one person said he (inaudible) put his boot on Elias Howe's neck and all this stuff.

So, I mean, today, because of our technology and because of changes in financial law and because of technology we have vast more complex corporate arrangements and financial arrangements and what not, and so you wouldn't be surprised that in the same way that Thomas Edison was able to take advantage of the changes in technology to create the very first research and development company, that was Menlo Park, it was an invention factory, and he was only able to do that because of changes in the technology that made it possible for him to do that.

We have similar changes in technology which now make it possible for people to aggregate patents for the purposes of licensing. But you have -- you're right, so that is different. But the act of licensing as a business model and people licensing patents that they were not the inventors of is not a new phenomenon actually.

MR. RUSSELL: I don't think -- I personally don't think there's anything wrong with the fact that you should extract value for your creativity. I think that's a part of the American culture, right, or system. You should do that. I think it's actually a good thing that we do it for the following reason: those companies that are choosing not to invest in -- to take some of those corporate profits and put them in long-term basic

research, should have to pay for those people that choose to do that.

So, I mean, it's a different way to look at it. I think it would stimulate them to redirect some of the funds into basic research as opposed to just applied research if they want to own their own patent or they should pay a handsome price for those people that choose to do the other, right.

MR. WEST: Okay. There's a question back on the aisle right there.

MS. KLEIN: Hi. Indra Klein. I'm a nonprofit development consultant.

With regard to patents, the U.S. is pushed to go with the international patent code and with the U.S. patents being much more complex in their classifications; do you see any difficulties with regard to that individual or small business inventor in going through that maneuvering, particularly with regard to the espionage aspect?

And number two, do you think it's time for the Patent Office to reconsider the life of a patent, especially with technology evolving as quickly as it does?

MR. VALDIVIA: Let me take that question. On the first part of your question, on the new law there is also a provision for charging lower fees for smaller entities, and I think that that directly speaks to your concern as to we don't want to imagine that the patent system will be a hindrance for a small business, rather it will encourage a small business to enter high tech industries.

On the -- could you repeat the second part of your question?

MR. WEST: The length of the patent.

MR. VALDIVIA: Right. Here's a partial answer to your question from the area of licensing university patents. Under the current legislation, which is governed by the Bayh-Dole Act, a university has -- is given the title of a patent and the university can decide the terms of licensing, whether these are exclusive, non-exclusive, and the length of patenting.

So, there has been the experience of some programs of, for instance, the University of California Berkeley, introducing socially responsible licensing programs that offer creative arrangements in the licensing contract such that, for instance, a license could be exclusive within the U.S. jurisdiction, but allow developing countries to practice the patent on a non-exclusive basis.

So, the company that will develop for a market -- a strong market as the American market will enjoy the benefits of a patent monopoly whereas there will be competition in other markets where prices would not be as high.

Along the same lines, it could be envisioned the possibility of negotiating different lengths to the licensing contract of a given patent. So, there could be -- something could be worked into the system without changing a law that manages the different tenures of a patent, the tenures by which a patent is effective, depending on the different needs of the sectors to which the licenses go.

MR. WEST: Okay. You had a question up front?

MS. STEVENS: Iryna Stevens, Tech America and a grad student at Georgia Tech.

MR. WEST: Could you speak into the microphone so we can hear you?

MS. STEVENS: Sorry. I was wondering what kind of specific changes you would propose, not necessarily to the overall patent system, but in patent litigation, especially in light of how some patent trolls prefer some court systems over others.

MR. MOSSOFF: Well, I guess as the patent law professor, I'll speak to that. I am -- I worry about some of the proposed changes to -- patent-specific changes to patent litigation, such as the SHIELD Act and other types of provisions, loser-pays, for instance. And one of the reasons -- I worry about them for two reasons, one is on a general level about what it's inserting into the patent system, and then a more specific

issue about the litigation.

At the more general level I worry about it because you're creating a -- the virtue of the patent system, setting aside for just a moment the Bayh-Dole Act, which is one exception to that, is that it's been neutral with respect to technologies, right, so the Patent Act doesn't speak to any specific technology, and even more importantly, it doesn't speak to a type of a patent holder or owner.

So, there's no -- so, there aren't differentiations in the patent system between the person who licenses versus the person who manufactures versus the person who -- like IBM who used the patent portfolio defensively very successfully for 50 years and therefore, as a result, was never sued.

And so what you're injecting into the patent system with proposals to start differentiating between people -- the types of different people who hold patents, whether it's a patent licensing entity or patent manufacturing entity is you're creating incredible amounts of rent seeking incentives for people now to go to Congress and say, I am being injured by X person hold this type of patent and I would like protection for it. And here I've gotten some scholars or some academics who've done some studies to support it. Please help me, right, and we know that rent seeking occurs at Congress a lot.

And so, you're creating incentives for this to occur even more now in a system where it didn't exist before. That's the general problem.

The more specific problem is that the particular things that are being proposed in the SHIELD Act are not -- are very problematic because they, first of all, the types of standards that it sets up for people, you know, bringing lawsuits and saying, if you lose the lawsuit, you have to pay it, and things of that sort, a lot of -- it sets up the ability for defendants, for people who are sent letters saying, I would like you to pay me a

royalty because you are actually using my patented technology, please pay me a royalty, it sets up incentives for them now to engage in strategic behavior by saying, well, you know, I don't want to pay the amount that you're asking from me, I want to pay less, and if you sue me, then I will challenge your patent and if your patent happens to be found invalid or if they happen to find -- or if you happen to lose this lawsuit for whatever reason, you're going to have to pay all of my costs as well.

So, you're changing what was originally an unfettered, private exchange of information based upon the information that each party held with respect to the value of the patented technology and the nature of the information, and now you're adding in a whole new layer of litigation, strategic behavior that changes those dynamics and changes it against the patent owner in favor of the potential infringers.

MR. VALDIVIA: If I may add a very quick connection between the patent system directly to invention, that would be a much needed formalization of the research exemption to patent litigation would allow to prevent frivolous suits to researchers who may be using given patents particular research tools to advance science and technology without necessarily them profiting from the use of those patents.

So, that's a possible change in patent law that may help invention.

MR. MOSSOFF: And also just a lot of the complaints about the cost of the patent litigation system aren't specific to patent litigation. Yes, patent litigation is very expensive, but our litigation system is very expensive across the board, whether you're talking about torts or contracts or other types of suits. So, if your concern is about the cost of discovery and all the other issues that go into litigation generally, the solution isn't to come up with specific industry or legal entitlement specific changes, the solutions are to reform litigation system more generally, not directed to specific types of patent owners or specific patent litigation as such. That's just putting a Band-Aid on what is a more

global problem in the system.

MR. WEST: Other questions? Right here on the aisle we have a question.

MR. CHOATE: My name is Pat Choate and I'm an economist and independent author. In your earlier discussion about the robustness of the U.S. system, I think that we can say one of the distinguishing characteristics of the U.S. system, it always has been, has been the small entity inventor under 500, and individual inventors.

In the 1970s and early 80s, they constituted 30 percent of all the patents issued inside the United States, now they're 20 percent. Individual inventors were 12 percent and they're now a little less than 5 percent.

What we've, I think, seen is changes in our patent laws that have favored large entity transnational firms over the small entity and individual firms. The whole issue of the question of troll is, I think, direct to that. Ninety percent of our patents are unpracticed in the United States and many of the innovations that individual inventors and small companies have, the only way that they can secure remuneration for their efforts is through a licensing arrangement or a sale arrangement.

And what I think has been happening is something that's euphemistically called "efficient infringement" where we have large firms that are literally taking the technologies of others, practicing them, and then in effect challenging them to go to court to deal with that, and the SHIELD Act that Professor Mossoff referred, is directly to that. In that Act itself, what it requires is it allows the defendant 120 days to check to the defendant and if the defendant is a university or a spin-off or if it is a company that is not practicing, if it's in that 90 percent, then that company has to put up 120 percent bond on the litigation cost.

If you're dealing with a $3 to 5 million average cost, you're looking at

putting up $4 million to $6 million, how many small firms can do that? How many individuals can make that bond to do it? It seems to me that one of our concerns is how do we go back and reinforce the dynamism that exists in our system in encouraging small entity invention, individual invention, being able to move a patent through in nine months instead of 34 months, being able to end these very expensive post-grant reviews and ex parte reviews that are being used for strategic purposes.

So, I would throw the question to you, what will happen if we do not focus on small entity and individual inventions and an environment, a public policy environment, that facilitates them instead of crimping them as we're now doing?

MR. WEST: Jesse, do you want to address that?

MR. RUSSELL: No, I -- what you just said is like music to my ears as a small enterprise because the cost to move our patents -- we have to make, every day, very, very strategic decisions about whether we will patent something or keep it as a trade secret, and if you look at some of the work that (inaudible), just using us as an example, because you just happened to hit a chord with what you said, right, but using us as an example, I mean, we are developing -- have spent quite a few years developing this whole area of enterprise cellular networks to allow, as I said earlier, the creation of private cellular networks to run into corporate enterprises.

And the question is, well, some of the unique innovations that we've come up with, we can't even afford to patent them. And so, as a result, we spend most of our time hiding what we're doing as opposed to being very visible about what we're doing, because we have no way to protect it.

So, what you just said is absolutely something we need to do. But let me just make another point because I think one of the reasons we're not able to collaborate enough, and this gets back to this whole ecosystem that I talked about earlier, we're not

able to collaborate enough with universities and so forth because when they invent something, the cost of getting through a university -- I mean, one of our top universities -- is staggering to very talented minorities and underserved -- people from various underserved communities.

What I think we should be doing more, the inventions that are coming out of the universities, and I think you spoke to this, where they don't have to worry about challenging corporations that exploit those, but I think those corporations should be reinvesting back -- if they're not going to create laboratories like we did in the days of the Bell system and Bell Laboratories, then what they should be doing is giving that money to the universities to defer the cost of students getting through universities, such that we still get the top kids coming into our universities.

What's happening right now, and I'm not trying to be (inaudible) of individuals from coming in through the immigration system, but if you look at the most talented individuals, whether they're from China or from India, they tend to go with the top ranked, top recognized companies in China or in India, and the next wave of people come out, they chase the available seats at our universities. And I think what we really need to do is to make sure we're applying money back into the universities so they can reduce the cost and try to attract more individuals from the United States into those seats.

So, I tend to think that the university ought to get paid for having companies use their innovations, right, as opposed to having to fight to recover the cost.

MR. WEST: Okay. In the very back there was a hand that was up a little while ago.

MS. DURAN: Yes, Anna Duran, president of Avatar Research Institute. To build on that idea, I'm extremely concerned that we have created an idea creation

monopoly where there are certain demographic groups that have the resources to develop and to have their ideas taken to the marketplace. And I'm wondering if we can continue on with this conversation in another way. How can we create better environments so that the new ideas coming from the emerging majority groups can get better support, because obviously they're not going to have the monies or resources to get into these patent battles? And then we know from the research of venture capitalists endorsements that women, for example, receive less money to support their ideas than other groups, and then we can look at the minority groups.

How can we -- I'm trying to look for the way to ask this question -- what can we do -- how can we innovate, asking the panelists, a different system to make sure that new ideas from the new emerging majority groups come to fruition?

MR. WEST: Great question.

MR. ADAM: Walter, do you -- I mean, you were speaking to some of this earlier with your comments about decentralization of innovation and universities. I don't mean to put you on the spot.

MR. VALDIVIA: No, it's fine. It's really a very long question so I'm going to give you only a two-hour answer. Buckle up.

Let me see if I can do two lines trying to respond. One, traditionally technology has evolved excluding many of the groups or the stakeholders that come in to participate from the benefits of those innovations. So, one important institution modification that should be brought to bear is how to create a more inclusive innovation system, how to bring in the concerns of our customers, for instance, how to bring concerns of affordability and cost, also, how to connect better the different parts of the innovation ecosystem that -- we have been using that metaphor -- how to make sure that the creativity in basic science laboratories it is deploy (inaudible) with an orientation and a

direction.

Scientists are also citizens. Scientists also eat and have needs and participate in society, so scientists can also be attuned to social needs.

So, there are two ideas, how to -- ways to better connect the innovation ecosystem and ways to include traditionally excluded stakeholders from the innovation system. But perhaps the other panelists will have --

MR. RUSSELL: I think -- my reaction to -- I have put this idea forth in the past, where some of our major or larger corporations need to not -- right now the approach is to acquire smaller innovation companies that are headed by various protected groups -- women, minorities, et cetera. What I think we should be moving more toward and the government should be incenting, larger companies to allow these new smaller innovation engines to spur us by saying, you can adopt them almost like a mentoring system, right, where you can adopt a small company, just like we adopt a highway or we adopt a park, and so forth, and invest in those companies to allow them to do what they do as opposed to acquire them. The innovator gets a take and maybe the reason they're being acquired is not necessarily to allow it to move forward, but to shut it down, right.

And so, as opposed to allowing that to happen, if we just create a system whereby the larger corporations, if they're not pursuing a specific area -- maybe they could get a tax break by actually allowing smaller, minority businesses to pursue innovative ideas and provide access to capital for those smaller companies to pursue unique ideas that -- maybe it's not competing directly with them, but creating more jobs and opportunities in America for others.

I mean, I think we need to get out of the comfort zone where we're just worried about protecting -- meeting the quarterly results with no commitment back to the

overall system that created -- both our universities, the government, and everything else have created the success of many of our very large companies and we need to make them more sort of accessible or committed to investing back into other innovation (inaudible) that we can grow new companies inside of the United States and headed by minorities, women, and so forth.

MR. MOSSOFF: And then just -- I think some of the remarks by Pat, also, earlier, speak to some of your concerns because, you know, the disruptive technologies that bring out that creative destruction that Walter mentioned tend to come from individuals who are working outside of the established structures of the current corporations and other types of entities that are deploying technology and so there's a natural tendency of those corporations to want to have -- to be protected from the challenges to their business models and to their current technology by the new technology that's being created by individuals who are working in their garages and whatnot.

And I think that this -- and so, I think the best thing we can do is to try to, at this point, go back to, because it's been changed, but go back to the patent system that we had that made individuals possible to bring forth those disruptive technologies and to challenge large existing companies that -- multi billion dollar companies that aren't in existence anymore. I mean, Data General Corps, DAC, I mean, you know, people -- these multibillion dollar companies in the 1970s have -- poofed -- they're gone, why? Because there were some people working in their garages in California in the 1970s.

And, you know, in the America Invents Act, when you've created all of these additional structures and shift to first to file and other, which favors the resources of established corporations with vast legal departments that can deploy millions of dollars to their lawyers to quickly rush to file their patents, when you have Congress willing to

entertain what I would contend is discriminatory type changes to the patent system, starting to say, well, we're going to differentiate between different types of patent owners, and things of that sort, then those are the bad -- then you are institutionalizing within the patent system the very -- the concerns that you talked about excluding the individuals who already are outside, working outside, who originally had access to a legal system, a property system that gave them the power to challenge the big entities and the politically and economically powerful entities are now being excluded by the very system. And that's a problem.

MR. WEST: We have time for one more question. This gentleman on the aisle, did you have a question?

SPEAKER: Adam's comment is particularly significant and particularly on point to your question, ma'am. The AIA and the other things that have been going on -- let's call it generally anti-patent activism -- that has directly impacted the structures that provide open access for a whole bunch of people to capital and investment, to the venture capital community. When these people decide to go after the patent system, they're going after individuals who need the patent system in order to get access.

MR. WEST: Okay. I think we're out of time but I want to thank Adam, Jesse, and Walter, for sharing their views with us, and this will be part of our quarterly mobile economy series, so in a few months we will explore the next topic here. So, thank you very much for coming out and joining us.

(Applause)

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