

INNOVATION AS A CATALYST FOR NEW JOBS

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Thursday, April 18, 2013

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SMALL BUSINESS,
SUBCOMMITTEE ON ECONOMIC GROWTH,
TAX AND CAPITAL ACCESS,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2360, Rayburn House Office Building. Hon. Tom Rice [Chairman of the subcommittee] presiding.

Present: Representatives Rice, Chabot, Schweikert, Chu, and Barber.

Chairman RICE. Good morning. Thanks for being with us today. I now call this hearing to order.

Today's hearing is the first in a series that will examine how to bolster America's competitiveness and propel economic growth through innovation and entrepreneurship. America is the most innovative nation in the world. As a global hotspot of breakthroughs and emerging technologies, entrepreneurs have embraced our country's creative spirit for decades and have brought innovations into the marketplace creating jobs and spurring economic growth. Only 20 years ago, the transformative "IT Wave" struck the nation, generating new industries, and with it, new jobs and heightened economic prosperity.

Currently, we stand at a critical juncture. The United States remains number one in innovation, but with unemployment at 7.6 percent and a sluggish economy, communities across the nation are fighting to regain strength and bring back economic prosperity. The question remains - where do these new jobs come from and how can America's competitive advantage in innovation drive economic growth?

To address this question, various entities are taking a variety of approaches to capitalize on America's innovative spirit. For example, in my district, we have the Southeastern Institute of Manufacturing and Technology's Manufacturing Incubator Center, that aids startup manufacturers to transform innovative ideas into commercial products. This sort of focus reinvigorates local communities and recognizes the unique strengths of South Carolina's 7th Congressional District, and I am happy to have Mr. Roach, the Director of the Southeastern Institute of Manufacturing and Technology, with us here today to discuss their work.

Additionally, ADP, human capital management solutions company, which has an office in my district, works with small businesses to find innovative solutions to their business challenges.

While a representative of ADP was unable to be here today, I wanted to highlight the work that they and similar companies are doing around the country to help small businesses innovate to address challenges with everyday tasks such as cash flow, regulatory and tax compliance, and human resource management.

It is evident that creating innovation-friendly conditions is necessary to allow entrepreneurs to thrive and generate new jobs, yet for each community, this may mean something different. Today's witnesses truly understand the challenge and conditions necessary to succeed, and I thank you all for being here. And I look forward to your testimony.

I now yield to Ranking Member Chu for her opening remarks.

Ms. CHU. Thank you, Chairman Rice. And before I begin, I want to congratulate you on your appointment as chair to this Subcommittee on Economic Growth, Taxes, and Capital Access. Chairman Rice certainly knows about small business economics and taxes. He owned his own tax law practice before he came to Congress, so he is certainly well qualified and I look forward to working closely with Chairman Rice on the many critical issues facing this Committee.

Today's hearing is the first in a series that will focus on making America more competitive. Innovation is at the center of what makes America the greatest nation in the world. The ability to turn new ideas into reality drives the U.S. economy forward, creating entirely new industries and the employment opportunities that come with them. It comes as no surprise that small business startups are responsible for leading this charge, seizing on opportunities and growing rapidly.

America has a long tradition of cultivating innovation. About 40 percent of Nobel Prizes have been awarded to American citizens, and almost half of the world's 100 most innovative companies are located right here in the United States. Whether it was providing electricity throughout the country, putting men on the moon, developing the Internet, or decoding the human genome, we can be proud of our legacy of discovery. Not only that, these innovative new businesses created new jobs, an average of 3 million a year.

However, though America has the largest economy in the world, a highly-skilled workforce, top tier companies, and a second-to-none higher education system, there are signs that America's innovative performance is beginning to slip. In the most recent world economic forum, rankings of the national global competitiveness, the U.S. dropped from fifth to seventh place. In fact, in 2008, America ranked number one but we have been steadily outranked ever since.

We can reverse this trend if we take certain key and critical steps. This means investing in education, funding federal research and development, strengthening our patent system, and reforming our nation's immigration system. Because of the timeliness of the last two issues, I'd like to make a few comments on them.

Patents certainly incentivize creativity and innovation, rewarding people for their ideas. Businesses must also know that our nation's patent system is strong and their intellectual property will be protected. If we want to encourage more startups to invest in

their businesses here in the U.S., then it is critical for us to ensure that their developments receive the protection they need.

As a member of the Judiciary Subcommittee on Intellectual Property, I am happy to say that we did pass a law providing the greatest reform to patent law in 40 years. We are also, however, continuing discussions on supporting innovations through patents. Just yesterday we had a hearing examining the effect of abusive patent litigation. Unfortunately, there are bad players out there that abuse the system and impose obstacles for real innovative startups. Companies called patent assertion entities are what some call patent trolls, acquiring patents that they had no role in developing. Their business model is to sue companies that have related products and then seek as many settlements as they can for profit. According to a recent Boston University study, 90 percent of defendants in these suits are small- and medium-size companies. This poses a significant problem for startups, especially technology startups, and I am hopeful that we can find a solution to this issue.

Comprehensive immigration reform is a key issue in Congress right now and is certainly related to the issue of innovation. Immigrants have made extraordinary contributions to America's innovation. Twenty-five percent of the highest growth companies in America, including iconic success stories like Intel, Google, Yahoo, and eBay were started by immigrants. In Silicon Valley, the world's hub of innovation, immigrants helped found half of all technology companies, many of which were small startups. But many of these high tech companies cannot find the workers they need because there are not enough applicants trained in STEM—that is science, technology, engineering, and math. To make matters worse, immigrants who study in the U.S. and want to make their great new idea a reality, cannot get visas to stay and work on their startup. Instead, they are taking the next Google back home instead of growing it right here in America.

It is not just employment-based visas that are critical to the success of the technology industry. We will not be able to attract the best and brightest if they cannot live and work in the U.S. with their families by their sides. Immigrants are twice as likely to start a business as native-borns, and there are many who come to the U.S. through family visas. Jerry Yang, the founder of Yahoo, is a perfect example. His mother brought him from Taiwan to America when he was 10-years-old on a family visa. Despite knowing only one English word, shoe, upon arrival, Yang went on to master the language and thrive in his new home, ultimately founding one of the world's largest Internet companies. He created thousands of American jobs and provides a service that allows millions of Americans to be more productive.

I believe a strong immigration system needs to work for our small and innovative businesses. We must reform our system so that our small businesses have the workers they need and that the students educated here can keep their ideas and businesses in America.

With this in mind, I am looking forward to today's hearing which will provide insights into what our country can do to be one of the most innovative and competitive economies in the world. I would also like to submit two documents for the record under unanimous

consent—one documenting the cost to our American system of abusive patent litigation and the other, policy recommendations from Connect, a successful program linking inventors and entrepreneurs with the resources they need.

Thank you. And I yield back.

Chairman RICE. Thank you, ma'am.

Without further delay, let us get to the witnesses. I appreciate every one of you all taking your time and making the trek here to Washington to be with us to help educate us and the public about what we can do to foster innovation. I see us as the greatest country that has ever been on earth, and we have so much potential. And what we need to do is do everything we can to foster that.

So starting out with Mr. Roach, Mr. Roach and I are acquaintances. He is the Director of the Southeastern Institute of Manufacturing and Technology, which is in South Carolina in my District. And just so you know, my District, eight counties in South Carolina with the national employment rate at 7.6 percent, statewide unemployment rate 8.6 percent, not one of my eight counties is even at the state unemployment rate. We have got a lot of work to do, and it is through institutions like the one that Mr. Roach is the director of that we are going to start to deal with this problem. I have got one county in my district, Marion County, South Carolina, 19.2 percent unemployment. So there is a lot of work to be done.

Mr. Roach, if you want to—I thank you again for being here. If you want to tell a little bit about you and what the Southeastern Institute of Manufacturing and Technology does, I sure would appreciate that.

STATEMENTS OF JACK ROACH, DIRECTOR, SOUTHEASTERN INSTITUTE OF MANUFACTURING AND TECHNOLOGY; JULIE LENZER KIRK, CO-CHAIR, STARTUP MARYLAND; STEVE JOHNSON, PRESIDENT AND CEO, CREATIVASC; MICHAEL D. MCGEARY, CO-FOUNDER ENGINE ADVOCACY.

STATEMENT OF JACK ROACH

Mr. ROACH. Thank you, Congressman Rice.

I am the director of the Southeastern Institute of Manufacturing and Technology. It is a wholly owned division of Florence-Darlington Technical College, which is in Florence, South Carolina. Historically, innovation has created the bulk of American jobs, and we believe it will most certainly be the force that creates jobs tomorrow. We also believe that creativity and innovation are critical to the success of business, industry, and the economy. The SiMT, as we call it, was created to provide support services to existing businesses and entrepreneurs, to help them be successful. Both existing companies and entrepreneurs tend to be in need of some of the same things. These typically include technology, customers, capital, and talent. The SiMT offers services in support of all these areas. Since we opened the doors of our 177,000 square foot Advanced Manufacturing Center in August of 2007, we have worked on projects for over 200 clients, with approximately one-quarter of those being entrepreneurs working on innovative new product ideas.

In support of the first need, that being technology, we offer services in computer aided design, rapid prototyping/additive manufacturing, as well as reverse engineering. Additionally, our 3D-Virtual Reality Center can develop content that allows clients to do both product and process visualization and simulation, and virtual prototyping. We have provided these services to clients that range from Fortune 500 companies to entrepreneurs-inventors who come to us with a sketch on the back of a napkin—very common. The person that comes to us with a napkin sketch, and many small manufacturers, need a resource like SiMT to get their new product innovations to market. We become a part of their product development team, and in some cases we become their entire product development team.

To help our clients with their second need, which is customers for their new product ideas, we create many sales and marketing visual presentations for our clients. These could be a product simulation shown on a laptop computer, or an Internet-based product demonstration. We use many tools, including virtual and augmented reality software to create compelling visualizations of new product concepts. Entrepreneurs, particularly, use these visual applications to sell their product idea to both potential customers and investors. Several of our client entrepreneurs have been able to generate enough interest in their product idea to secure funding for their business startup. In some cases, they were even able to procure purchase orders for their product from established retail companies, such as Home Depot or Lowe's.

The third need, capital, is always tough to come by for innovative entrepreneurs. We are not in the venture capital business. We cannot offer seed money to a client to get his business going. However, what we can do is offer them some ways to leverage the capital they do have. In September of 2012, we finished construction of our new 28,000 square foot Manufacturing and Business Incubator facility. This facility provides startup companies both office and light manufacturing space, which is reasonably priced. It has a potential to house up to 26 different startup companies. It provides amenities found in most business incubators—things like Internet access, telephone service, conference and meeting rooms, shared copiers and printers, and shared commons areas where tenants can network together. Additionally, in partnership with our local Small Business Development Center, we offer training sessions for tenants on subject areas related to running a small business.

Additionally, this new Manufacturing and Business Incubator facility is adjacent to our existing Advanced Manufacturing Center, which houses our large machining center. The machining center has state-of-the-art equipment, such as CNC machining centers, water-jet cutting, and an inspection metrology lab. An incubator tenant that may have a limited need for this type of equipment may procure time on our equipment instead of buying their own. Access to our capital machinery can help get their business off the ground, while preserving their precious operating capital.

We currently have our first client tenant in the Manufacturing and Business Incubator facility. The company, MatrixXcom, was recently accepted into the Mentor-Protégé Program that the Federal government has by Homeland Security. They feel that when they

are up to full production capacity they will employ as many as 200 people in our local market. We have two more companies that we are currently working with to finish their product development. Ultimately, they will move into our incubator as well.

The fourth need is talent, and it is almost universally in short supply today. Companies across the country say they cannot find enough skilled workers to meet their needs. Our parent organization, Florence-Darlington Technical College has its roots in training skilled workers for local industry. The SiMT carries on that tradition. We provide customized workforce development training solutions for client companies. When a startup company needs to train a new workforce or an existing company's desires to raise the skill level of its current workforce, they can get that specialized training at the SiMT.

In conclusion, as communities look for ways to create jobs and drive economic growth, many are finding innovation to be a key element and startup companies to be the real job creators. The Southeastern Institute of Manufacturing and Technology is an initiative to support the innovators and entrepreneurs in its home state of South Carolina, as well as the southeastern region of the United States.

Thank you.

Chairman RICE. Thank you, Mr. Roach.

Our second witness is Julie Lenzer Kirk. Ms. Kirk is the Co-Chair of Startup Maryland, which brings entrepreneurs together throughout Maryland to stimulate innovation and drive economic growth across the state. Startup Maryland was launched on March 30, 2012, and is one of the regional initiatives within the Startup America Partnership. A serial entrepreneur herself, Ms. Kirk founded her first company, Applied Creative Technologies, in 1995.

Thank you for testifying today, Ms. Kirk. You may begin.

STATEMENT OF JULIE LENZER KIRK

Ms. LENZER KIRK. Thank you. Good morning, Chairman Rice, Ranking Member Chu. I am honored to have the opportunity to talk to you about innovation as a job creator. It is a topic that is very near and dear to my heart.

As you mentioned, I am a serial entrepreneur. I call it a "recovering entrepreneur," but I am not recovering very well because I surround myself by that which I am trying to recover from. But really, in my current role as co-chair of Startup Maryland, and as the executive director of the Maryland Center for Entrepreneurship in Columbia, Maryland, I feel fortunate to be surrounded by innovation every day. We have entrepreneurs and aspiring entrepreneurs coming in to us with incredible ideas and inventions and they are just looking for the resources that they need to help build their businesses.

Raymond Cooper is an example of one gentleman who had a great idea. He had filed a patent for his invention. It is an innovative design for a wind turbine that is smaller and more efficient than current designs that are out there. But once he did that he was not really sure where to go to get the help and the resources that he needed. It is not until he stepped onto the Startup Maryland bus that he found the resources that he needed. It was actu-

ally on the advice of his mother who saw the bus on TV that the 39-year-old gentleman came out to Bethesda, Maryland on the second to last stop of our two and a half week tour across the state so that he could pitch his business idea. Little did he know that this unplanned visit to this big yellow bus with the Maryland State flag draped across it, that that would be the catalyst that was going to help him take his invention into the marketplace and go from being a dreamer to a doer, which is what we focus on.

Contrary to what many people think after seeing phenomenal successes like Google and Facebook, the road between an idea and a viable business is highly complex and full of risk. And I am sure, Chairman Rice, you know this firsthand as a business owner and working with business owners, and I have been privileged to assist hundreds of business owners, entrepreneurs, and help them navigate the path from concept to viable business.

Unfortunately, we lost a few long the way because of the risks. But what I found is that while there are many different paths to building a successful business and there is a myriad of unanticipated opportunities to what we call “pivot” along the way, we as a community can and should provide assistance throughout the process. Communities, by way of grassroots efforts like Startup Maryland and strategic public/private partnerships, can increase the probability of success and drive greater outcomes in revenue growth and job creation. They can do this by encouraging connections, promoting and celebrating a culture of entrepreneurship, and facilitating access to needed capital. This is exactly what we at Startup Maryland were told when we asked entrepreneurs across the state what they needed and what we have been focused on since we launched in March 2012.

You shared a little bit about Startup Maryland. It is a regional initiative of the Startup America Partnership, and it is a great example of what we can do through grassroots efforts. It is actually organized by entrepreneurs for entrepreneurs, and we are very much a startup organization ourselves. We are all working for free and we have no money. However, that has never stopped an entrepreneur, and that does not stop us. Our focus for 2013, as we shared at the White House briefing in February, is to leverage the unique assets of Maryland to provide entrepreneurial companies with the connections, coaching, and capital that they need to start and grow, while celebrating the entrepreneurial journey, which includes successes and failures. This, we are hoping, will provide them with an unfair advantage to help them drive increased scale.

In 2012, as I mentioned before, we conceived of and executed a bus trip across the state of Maryland called the Pitch across Maryland, and we invited these entrepreneurs to come on the bus and pitch their companies to a video camera. We then posted them on YouTube so that we could get visibility for these companies and their businesses. We thought we would get about 50 people to come on the bus—we had 168. We had to start turning people away. The tour, we made 25 stops throughout all corners of Maryland, and Maryland is not a huge state.

It was also created as a way to connect these entrepreneurs with the resources that can help them to start and grow their business, and also with each other. We tried to shine a spotlight on them to

elevate the visibility of entrepreneurs. Now, pulling off something of this magnitude with a scant two months of planning, required collaboration with a lot of people around the state. Universities, community colleges, incubators, and economic development agencies all stepped up to help us to customize the message for their regions and to introduce these entrepreneurs to their resources. It was amazing. You had entrepreneurs not even knowing that there was an economic development organization in their county, and we were able to make those connections.

The most impactful outcome for many was the connections that they developed between each other. They were just happy to share their story and to meet other people that were going through that very lonely journey. They were excited to be connected with not only the Startup Maryland community, but also the Startup America. We had a lot of fruitful connections and partnerships that came from that.

Bringing together the community of entrepreneurs is also exactly what I was hired to do by the Howard County Economic Development authority, under the leadership of county executive Ken Ulman, from the Maryland Center for Entrepreneurship, not unlike the incubator that you run. We are leveraging the resources and programs. We have a technology incubator, although as an entrepreneur I do not like using the word "incubator" because it sounds like a warm, fuzzy chicken, so we call it an innovation catalyst or the iCat. We also then connect them with other technology people in the community through the Howard Tech Council. We ran something called the Race for Innovation, where we brought in entrepreneurs, investors, supporters, and nobody knew who anybody else was, so it was just first name only, in a way to get them to connect with each other before they have to actually ask for an investment or ask for services. And that is really what it is about. It is connecting that community. And we have had mentors end up investing in or taking a leadership position in some of these startups and finding partners, getting revenues, and even getting customers.

Another key need in fostering innovation is promoting a culture that supports it. Feeding the entrepreneurial mindset runs through everything we do at Startup Maryland and the MCE, but our climate does not always make it easy. So being able to celebrate failure as well as success I think is really important so that you can get that mindset that it is okay to try things and fail.

Funding is also important. If you cannot have money, you cannot be successful. Many examples of state and local funding, but there is a lot we can do to help that. For example, making the SBIR process a little bit faster and easier so entrepreneurs can get that in time for their businesses. There is also a large and growing gap between sustainable company and concept, and we need more seed funding for that.

So the work that you are doing here is really important, and having us here to help highlight these entrepreneurs, we really appreciate. We need to provide outlets so that we can spread these stories. We need to simplify the federal SBIR process, encourage and expand seed funding.

Chairman RICE. I am sorry, Ms. Kirk, if you could wind up.

Ms. LENZER KIRK. Absolutely. Facilitating key decision-makers to bring innovations to companies to drive revenues.

And then to your point, Congresswoman Chu, creating a startup friendly track to permanent residency for foreign nationals so that they can stay in the States and keep their innovations here.

Thank you.

Chairman RICE. Thank you, Ms. Kirk.

Next we have our third witness, Mr. Johnson, Steve Johnson, who hails from my home state of South Carolina. Mr. Johnson is the President and CEO of CreatiVasc, located in Greenville, South Carolina. In 2012, his firm was competitively selected to be part of the FDA's Innovation Pathway Program. CreatiVasc was also an early company to receive support and investment from the South Carolina Research Authority's SC Launch Program, which aims to bring high tech companies into South Carolina and supports the growth of early stage firms.

Mr. Johnson, thank you for being here today. You may begin.

STATEMENT OF STEVE JOHNSON

Mr. JOHNSON. Thank you, Chairman Rice, Ranking Member Chu, members of the Committee, ladies and gentlemen.

My name is Steve Johnson. I am president and CEO of CreatiVasc Medical in Greenville, South Carolina. Our company began full-time operations in 2007, and we are focused on developing medical device innovations for one of the most expensive chronic diseases: end-stage renal disease, or kidney failure. It represents now over a \$47 billion burden to the health care system. These patients must rely on dialysis to live, but this cost over \$86,000 per patient per year. It has also had very little innovation in the past 30 years.

CreatiVasc developed and now has in clinical trials at Johns Hopkins an innovative device called the Hemoaccess Valve System, which has the potential to significantly reduce the complications and cost of dialysis.

Last year, as you mentioned, CreatiVasc was selected competitively by the FDA to be one of the three inaugural companies in the agency's new Innovation Pathway program, which is designed to accelerate the clinical testing and approval of promising new technologies without compromising patient safety. Our company is in South Carolina, which has traditionally been viewed as a "fly-over state" when it came to innovation: you flew over us to get to either Research Triangle in North Carolina or Georgia Tech in Atlanta, or Palo Alto, or Boston. Now, we are proud that South Carolina is quickly becoming a destination state when it comes to innovation. Over the last six years, over 280 technology-based companies have started up in our state.

What has caused this dramatic change? One major stimulus, as Chairman Rice mentioned, has been a program created by South Carolina Research Authority (or SCRA) called "SCLaunch." And while the state of South Carolina fostered the creation of this program, not a penny of state funding has supported it. This SCRA program provides tax incentives to support and encourage private donations which are used to support early-stage innovations in our state. This SCRA early-stage funding is provided only after exten-

sive and rigorous scrutiny of not only the technology but its management team, its competition, its patents, as well as its paths to market.

Early-stage SCRA funds have triggered over \$200 million in follow-on capital from angel and venture capital investors, and Forbes Magazine named it as one of the top five economic programs in the nation.

The SCRA program recognizes that capital is the fuel that drives the economic engine. Capital transforms “technology” into “products.” This then translates into manufacturing, which then translates into jobs. But something has to prime that pump, and most times, traditional sources of capital, such as banks and now even venture capital funds, want to avoid the risk of early-stage technology startups. Programs like SCLaunch fill that vacuum. Without this program, most of these innovation startups, including our own company, would not exist.

As a native South Carolinian, I fully recognize that our state has rarely been at the top of any ranking. We are usually 48th or 49th. But that is rapidly changing when it comes to encouraging, supporting, and creating new companies with breakthrough innovations.

Innovation is the key to economic growth because it is how we can compete in a global marketplace. It is also how we create good, high-paying jobs here at home. But for innovation to succeed there must be adequate capital to mature these inventions from the lab to the market. I can tell you from personal experience that the greatest challenge is to find long-term funding. Even though CreatiVasc was fortunate enough to be selected by FDA to be one of the top three innovations for one of the most expensive chronic diseases, it is still amazingly difficult to find capital, especially for medical devices which take years to develop, test, and get to market.

This is the opportunity for the future: to provide attractive incentives that secure private investment to support innovative but maturing technologies.

Again, thank you for this opportunity. It is something that obviously you can tell I feel very passionate about. I look forward to your questions.

Chairman RICE. Thank you, Mr. Johnson. I am now going to yield to Ranking Member Chu for introduction of the minority witness.

Ms. CHU. I have the pleasure of introducing Michael McGeary. Michael McGeary is the co-founder and chief political strategist of Engine Advocacy, a working group of people in the entrepreneurial sector based in San Francisco. And it is working to connect those leaders with government to effect change on issues that are important to high growth, entrepreneurial tech businesses. He also serves as a strategist with Hattery Labs, a San Francisco-based seed stage venture fund and creative consultancy. And he is working on high level social and brand strategy. Previously, he worked with Silicon Valley startup Tune-In, and with a leading California law firm specializing in political compliance and disclosure.

STATEMENT OF MICHAEL MCGEARY

Mr. MCGEARY. Thank you, Mr. Chairman and Ranking Member Chu, members of the Committee, thank you for having me here with you this morning.

I want to spend my time talking about issues that will impact the true engine of economic growth in this country, which is our startup community. Starts promise the rebirth and rejuvenation of the American economy, and far from the idea that is held by many about startup life, of bespectacled views and ironic t-shirts gallivanting around Palo Alto or the Flatiron district of New York, spending their days writing code for the next great game about unicorns, we will all have our heads down in our phones, playing as we ride the subway to work. In fact, the startup community in America reflects the best of American business. It is dedicated men and women working in coffee shops and coworking spaces, office parks and garages in Kansas City and Austin and Pasadena and Nashville, and yes, San Francisco and New York, creating economic growth and multiplicative effects not seen in any other industry, helping power not just their own business but in many cases countless others across the country. These men and women have created all of the net new job growth in this country for the last quarter century, and according to our recent study, Technology Works, are projected to create 4.3 jobs in local communities for every job created in a technology concern.

It is for those reasons and so many others that a few of us got together to form Engine Advocacy, and for those of you who may not be familiar with our group, we got started about a year and a half ago with the intention of connecting the startup community with government at the federal, state, and local level. We did so with an eye towards turning some of the workarounds, good ideas, and innovative solutions to common problems faced by the startup community into new legislation or government programs or smart regulation that can help make it just a little easier to start and run those businesses here in America.

We did that in a number of ways for a community that has largely been underrepresented here in the halls of government. Our work is balanced between direct advocacy, convening our members from all over the country with leaders in government, such as yourselves, and educating all of the players by arming them with good stories and strong data that point to the impact that startups can have in driving economic growth.

And that is really why I came here today. If you took a survey of startup founders and entrepreneurs, of investors, technologists, developers, engineers, and the myriad of others working in startups today, they would tell you that two issues more than any other threaten the promise and progress of their companies. These issues—immigration reform and software patent reform—are Engine's immediate priorities and will form the basis of our advocacy work in the coming year.

First let me touch on immigration. Despite our historical competitive edge, we in the United States are facing a growing gap between the jobs we can create and the skills and employees needed to fill them. In the long term, we need to continue to work to evolve our American education system to help power that growth and give

young people the skills they need to compete in a global marketplace. But in the short term, we must also realize that that most valuable resource, talent, is already on our shores. They are attending the University of Wisconsin or Kansas University or MIT or Stanford and others around the country. And unfortunately, we seem to be looking for ways in our current system to send these smart, talented, and entrepreneurial individuals either back to their countries or origin or to places like Canada or Chile or South Korea where they have hung out the welcome sign to these promising minds as we have done for so many years, going back to Ellis Island and Angel Island. It is imperative that we find a way to keep knowledge here, working and building business in America so that our economy can continue to grow and our businesses continue to thrive.

Second, for those that cannot stay and others who are starting business, another specter is lurking, threatening to choke off innovation nearly at its source, and that is the danger of patent trolling. According to recent findings by the Electronic Frontier Foundation, patent trolls are, forgive me, patent assertion entities account for 56 percent of all lawsuits filed against innovators. This environment creates a legal and regulatory thicket, which many young companies of two and three people find incredibly hard and costly to navigate. We must find smart ways to protect innovative intellectual property, and as the constitution says, to promote science and the useful arts. The current system in place does no such thing. In fact, it even threatens to kill innovation as young companies find fewer and fewer avenues for capital as the prospect of patent troll lawsuits grow.

In the end, what is good for startups is good for small business on the whole because startups power small business. Consider a single parent making jewelry in Boise who is able to sell to consumers all over the world thanks to Etsy or the rural doctor in South Carolina who is better and more readily able to diagnose cardiovascular problems in a patient because of increased computing power and new data from existing MRI scans paired with 3-dimensional flow visualization. That is the technology being pioneered right in our office in San Francisco and being made available by Morpheus Medical. And it is the bakery in my neighborhood in San Francisco's Sunset district that accepts credit card payments via Square on their iPad rather than having to buy a costly point of sale system.

The promise and potential of America's entrepreneurial future is also so much more. Yes, we can create gaming apps that distract and delight, but there is also technology being created that saves lives, that brings people closer together, and allows us to see our world and ourselves from a reframed perspective. And startups can power the next generation of American growth if we let them. It will be in working with this Committee and with our other allies in Congress which can allow for that future, our future, to be prosperous.

Thank you, and I look forward to your questions.

Chairman RICE. Thank you very much for your statement.

So many well-intentioned and very talented people here, and I just appreciate so much you taking your time to be here with us today.

Mr. Roach, I want to start with you. I want you to tell me about particularly these technology programs that you have at the SiMT and how it is working with attracting students and what your job placement prospects are.

Mr. ROACH. Yes, sir. The SiMT is part of the Florence-Darlington Technical College, which is one of the 16 technical colleges in the State of South Carolina system. In our Advanced Manufacturing Center in our large machining center in that facility is where we have the Machine Tool Technology program run by the college. Those students are learning the science of machining materials. They start out with fundamental manual machining processes and by the second year of the program they are in computer numerical control, CNC Machining Center operations programming is set up. Those students have a 100 percent job placement rating coming out of that program. In fact, it is very difficult for us to keep them in the program for the full two years because once they get marketable job skills, the local industries out there are trying to hire those students as quickly as they can to get them in the workforce because there is a shortage of those skill sets. So that program in particular is one that is in high demand, it is high paying, and it is even difficult to get people into the program because of the science and technology level it includes, and the young people coming out of high school today typically are not fully prepared to go under that kind of career path. But we are doing everything we can to try to encourage them to go down that path because there are good paying jobs in that field and they are placed 100 percent.

Chairman RICE. You know, what would you say would be the average pay scale? And what would be the prerequisites for entering the program? Are you getting kids that have graduated from college that are entering this technical program?

Mr. ROACH. Yes, sir. We get students in those programs from high school graduates to people with four-year baccalaureate degrees from other institutions who maybe they have got a degree in English or in History or something and they cannot find a job in the job market and they are looking for a high tech skill set that they can market. And they end up coming back to us. We jokingly refer to ourselves as graduate school for some of the four-year universities because we get a lot of their graduates coming back to get a skill that they can market.

The prerequisites essentially are the ability to do math and science. They need a good strong STEM background. Once they have got those prerequisites under their belt they make very good students in these programs.

Chairman RICE. How many students do you take in this program?

Mr. ROACH. Currently, we have approximately 40 students per year in the program. That includes both first-year and second-year, so about 20 in each group.

Chairman RICE. Is that your capacity?

Mr. ROACH. No, sir. That is not our capacity. That is basically what we are being limited to by the local pool of candidates willing to go into the program. In our local area we have had a difficult time with the K-12 system actually steering students away from these kinds of career paths in their education going through high school, so we are trying to bring them in.

Chairman RICE. And I just want your opinion. What is the status of manufacturing in the United States?

Mr. ROACH. The state of manufacturing is strong. Even though we are down on job count, the manufactured products generated by this country are as great as they have ever been. The big difference is that it is being done with technology more than with people. So the people that work in industry today have to have a higher skill set. They have to have more training, and they get, you know, higher paying jobs. So it is a question of same output, fewer numbers of heads, greater skills, greater pay scale. And manufacturing is not dead. It is not going away. It is just different.

Chairman RICE. And you are there and you are ready to provide the skills?

Mr. ROACH. Yes, sir.

Chairman RICE. But you cannot find the people to sign up for your program?

Mr. ROACH. That is part of the difficulty, is getting the pipeline filled with people that are interested in going into manufacturing because the news is always talking about manufacturing is dying, no one wants to go into manufacturing. We have a hard time with parents steering their children away from that kind of a career path, even though a machine tool student graduating from our two-year associate degree program today starts out anywhere from \$17 to \$20 an hour with the possibility of going up to as high as \$30 an hour with about five years experience under their belt. Good paying jobs.

Chairman RICE. These jobs, are you placing them in the local area or are they going nationwide?

Mr. ROACH. This particular program is local. There is enough demand in our local market that it is gobbling up all of our graduates. But we have gotten calls from companies as far away as Kentucky and the Midwest looking for people with this skill set. They have heard about our program through the SiMT and they are asking can we come in and talk to your graduates? Can we get them to come to our facilities? And we say, yes, you can come and talk to them but typically they want to stay close to home and there is a job for them waiting right here in the local market. We are providing as many as we can get our hands on to the industry.

Chairman RICE. And one more question. What is your tuition?

Mr. ROACH. Our tuition at Florence-Darlington Tech, I do not know the exact number because I do not deal with it myself on a daily basis, but we are about \$150 a credit hour. So a full load is, you know, \$1,700, \$1,800 a semester. And in our case, with the State of South Carolina's lottery tuition assistance program, about 80 percent of our students qualify for some sort of financial aid, either Federal Pell Grants or state lottery tuition assistance. So by the time they are done, most of our students either go for nothing

or for \$200 or \$300 out of pocket a semester, not counting books. Books, of course, are additional.

Chairman RICE. Can you stand up and turn around and show me your cape?

Mr. ROACH. No, sir. I don't think I can do that. I cannot bounce bullets off my chest either.

Chairman RICE. Ms. Kirk, could you please tell me some specific assistance? I want to know more about—did you say you work for free?

Ms. LENZER KIRK. The Startup Maryland is all by entrepreneurs who are donating their time, so we are all volunteering our time to bring together the ecosystem.

Chairman RICE. I bet you have a pretty big cape, too.

Ms. LENZER KIRK. No, no, no. It is a great community of support. Everybody pitches in. I think any entrepreneur that has been successful, or even if they have failed and have really enjoyed the process which most of them do, they want to give back. They want to go and help. I am always amazed at the generosity of entrepreneurs to help other entrepreneurs.

Chairman RICE. Now, does this entity, I assume, get some kind of funding? No funding at all?

Ms. LENZER KIRK. No. In fact, it was interesting when we said we wanted to do a bus, everybody just kind of looked at us and said, "How are you going to do that?" And so we figured it out. We went out and raised money from corporations. We got some money from, like, the Howard County Economic Development Authority put the first money in for the bus. And once you start going we were selling the idea before we had it fully funded. I mean, that is kind of what entrepreneurs end up doing. We then charged all of the stops a stoppage fee so that they actually helped to supplement the bus tour. So it is about being creative. It is about figuring out a way, and that is what entrepreneurs do. It is not sitting back and waiting. I mean, we would love to take money and the Maryland State Government did support us but we got started before we had that. We went out and started raising money and talking about getting people excited about the idea, which is what entrepreneurs have to do.

Chairman RICE. It sounds like you are doing a considerable amount of marketing and letting people know about available resources that are already there.

Ms. LENZER KIRK. A lot of it is just grassroots, Twitter and Facebook, and people talking about it to their friends. It is more of a grassroots-type of an effort. No marketing budget.

Chairman RICE. The bus tour sounds like it was a very innovative, brilliant marketing plan.

So when an entrepreneur—how do they contact you?

Ms. LENZER KIRK. How do they contact Startup Maryland? We have a website startupmd.org. And in fact, Startup America has several startup regions—38 regions across the country, s.co is the—s.co, that is all you have to type in, is Startup America, and you can get access to the region that is closest to you.

Chairman RICE. Tell me more about the national Startup America Partnership.

Ms. LENZER KIRK. So the national Startup America was a partnership with the Case Foundation and Kauffman Foundation. And they set out to help to do what we are doing—help entrepreneurs across the country. And so they are pulling in—

Chairman RICE. How old is this entity?

Ms. LENZER KIRK. Two and a half years, I think. It is fairly new.

Chairman RICE. I did not mean to interrupt.

Ms. LENZER KIRK. Yeah, no, that is okay. Obviously, I could go on, right?

So what they realize is that each region really needs something a little bit different, and so they formed the regional initiatives so that the folks in the region could figure out what does that region need the most? So, for example, in Tennessee, they had no incubators, so they connected Startup America. They formed Startup Tennessee and now they have incubators across the state of Tennessee and are doing an amazing job of getting innovations and turning them into businesses. There is a Startup California. There is a Startup Virginia, Maryland, and D.C. We call it the Startup DMV where we try to work together because we are so close. And each region is focused on whatever that region needs. In Maryland, we needed to connect all these great resources we have. We have Johns Hopkins University of Maryland, but they operated in silos, and so they needed that connective tissue, and that is what we have been providing to them.

Chairman RICE. Thank you very much.

Moving on to Mr. Johnson.

Now, I had one more question for you, Ms. Kirk. So when somebody contacts you, gets in touch with you through your website, what specific aid can you give them?

Ms. LENZER KIRK. Well, first we figure out what they need, what stage they are at. And then we will often connect them with their local jurisdictions, the resources there. But within Startup Maryland, we have started a couple of new programs. We have a web portal called Co-Founders Lab that connects team members. It is like the EHarmony for entrepreneurs, so you can go in and find a team member. We have a program that we are just kicking off called “Raise Your Game,” that is for existing companies that can connect them into a community and help them go to their next growth inflection point. We have another startup that we have partnered with called Fosterly that is a resource map of all the resources in the state. It is crowd sourced. So we figure out really what it is that they need and then connect them into the network to find it.

Chairman RICE. Thank you, Ms. Kirk.

Mr. Johnson, thank you again for coming all the way here from Greenville. Wow, it sounds like you’ve done big things coming up with help for people with dialysis needs. That is wonderful.

How specifically did SCRA help you get off the ground?

Mr. JOHNSON. When we were forming the company in 2007, obviously we realized that with an implantable mechanical long-term blood exposure device, this was not going to be either a short-term or inexpensive process. We needed, if you will, the term we use is “runway.” We needed a runway to raise money. We went to South

Carolina Launch and pitched them on the concept of our device, the kind of need that there was in the market, the fact that there had been no innovation in the field in 30 years, and we were able to get a \$200,000 grant from South Carolina Launch that basically bought us about nine months of time. During that period of time we went to the private investors in the area. We brought together 40 angel investors and we raised \$3.4 million. That \$3.4 million was based upon our achieving set milestones, and I think that is a key, too, to our success and to any—

Chairman RICE. Was SC Launch or SCRA involved in pulling together these investors?

Mr. JOHNSON. We pulled together the investors, the mechanism that gave us the funding to allow us that time to pull those investors together. But in that six month period of time we were able to raise \$3.4 million as a total commitment from those investors, and then based upon milestones of developing a finished prototype in animal trials and then beginning human clinical trials, various tranches were called in from those investors based upon our success. But truly, and we have received three installments from South Carolina Launch. The first enable us to get off and running. The second one enabled us to actually create our finished prototype and finished device that is being implanted in humans now, and the third tranche came last year when frankly we were just out of cash. And it frequently happens. And again, even though we have one of the first innovations in this field in 30 years, it is still in this environment extremely difficult to raise capital, even among the venture capital community because they want lower and lower risk and greater and greater assurance of success. And in medical devices, you are always at the exposure of what happens in the human body that you do not see in the lab. And so it is not always linear. It is not always predictable, but it is something that we live with.

Chairman RICE. Thank you.

Mr. McGeary, I want to ask you questions but I have taken far too much time already. Not that I do not appreciate what you do or the fact that you are here, and I appreciate it very much. I could talk to each one of you for an hour. So just thank you all very much for what you are doing. Thank you for what you are doing to help create businesses and jobs in this country. And with that I am going to yield to the Ranking Member, Ms. Chu.

Ms. CHU. Thank you so much.

Well, I have questions for Mr. McGeary. Mr. McGeary, according to a study from the Center on Education in the Workforce at Georgetown University, science, technology, engineering and math could have a 230,000 shortfall of advanced degrees in the U.S. by 2018. What do you think is the best way to address this shortfall?

Mr. MCGEARY. Thank you, Ranking Member Chu.

I think that it is critically important to address. There are a number of ways in looking at the entirety of the system. Obviously, in the long term we need to address the educational system we have got in this country and really retrofit it for the jobs we are creating moving forward in the 21st century and train young people of promise to be part of these science, technology, engineering, and mathematics disciplines to take those positions.

The short-term answer to that is comprehensive immigration reform, and as part of that it really does have focus on technology. Obviously, your colleagues across the street have shown us their proposal. The Senate has come out with their proposal on immigration, which has some good in it for technology, including improved access to H1B and things like that.

We have done a recent study that I reference in my opening statement called Technology Works, which has similar findings and we will be diving deeper into those throughout the year, alongside the Georgetown study. And we are seeing the same thing—that we are going to have a gap between the jobs we are already creating and the skills needed to fill that and the talent needed to fill those jobs. So it is critically important that we start that process now. We have got people here in our universities as I mentioned, who are ready to take on those jobs or to create their own companies, their own startups in communities all around the country that would, in fact, create even more. We have got to do better at keeping those people here. It is not about even opening up so much; it is keeping people that are already here, here, as opposed to sending that creativity and that entrepreneurship and those skills overseas. So in the long term, education; in the short term, we have to keep people here.

Ms. CHU. And talking about the short-term, can you give us an example of how our broken immigration is hurting startups?

Mr. MCGEARY. Well, I will give you one that is clear and plain as day from last week. On the first of April, and this is not an April Fool's joke, we opened the H1B process for high skilled people to apply to stay here. There were 65,000 visas available. There were 124,000 applications. So not only are we keeping half of the people where, we are sending half of them home on a coin flip. We do not even frankly know if we are keeping the right 65,000 people here. That is a sin. Those are 124,000 very skilled people that would power immense job growth not just in technology, but as I mentioned, it would also engender job growth in the communities that surround it to a level of 4.3 jobs created for every high tech job. So sending these people back overseas is awful and something we need to fix immediately.

On the very same day, in Canada, they opened their startup visa program. It was a very nicely designed website that shows you all the different pathways and the people in government that will help you as an entrepreneur come and start a business in Vancouver and Toronto or any city across Canada to start your business there, and they will help you get a visa and they will help you start. So instead of shipping people away, they are asking people to come in. They are not alone in that. There are other countries, like I said, with a welcome sign out. We have got to be one of those countries again. We have a history of that in the United States. You know, I am a descendant of immigrants, as so many people are in this country. We have got to make it once again so that the highly skilled people that are powering economic growth on all sectors of the economy can stay here in the United States and start businesses.

Ms. CHU. I would like to turn now to the patent issue, and you certainly were very eloquent in talking about the effect of that on

startups. Could you give us an example of how these patent assertion entities, as some call patent trolls, how they work on the existing companies that do productive work? And also, any insights in terms of solutions that Congress could undertake.

Mr. MCGEARY. I will answer that by telling a quick story. My co-founder was on a panel. I think it was Stanford Law School, and this was about a year ago now. It was him, it was a lawyer from a big law firm with an IP practice, and it was a gentleman from Intellectual Ventures, which is one of the most notable patent assertion entities out there. And a student asked a question. He said, "I am starting a business and I think there might be some patent issues with this. How do I protect myself?" And this is an early 20s, starting his first business, wanting to get started. And the gentleman from Intellectual Ventures says, "Well, you can come to us and you can license our patent portfolio." Because what they do is go up and buy patents and they do not create products with them, but then they license them back to companies that will in some cases, or they use them as leverage against companies that are infringing them, knowingly or not, in court battles. And so that will cost you about \$250,000. And then they went to the attorney sitting next to him and they said, "Well, actually, you can come to us and we will protect you from the patent trolls and we will represent you in court, and that will cost you about \$250,000." And then they got to Josh, my co-founder, and he looked down the table and he said, "You know you people are all crazy, right?" No startup, and certain no venture capital firm—and in my day job, which I get to do very infrequently these days, I work for venture capital and I see this every day—no venture capital firm is going to make an investment of \$250,000 in a company so that they can then send that money into litigation. And that, by the way, is an opening offer. That is just to clear off the simplest of infringements unknowing, what have you. It goes so much deeper than that.

There are a lot of things that we can do, I think, on a legislative level and on a regulatory level that Congress can lean on. Most notably is working with the Patent and Trademark Office to reform some of their policies on software patents and making sure that fewer bad patents get through. There has been a lot of that. There is a provision in the America Invents Act, which allows for financial services patents to be reexamined and thrown out if they were not shown to be useful. I think extending that to software would be good as well. But also looking at things like fee shifting and other areas, things like we have seen in your colleague, Congressman DeFazio's SHIELD Act, which is co-sponsored by Congressman Chaffetz, that has been out for a while, which we have taken a good look at and we are broadly supportive of. I think there are a number of avenues for doing this, but it is—I like to say that if you ask for the top five issue areas concerning startups, the first four would be immigration, but that fifth one is definitely patent. It is right there and we are looking at ways to work with the community on the whole and all of you here in Congress to make that situation much better.

Ms. CHU. Thank you.

Mr. Roach, I was interested in your comments about a couple of important programs in Congress—the Mentor-Protégé Program, as

well as the SBDCs. You mentioned that your first client-tenant in the Manufacturing and Business Incubator Facility had been accepted into the Mentor-Protégé Program. And I was very interested in this because in the last Congress, Congressman Schilling and I introduced a bill to improve that Mentor-Protégé Program and it did pass. So could you talk about why this program was so important to your client and how it could help startups and small businesses to be more innovative?

Mr. ROACH. Well, I will try. I am not a real expert in the program.

My understanding of the way the program works is that if the small companies have some sort of technology that is of interest to the federal government, whether military or Homeland Security or whoever it is, they are paired up with a company who is already doing business with the government in that area. And that company sort of shepherds the small startup company through some of the government bureaucracy, the red tape of government procurement, things like that, as well as offering technical support in some areas to the small startup companies to help them really get their product developed, get it to market, and get it into the hands of the people within the government who want that technology. Sort of fast track it as best they can. That is kind of my understanding of the program. I am not an expert in the program.

Ms. CHU. But I appreciate your insights. And Small Business Development Centers have provided training sessions to tenants of your incubator, so could you talk about these SBDC, Small Business Development Centers, and how they have helped in what you are doing as well as if there were cuts, which there could be cuts of \$10 million due to the sequester, how that would affect the situation.

Mr. ROACH. As far as our interface with the SBDC, we actually have one of the offices on our main college campus. It is one of the groups in the state of South Carolina. We work closely with that group all the time with our incubator facility. They actually help us do a good job of prescreening a lot of potential candidates into our center. I just had someone visit me this past week who wanted to come into my incubator and rent space, and when I discussed it with him it was obvious he had no idea what starting up a business was even about. He just had a good idea he thought and he wanted to come to me and rent space. I want him to go through the SBDC process because they will shepherd him again through the process, help him create a business plan, be a good sounding board whether his concept even is sound—all those steps that he really needs to do before he comes to see me at my incubator facility because I cannot give him that sort of grassroots guidance that the SBDC can. So we lean on them heavily to help us sort of prescreen or filter potential tenants in our facility.

And they do a great job in our area. They work with a lot of people who have got an idea and they do not have a clue what they need to do as a first step to get started. They do not even know what a business plan is. Just I am going to get out there. I am going to make a million dollars today no matter what. I have got a good idea. So if I can say anything about the SBDC, we need to do everything we can to keep those folks in business. I do not know

what the sequestration cuts might do to them. I have not got a clue. But we need to do what we can to keep those people doing what they do because they are a godsend to people in the startup phrase of contemplating a new business.

Ms. CHU. Thank you for that insight. I really appreciate it. And I yield back.

Chairman RICE. I now yield to Mr. Schweikert for five minutes.

Mr. SCHWEIKERT. Thank you, Mr. Chairman. And I am sorry I missed some of the testimony. As we all know, this is the wacky time of year where they have you on two different committees, but at least we are on the same floor of this building.

In listening to this—and this is sort of a question—and I was going to start with Ms. Kirk—access to capital. I have a personal fixation because of my participation with the Jobs Act last year and how do you get smaller companies an access to money. With what you are doing in Maryland, issue, nonissue, where does that rank?

Ms. LENZER KIRK. Huge issue. Yeah, huge issue. There are a lot of companies—as he was talking about venture capital, they are going farther and farther away from pre-revenue. They want a less risky deal. But in the beginning, there are no guarantees, especially if you have to go through FDA approval and things. So it is a huge deal. We have companies looking for—and loans are harder to get, too. You know, thankfully, the SBA does back loans and that is helpful, but there is a lot of—because of the economy, there is a lot of entrepreneurs who maybe do not have great credit. That does not mean they are bad people. That does not mean that they cannot build a phenomenal business.

Mr. SCHWEIKERT. From some of the smallest ventures you have had approach you in Maryland, how small? I mean, where do you see the entering point of someone with a good idea? I mean, are they looking for a million dollars?

Ms. LENZER KIRK. Sometimes it is can you buy me a laptop? I need \$1,500 to get a laptop. I need \$5,000 to file a patent.

Mr. SCHWEIKERT. Mr. Roach, for you, where do you see some of your starting point entrepreneurs? What are they hunting for?

Mr. ROACH. Very similar. In a lot of cases the fellow I just mentioned who was looking to rent office space, all he needed really was—in his case I think he had a laptop computer already so he did not need that but he needed some amount of money to even pay his rent. He was off the hip for any rent money.

Mr. SCHWEIKERT. Why does this sound like something I would end up investing in.

Mr. JOHNSON, the same question.

Mr. JOHNSON. It is very, very, very challenging. Venture capital, again, they want revenue-generating companies. And again, it is very difficult to get that at point when you are under regulatory scrutiny. And again, I think there is a great opportunity to improve the connection between NIH and FDA. They have been siloed too many times in the past.

Mr. SCHWEIKERT. Well, but that is not where, you know, the first level of entrepreneurial innovation is coming from.

Mr. McGeary, and you are also—you have a relationship with the venture capital world; right?

Mr. MCGEARY. That is correct. I do retain a desk anywhere at a venture capital fund in San Francisco. And we make early stage investments in consumer and retail and enterprise companies.

Mr. SCHWEIKERT. Because where I was going to come back to you, I know you said my first four is immigration, talent—which having a large Intel facility in my state and these things I hear that all the time. But somewhere in there I was hoping I could get you to adjust your top five to have access to capital somewhere in there.

Mr. MCGEARY. Well, the good news, Congressman, is through your work on the Jobs Act, that is less of a worry for us because especially for early stage investors—I am sorry, for early stage startups, there should be better access to capital.

Mr. SCHWEIKERT. Now, there is a very interesting clause in that sentence, is there not? “Should be.”

Mr. MCGEARY. Should be. You have done your work and we thank you for it. And we need the Securities and Exchange Commission to enact the law.

Mr. SCHWEIKERT. Say that again?

Mr. MCGEARY. You have done your work, Congressman.

Mr. SCHWEIKERT. No, no, no. Not that part.

Ms. LENZER KIRK. We need the SEC to do their—

Mr. SCHWEIKERT. No, no, no. I get enough flatter around here. I never knew I was so tall and good looking until I got elected as a member of Congress, but there is a discussion—hey, you all know exactly what I am talking about.

But the discussion—and I do not want to beat up on them because they have had a lot of interesting situations over at the SEC, but we all came together as a body, moved a bipartisan piece of legislation, and something like crowd funding, you know, it is the egalitarian access to put up an idea, have it vetted through the Internet, have us write positive and nasty things about it in blogs, and be able to raise up to a million dollars, and we cannot get it through the bureaucracy and we are over a year late on the rule set.

And I guess where I was heading on this is you all build the silos and these organizations to help people. You are out there doing venture capital. You are trying to bring talent together, and yet it is our own bureaucracy that is killing, starving this next generation. Because who knows what that great idea is going to be? It is in someone’s garage right now. It is probably not at the national institutes. It is probably in someone’s garage. So please, help us to continue to fuss at the SEC to get these rule sets out. And with that I yield back, Mr. Chairman.

Chairman RICE. Thank you, sir. I recognize Mr. Barber.

Mr. BARBER. Well, thank you, Mr. Chairman. Thank you to the witnesses for coming. I am sorry I missed some of your testimony but I was here certainly to hear about the good work you are doing.

Particularly, Ms. Kirk, I am very impressed. When you said how much does it cost, you said nothing. And of course, people are investing time and energy in providing that kind of collaboration and knowledge through others and I really commend you for what you are doing.

I want to talk a little bit about how we move research—university research from the university to small businesses. Yesterday, I met with President Ann Weaver Hart, who is the new president of the University of Arizona, which is one of the premier state universities in research, not withstanding what is going on at ASU, Congressman Schweikert. But one of her earliest decisions as president was to establish what she calls “Tech Launch Arizona.” We know we have incredibly smart researchers, people who really know that part of our world very well, great scientists, but I think they would be the first to admit they do not know a whole lot about how to make something a commercial product. So this enterprise brings in expertise from the College of Business to help these professors and researchers get their product quickly to market. Arizona—Southern Arizona in particular—has a very strong foundation of bioscience, high tech industries, and a burgeoning solar industry, so we have a base on which we can build.

I guess my question to you and to any of the other witnesses who would like to respond is what can Congress do to help move, first of all, to find and move research to the market quickly. Small businesses, we all know this, are the engine of our economy. These innovations have the opportunity to provide great paying jobs that will last forever that will help people in many, many ways. And I would just like your advice on what it is we can do specifically to in this arena to help research universities get those products to market so that we can actually build those businesses.

Mr. Johnson.

Mr. JOHNSON. Traditionally, the University Tech Transfer Offices are overwhelmed. I think what needs to happen is if there could be assistance that could go to the research universities, in order to help them inventory their technologies that are on the shelf and help match those against market needs, unfortunately, so much university research is done sometimes in a vacuum. It is not connected to a need in the marketplace that pulls that technology through. Any assistance that could help those universities analyze markets, see market needs, get them in touch with real entrepreneurial ventures, like Ms. Kirk’s, and help them understand the process, you do not want a researcher running a business, and all the data points to that. But you do need them to help transfer it into people’s hands that can do that.

Ms. LENZER KIRK. And I would say, so one of the programs that I taught is called Activate, and it is helping mid-career women start tech-based businesses. And it is all based on commercialization. We started out teaching them. As an entrepreneur, I had no idea there was this rich resource of intellectual property sitting in these universities and government labs, so educating the public about this opportunity and this thing is imperative that we need to do. We are getting ready to launch a program working with the NSA, Johns Hopkins, and APL to accelerate the commercialization of technology by bringing entrepreneurial thinking people in, teaming them with the researchers so that they can form a team. The researchers can keep doing what they love to do and have the entrepreneurs bring those commercial products to the commercial world.

Mr. BARBER. I would really like to know more about that initiative when my staff is here, my legislative director. We would love to be able to learn a lot more about that. This is an adventure in our community that is in its infancy. We have had tech launch programs across the university, and this is the first attempt to really bring all of that expertise together with all of the struggle that it will be to take people away from their departments, but I think it is the future for our economy in many respects and many other states as well. So I would love to hear more about your initiative.

Thank you. I yield back.

Chairman RICE. Thank you, sir.

Again, everybody, thank you so very, very much for being here today. You all came a long way. You all are doing your part to move our country forward, and I cannot express in words my gratitude for what you are doing. America is at a crossroads and cultivating our innovative strength to foster job creation and economic growth is necessary if we are going to compete on a worldwide stage. As our witnesses today demonstrate, America's innovative spirit is alive and well. I am encouraged by local communities and private entities who are finding creative ways to embrace the spirit and aid entrepreneurs in turning their ideas into viable business products.

I ask unanimous consent that the Members have five legislative days to submit statements and supporting materials for the record. Without objection, so ordered. The hearing is now adjourned.

[Whereupon, at 11:14 a.m., the Subcommittee was adjourned.]

A P P E N D I X

COMMITTEE ON SMALL BUSINESS

SUBCOMMITTEE ON ECONOMIC GROWTH, TAX, AND CAPITAL ACCESS

HEARING ON “INNOVATION AS A CATALYST TO NEW JOBS”

TESTIMONY OF JACK ROACH

DIRECTOR OF THE SOUTHEASTERN INSTITUTE OF MANUFACTURING
AND TECHNOLOGY

VICE PRESIDENT OF WORKFORCE DEVELOPMENT FOR FLORENCE-
DARLINGTON

TECHNICAL COLLEGE

FLORENCE, SOUTH CAROLINA

APRIL 18, 2013

The Southeastern Institute of Manufacturing and Technology (SiMT) is located in Florence, South Carolina. It is a wholly owned division of Florence-Darlington Technical College. Historically, innovation has created the bulk of American jobs, and we believe it will most certainly be the force that creates jobs tomorrow. We also believe that creativity and innovation are critical to the success of business, industry, and the economy. The SiMT was created to provide support services to existing businesses and entrepreneurs, to help them be successful. Both existing companies and entrepreneurs tend to be in need of some of the same things. These typically include four things; Technology, Customers, Capital, and Talent. The SiMT offers services in support of all these areas. Since opening the doors of our 177,000 square foot Advanced Manufacturing Center in August of 2007, we have worked on projects for over 200 clients, with approximately $\frac{1}{4}$ being entrepreneurs working on innovative new product ideas.

In support of the first need, Technology, the SiMT offers services in Computer Aided Design, Rapid Prototyping/Additive Manufacturing, and Reverse Engineering. Additionally, our 3D-Virtual Reality Center can develop content that allows clients to do both Product and Process Visualization & Simulation, and Virtual Prototyping. We have provided these services to clients that range from Fortune 500 companies, to the entrepreneur-inventor who comes to us with a sketch on a napkin. The person that comes to us with a napkin sketch, and many small manufacturers, needs a resource like SiMT to get their new product innovations to market. We become a part of their product development team.

To help our clients with the second need, Customers for the new product ideas they have, we create many sales and marketing visual presentations for our clients. These could be a product simulation shown on a laptop computer, or an internet based product demonstration. We use many tools including Virtual and Augmented Reality software to create compelling visualizations of new product concepts. Entrepreneurs, particularly, use these visual applications to sell their product idea to both potential customers, and investors. Several of our client entrepreneurs have been able to generate enough interest in their product idea to secure funding for their business startup. In some cases, they were even able to procure purchase orders for their product from established retail companies.

The third need, Capital, is always tough to come by for the innovative entrepreneur. The SiMT is not in the Venture Capital business. We cannot offer seed money to a client to get his business going. However, what we can do is offer them some ways to leverage the capital they do have. In September of 2012 we finished construction of our new 28,000 square foot Manufacturing and Business Incubator facility. This facility provides startup companies both office and light manufacturing space, which is reasonably priced. It has the potential to house up to 26 different startup companies. It provides the amenities found in most Business Incubators; internet access, telephone service, conference and meeting rooms, shared copiers and printers, and a shared commons area where tenants can meet and network with each other. Additionally,

in partnership with our local Small Business Development Center, we offer training sessions for tenants on subject areas related to running a small business.

Additionally, this new Manufacturing and Business Incubator facility is adjacent to our existing Advanced Manufacturing Center, which houses our large machining center. The machining center has state-of-the-art equipment such as CNC machining centers, water-jet cutting, and an inspection metrology lab. An Incubator tenant that may have a limited need for this type of equipment may procure time on our equipment instead of buying their own. Access to our capital machinery can help get their business off the ground, while preserving their precious operating capital.

We currently have our first client tenant in the Manufacturing and Business Incubator facility. The company, MatrixXcom, was recently accepted into the Mentor-Protégé Program by Homeland Security. We have two more companies that we are currently working with to finish their product development, before they move into the Incubator facility.

The fourth need, Talent, is almost universally in short supply today. Companies across the country are saying that they cannot find enough skilled workers to meet their needs. Our parent organization, Florence-Darlington Technical College, has its roots in training skilled workers for local industry. The SiMT carries on that tradition; we provide customized, workforce development, training solutions for client companies. When a startup company needs to train a new workforce, or an existing company desires to raise the skill level of its current workforce to compete in a broader market, they can get that specialized training at the SiMT.

In conclusion, as communities look for ways to create jobs and drive economic growth, many are finding innovation to be a key element, and startup companies to be the real job creators. The Southeastern Institute of Manufacturing and Technology is an initiative to support the innovators and entrepreneurs in its home state of South Carolina, as well as the southeastern region of the United States.



TESTIMONY OF

JULIE LENZER KIRK

CO-CHAIR STARTUP MARYLAND

And

EXECUTIVE DIRECTOR, MARYLAND CENTER FOR ENTREPRENEURSHIP

Before the

HOUSE COMMITTEE ON SMALL BUSINESS

SUBCOMMITTEE ON ECONOMIC GROWTH, TAX AND CAPITAL ACCESS

Hearing on "Innovation as a Catalyst for New Jobs"

April 18, 2013

Contact Information:

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Good morning, Chairman Rice, Ranking Member Chu, and members of the Subcommittee. I am honored to have been invited to speak with you about Innovation as a Catalyst for New Jobs, a topic very near and dear to my heart. Not only am I a “recovering entrepreneur,” but in my current roles as Co-Chair of Startup Maryland and Executive Director of the Maryland Center for Entrepreneurship in Columbia, Maryland, I am fortunate to encounter innovation every day. People come to us with incredible ideas and inventions looking for resources to build them into a viable, sustainable business.

Raymond Cooper had such an idea but didn’t know where to go for support. He had filed a patent for his invention, an innovative wind turbine that is smaller and more efficient than current designs. From there, however, he wasn’t sure which step to tackle next or where to find the resources he needed. Not until, that is, he stepped on the Startup Maryland bus. On the advice of his mother who saw coverage of the bus on TV, the 39 year old came to Bethesda Maryland on the second-to-last stop of our 2½ week trip across the state so he could pitch his business idea. Little did he know that an unplanned visit to the big yellow bus draped in the Maryland State flag would be the catalyst that would launch his journey from a dreamer to a doer.

Not an easy journey

Contrary to what many people may believe after seeing phenomenal success of companies such as Google and Facebook, this road between an idea and a viable business is highly complex and full of risk. I know because not only have I been down that road myself more than once, but I’ve also assisted hundreds of entrepreneurs navigate the path from concept to viable business. Unfortunately, not all of them make it.

What I have found is that while there are many different paths to building a successful business and a myriad of unanticipated opportunities to pivot along the way, we as a community can and should provide assistance throughout this process. Communities, by way of grassroots efforts and strategic public/private partnerships, can increase the probability of success and drive greater outcomes in revenue growth and job creation by encouraging connections, promoting and celebrating a culture of entrepreneurship, and facilitating access to needed capital. This is exactly what we at Startup Maryland were told when we asked entrepreneurs across the state what they needed and what we’ve been focused on since we launched in March 2012.

Startup Maryland - Pitch Across Maryland

Startup Maryland is a regional initiative of the Startup America Partnership, and it is a great example of incredible things being accomplished through grassroots efforts. Organized BY entrepreneurs, FOR entrepreneurs we are very-much a startup ourselves: we are all putting in a great deal of time without getting paid as we have no money and no resources. However, that’s never

stopped an entrepreneur and isn't stopping us. Our focus for 2013, as shared at a White House briefing in February, is to leverage the unique assets of Maryland to provide entrepreneurial companies with the connections, coaching and capital they need to start and grow while celebrating the entrepreneurial journey. This will provide them with an UNFAIR ADVANTAGE, ultimately increasing the rate and scale of successes.

In 2012 we conceived of and executed a bus trip across the state called Pitch Across Maryland that connected entrepreneurs with the resources they need to be successful. The tour—which made 25 stops through all corners of the state—was created as a way to connect entrepreneurs with each other as well as state, regional, and local resources while also shining a spotlight on entrepreneurship through celebration and awareness.

Pulling off something of this magnitude with a scant two months of planning required collaboration with key sponsors at each tour stop. A combination of universities, community colleges, incubators, and economic development agencies stepped up and customized the message and approach for the bus's visit to meet their community's needs and pulled in their local businesses to support and celebrate. Working through both our network and those of our state-based partners, we were able to exceed expectations in number of entrepreneurs reached and still hear stories of valuable connections that were made as a result of the tour.

The most impactful outcome for many has been the connections that developed between the entrepreneurs themselves. Grateful to have an opportunity to share their passion for their ideas and businesses, the entrepreneurs we met along the way used words like inspired, exhilarated, motivated, and we can't leave out—relieved—to describe how they felt after their experience on the bus. They were excited to be connected to each other and to something bigger—the community of entrepreneurs assembling as Startup Maryland as well as their peers across the country through the Startup America Partnership. A specific example of a fruitful connection resulting from the tour was the partnership between Startup Maryland and local startup CoFounderLab. CoFounderLab created a platform that is the e-Harmony of startups, helping entrepreneurs to build teams. Startup Maryland is now providing this service to the community.

Maryland Center for Entrepreneurship

Bringing together a community of entrepreneurs was also exactly what I was hired to do when the Howard County Economic Development Authority, under the leadership of County Executive Ken Ulman, formed the Maryland Center for Entrepreneurship, or MCE. At the MCE, we are leveraging our resources and programs, such as a technology incubator called the Innovation Catalyst (iCat), a Speaker Series and an innovative program called the Race for Innovation with the goal of ensuring members of the ecosystem—entrepreneurs, innovators, investors, mentors and service providers—are not only getting connected but are engaging with each other in meaningful ways long before they need to pursue for-

mally working together. For example, we've had mentors end up investing in or taking a position with our companies, strategic partnerships being formed, and companies finding new clients via the relationships they've built through the community.

Creating a Culture of Entrepreneurship

Another key need in fostering innovation and entrepreneurship is promoting a culture that supports it. Stoking the entrepreneurial mindset runs through everything we do at both Startup Maryland and the MCE but our environment doesn't make it easy. Maryland has over 15 academic institutions led by world-class innovators and commercialization leaders Johns Hopkins and University of Maryland. We have the highest concentration of employed doctoral scientists and engineers and opportunities for high-quality jobs at the approximately 20 government agencies and over 50 federal labs ¹ in our state. Unfortunately, these assets can provide significant career and earning opportunities that mark a stark contrast to the realities of lean earning while starting up a business. Additionally, some places consist of an environment which encourages a mindset that can counter and even deter people from considering entrepreneurship as a career option. Continuing to promote not only entrepreneurial successes and failures alike will make entrepreneurial role models and realities more readily available and accessible. This is especially crucial among under-represented groups and by offering programs to specific affinity groups such the ACTIVATE® entrepreneurship program for mid-career women and the veteran's entrepreneurship program, both supported financially in part by private company sponsorships, the MCE is actively working to spread the culture of entrepreneurship beyond traditional boundaries.

Funding Innovation

A business has no chance of being successful if it can't bring in money from either customer-based revenues or outside capital (dilutive and/or non-dilutive). There are many examples of state and local funding made available to innovators and entrepreneurs, but more can be done. For example, many rapidly developing innovations rely on and could benefit from the federal Small Business Innovation and Research (SBIR) grants but the time and complexity to apply for and receive these monies is often untenable for a start-up who needs to move fast to take advantage of market conditions.

Currently, there is also a large and growing gap between idea conception and sustainable sales that every company must go through and many don't survive without funding. Called "The Valley of Death" (one of many for a growing company), it is imperative that we help companies bridge that gap with more seed-level and pre-revenue funding including access to potential customers, large and small. One of the ways Maryland is helping companies to cross that chasm is through the \$84M InvestMaryland fund that was created by offering insurance companies tax credit. This fund is

¹Federal Labs Consortium, <http://www.federallabs.org/labs/results/?State=141>

being deployed across the state to be used to fill the funding gap, but is still too new to quantify the results.

Call to Action - What Can You do?

The work of this Subcommittee is important. Having me and my colleagues here today, shows you care about entrepreneurship and innovation and hopefully appreciate its importance in driving our economy. You are allowing us an opportunity to give voice to all of those entrepreneurs who need a chance, like Vasoptic Medical who is putting the ability to detect the onset of diabetes-induced blindness in the hands of primary care physicians; Unbound Concepts, who is helping level the literacy playing field by getting tools into the hands of educators; and Raymond Cooper, whose innovation could provide a huge leap forward in the adoption of wind-based energy solutions.

It is crucial that we continue to support these nascent companies and I respectfully offer the following recommendations:

1. Provide outlets to spread the word about entrepreneurial successes and failures, creating more visibility for role models and reinforcing the value of an entrepreneurial mindset.
2. Simplify the federal SBIR process to get much-needed funding into the hands of the start-ups more quickly. This could be an ideal project for members of the Presidential Innovation Fellowship.
3. Encourage and expand seed and early-stage investments that may be more risky than what a bank would take on, even with backing from the Small Business Administration (SBA). Example programs could consider tax credits for seed-stage investors (including the entrepreneurs themselves).
4. Facilitate key decision makers in the public and private sector sharing their needs with innovative companies. This outreach could also create a forum whereby innovators share their concepts with CEO's and Directors as they explore various types of partnerships that could help drive increased revenue.
5. Create a start-up friendly track to permanent residency for foreign nationals who obtain advanced degrees in the United States, particularly those start-ups that have independent backing from, for example, the SBIR program, an SBA loan, adequate angel or VC investment.

Thank you again for the opportunity to share my experiences and thoughts around innovation as a job creator and I look forward to answering your questions.

**STEVE JOHNSON TESTIMONY BEFORE THE U.S. HOUSE
COMMITTEE**

**ON SMALL BUSINESS, SUBCOMMITTEE ON ECONOMIC
GROWTH,**

TAX AND CAPITAL ACCESS: APRIL 18, 2013

Chairman Rice, Members of the Committee, ladies and gentlemen:

My name is Steve Johnson and I am President and CEO of CreatiVasc Medical in Greenville. Our company began full-time operations in 2007 and we are focused on developing medical device innovations for one of the most expensive chronic diseases: End Stage Renal Disease, or kidney failure, which now represents over a \$47 billion burden on our healthcare system. These patients must rely on dialysis to live but this costs over \$86,000 per patient per year. It is also a field that has had little innovation in over 30 years.

CreatiVasc developed and now has in clinical trials at Johns Hopkins an innovative device called the Hemoaccess Valve System® which has the potential to significantly reduce the complications and cost of dialysis.

Last year, CreatiVasc was selected by the FDA to be one of the three inaugural companies in the agency's new Innovation Pathway program which is designed to accelerate the clinical testing and approval of promising new technologies without compromising patient safety.

Our company is in South Carolina, which has been traditionally viewed as a "fly-over state" when it came to innovation: you flew over us to get somewhere else like Research Triangle, Palo Alto or Boston. Now, we are proud that South Carolina is quickly becoming a "destination site" for innovation. Over the last 6 years, over 280 technology-based companies started up in our state.

What has caused this dramatic change?

One major stimulus has been a program created by South Carolina Research Authority (or "SCRA") called "SCLaunch"—and while the state of South Carolina fostered the creation of this program, not a penny of state funding has supported it. This SCRA program provides tax incentives to encourage private donations which are used to support early-stage innovation in our state. This SCRA early-stage funding is provided only after extensive and rigorous scrutiny of not only the technology but its management team, its competition and patents as well as its path to market.

Early-stage SCRA funds have triggered over \$220 million in follow-on capital from angel and venture capital investors, and Forbes magazine named it as one of the top five economic programs in the nation.

The SCRA program recognizes that capital is the fuel that drives the economic engine. Capital transforms "technology" into "prod-

ucts.” This then translates into manufacturing which generates jobs. But something has to prime that pump—and most times, traditional sources of capital such as banks and now even venture capital funds, want to avoid the risk of early-stage technology start-ups. Programs like SCLaunch fill that vacuum. Without this program, most of these innovation startups, including our own company, would not exist.

As a native South Carolinian, I fully recognize that our state has rarely been at the top of any ranking. We usually come in 48th or 49th. But that is rapidly changing when it comes to encouraging, supporting and creating new companies with breakthrough innovations.

Innovation is the key to economic growth because it is how we can compete in a global marketplace. It is also how we create good, high-paying jobs here at home. But for innovation to succeed, there must be adequate capital to mature these inventions from the lab to market. I can tell you from personal experience that the greatest challenge is to find long-term funding. Even though CreatiVasc was fortunate enough to be selected by FDA to be one of the top three innovations for one of the most expensive chronic diseases, it is amazingly difficult to find capital, especially for medical devices which take years to develop, test and get to market.

This is the opportunity for the future: to provide attractive incentives that secure private investment to support innovative but maturing technologies.

Thank you for this opportunity to speak about something that I feel very passionate about—and I look forward to your questions.

April 18, 2013

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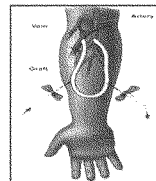
I. COMPANY INFORMATION

Founded in 2007, CreatiVasc Medical is a medical device company in Greenville, SC that is developing innovations to address the growing population and rising cost of End Stage Renal Disease (ESRD) patients, the vast majority of whom rely on dialysis to live. ESRD costs the U.S. healthcare system over \$47.5 billion annually, according to the 2012 U.S. Renal Data Survey. This figure will only increase as the population ages and the incidence of diabetes, hypertension and obesity continues to increase. It is also a field that has had little innovation over the last 30 years to address the universal and repetitive complications that every ESRD patient faces. CreatiVasc innovations have been recognized by the History Channel and three Deloitte InnoVision Awards. In 2012, CreatiVasc and its flagship innovation, the Hemoaccess Valve System® was named by FDA to be one of three inaugural companies to participate in the agency's Innovation Pathway program, designed to speed innovations for End Stage Renal Disease to the market as quickly as possible without compromising patient safety. Dr. Jeffrey Shuren, head of FDA's device division, cited CreatiVasc in his keynote comments to the February 2013 Southeastern Medical Device Association (SEMDA) convention in Atlanta.



II. THE CLINICAL PROBLEM

The 2012 Renal Data Survey also provides insight into the scope of End Stage Renal Disease, which affects 650,000 in the U.S. with over 450,000 of these on dialysis and growing 4-5% annually. A large number of these dialysis patients rely on an arteriovenous (AV) graft to provide access to their circulatory system for dialysis three times per week for 3-4 hours per session. This 6mm graft tube is traditionally made of PTFE (Teflon®) and is surgically implanted in the arm or thigh to divert blood from an artery through the tube and into a vein 24 hours a day. This unnatural diversion of blood through the graft creates a variety of repetitive (and costly) problems including thromboses (clotting) within the graft, post-dialysis bleeding, pseudoaneurysms in the graft, and arterial blood steal from the extremities which often leads to loss of circulation in the hands or feet. Gangrene and amputation of the extremities are frequently the fate of these ESRD patients.

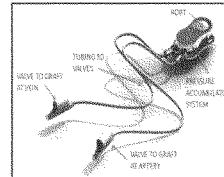


According to a May 2009 *New England Journal of Medicine* metadata study, 75% of AV grafts will require some type of surgical intervention to maintain patency (blood flow) during the first 12 months after implantation. This failure rate is not only expensive but severely compromises the patient's quality of life. Through the years, a variety of attempts have been made to improve AV graft functionality and reliability including pharmacological blood-thinning agents, radiation, ultrasound and graft design. None have been successful. The "holy grail" of dialysis has been to have "an on-off switch" to this graft tube, allowing blood to selectively flow through the graft only when it is needed for dialysis then turn it off afterward, restoring normal blood

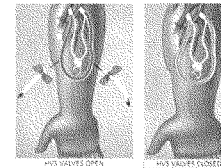
flow to the artery and vein except for the 9-12 hours per week when it is needed for dialysis. This has never been achieved, until the CreatiVasc innovation.

III. THE CREATIVASC INNOVATION

The CreatiVasc Hemoaccess Valve System (HVS) provides that “holy grail” of dialysis: an on-off switch for an AV graft. Turn the blood on when you need it for dialysis. Turn it off afterward. The company looked at the challenges of AV grafts from an entirely new perspective: utilize a simple mechanical valve system that closes off the graft to blood flow at the conclusion of dialysis then opens up the graft to blood flow for dialysis 48-72 hours later. The components of the CreatiVasc HVS device can be seen to the right:



The device is implanted concurrently when an AV graft is placed. Any vascular or general surgeon who has experience with AV grafts will find the HVS device very intuitive to implant with the graft. The HVS consists of a main body with a silicone port which allows 2-3cc of saline to be injected to inflate two balloon valves at the arterial and venous ends of the graft, as shown in the valve images to the right. This immediately seals off the AV graft and restores the blood’s normal pathway to the artery and vein. (For the first time, an AV graft now has an “on-off switch.”) Once the HVS valves are activated at the conclusion of dialysis, the dialysis needles and blood lines remain in the graft. At that point, the patient’s saline bag is then connected to the arterial line while a sterile flush bag is connected to the venous line. Saline flushes through the closed AV graft and removes any residual blood. Once this is done, the dialysis needles are removed and the patient can immediately leave the clinic. Open and closed graft images are to the right:



When the patient returns for dialysis 48-72 hours later, the process is reversed: the 2-3cc of saline is aspirated from the port, which immediately opens up the graft to blood flow for dialysis, as shown in the image to the right. The ability to selectively allow blood to flow through the graft only when it is needed for dialysis provides a number of benefits to the patient and clinic. These include:

- **No post-dialysis bleeding:** Currently patients stay in the clinic 15-30 minutes after dialysis is concluded before bleeding stops from where the dialysis needles were inserted. This is hard on the patient and slows patient traffic in the dialysis clinic. With the HVS device, because there is no blood flowing through the graft, post-dialysis bleeding is eliminated completely.

- **No internal graft thromboses:** Because no blood is in the graft after the HVS valves tightly seal it off to blood flow, there is little chance for internal graft thrombosis or clotting. Only sterile saline resides in the graft between dialysis sessions.
- **No arterial blood steal:** By adding the “on-off switch” to the AV graft, blood flow is restored to its normal path in the artery and vein. The blood is no longer diverted through the graft except when it is needed for dialysis. By restoring normal blood flow, this eliminates the potential for arterial blood steal which is usually caused by the diversion of blood from the extremities to the graft.

For the first time, the CreatiVasc Hemoaccess Valve System provides that “on-off switch” to AV grafts. In so doing, it provides a wide range of benefits, not only to the patient and the dialysis clinic but the potential to significantly reduce costs associated with the universal complications of those grafts.

IV. THE HISTORICAL ENVIRONMENT FOR INNOVATION IN SOUTH CAROLINA

Traditionally, South Carolina has been viewed as a “fly-over” state when it came to innovation. Investment groups or major companies looking for innovations to acquire flew over South Carolina on their way to Research Triangle, Boston or Palo Alto – historically the hotbed of innovation, especially in the life science field (medical devices, pharmaceuticals, medical diagnostics, or agriculturally-derived fuels or chemistry). While South Carolina had excellent research universities, it was not known for getting those innovations out of the lab and into start-up companies that transformed “technologies” into “products.” The state was frequently the brunt of jokes since it was almost always 49th or 50th in most “rankings” whether those measurements evaluated education attainment, innovation, or the health of its citizens. Twenty years ago, things began to change as the state was successful in landing major international companies who build North American high-tech manufacturing sites. Michelin, BMW and most recently, Boeing, now have made major manufacturing investments in the billions and are major employers in the state.

But the state was not producing its own “internally developed” high tech companies. While world-class work was underway at its research universities and many inventors were creating breakthrough innovations within the state, there was no pathway for these innovations to make it to the market. Over the last six years, this has changed dramatically. Over 280 technology-based companies started up in South Carolina over the last 6 years – in perhaps one of the worst economic environments since the Great Depression.

V. CAUSES FOR THE INNOVATION BOOM IN SOUTH CAROLINA

This major blossoming of innovation in South Carolina has several root causes. Perhaps the most significant stimulus came from South Carolina Research Authority (SCRA), a private 501(c)3 technology developer and management company. SCRA took \$12 million of its retained earnings and worked with the state legislature to create The Industry Partnership Fund to spark the South Carolina Knowledge



Economy. No tax funds, federal or state, were used to create this fund. Instead, private donations were encouraged by providing tax incentives for contributions to the Fund. A cap of \$6 million was set (and still remains) on this Fund and is quickly funded within weeks. SCRA used this funding to create SCLaunch which supports the commercialization of university research as well as the financing of innovative start-up and spin-out companies. Support to the innovation companies range from research about potential markets for the technology to incubation space for new start-up companies, to actual early-stage funding. This can range from grants of \$25,000 up to loans/convertible debentures of \$200,000 which are usually tied to the company securing matching funding, often at a multiple of what SCLaunch infuses.



No investment is done without extensive and rigorous scrutiny of not only the scientific merit of the technology but also of the management team which will guide the business and manage its assets, an analysis of the existing and potential competition for the technology, the patent protection behind the invention and the likely pathway to market.

The SCRA program now has six years of solid success to which can point. The following achievements are now recognized not only within the state but around the country. For example, *Forbes* magazine selected the SCLaunch program as one of the top five economic programs in the nation.

SCLaunch achievements:

- Number of entities that have received funding: **280**
- Amount of follow-on capital secured by portfolio companies from angel, venture and other private capital sources: **\$220,000,000**
- Average salary of jobs created by the program: **\$64,000**
- Number of companies receiving SBIR/STTR matching grants: **46**
- Number of innovation centers/incubators created: **4**

VI. STRATEGIC IMPORTANCE

The SCRA program recognizes that capital is the fuel that drives the economic engine. Capital transforms “technology” into “products.” Too many times in the past, research is conducted “for research sake.” Unfortunately, very little comes out of such efforts in terms of innovation that is then leveraged to address a societal problem, whether that problem is related to health care, transportation, or information management. “Disruptive technology” (or technology that

significantly changes the technical landscape to solve a problem) is often trapped on the shelves of research universities or in the minds of inventors who have no understanding of how to:

- Critically evaluate their idea
- Pursue intellectual property protection for their idea
- Write a business plan
- Secure and manage capital
- Interact with the applicable regulatory agencies, such as the FDA, to secure clearance to sell their product in the marketplace

Discipline is needed in this process: supportive but critical eyes taking a hard look at what the innovation is and how it could be translated into a finished product in the market. SCRA has recognized that the economic impact of technology comes from where it is applied, not from where it is developed. The SCRA program provides this independent and critical evaluation of what appear to be promising technologies, then guides the inventor or inventing company through the maze of startup, confirmation of the value of the technology and finally into a finished product.

SCLaunch capital, though not huge, has made the difference between success or failure for scores of companies in South Carolina. When a technology gets out of the lab and into a finished product, this translates into manufacturing which generates jobs. But something has to prime that pump – and most times, traditional sources of capital such as banks and now even venture capital funds, want to avoid the risk of early-stage technology start-ups. They want as close to 100% assurance of success and return on investment as possible. As a result, these organizations are avoiding higher risk (yet higher reward) technology start-up companies like CreatiVasc. Programs like SCLaunch fill that vacuum. Without this program, most of these innovation startups, including our own company, would not exist.

South Carolina has rarely been at the top of any ranking, usually coming in at 48th or 49th whether the measurement has been graduation rates, rural health care, or personal income ratings. But that is rapidly changing when it comes to the encouragement, support and creation of new companies with breakthrough innovations.

Innovation is the key to economic growth because it is how we can compete in a global marketplace. It is also how we create good, high-paying jobs here at home. But for innovation to succeed, there must be adequate capital to mature these inventions from the lab to the market. The greatest challenge for most of these companies is access to adequate capital, especially for those companies that are not in Palo Alto or the Boston or Minneapolis innovation corridors. Even though CreatiVasc was fortunate enough to be selected by FDA to be one of the top three innovations for one of the most expensive chronic diseases, it was amazingly difficult to find capital. This is especially true for medical devices which take years to develop, test and get to market.

This is the opportunity for the future: to provide attractive incentives that secure private investment to support innovative but maturing technologies.



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STATEMENT FOR THE RECORD

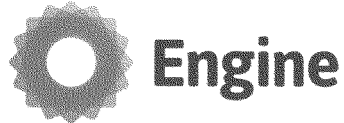
MR. MICHAEL MCGEARY
and
ENGINE ADVOCACY

BEFORE THE HOUSE COMMITTEE ON SMALL BUSINESS

Chairman Rice and Ranking Member Chu, Members of the Committee, on behalf of Engine Advocacy, I want to thank you for the opportunity to speak to you today about the importance of startups to the American economy.

Engine's mission is to create an environment where technological innovation and entrepreneurship thrive by educating and working with startups and lawmakers to construct smarter public policy. Our Advisory Board consists of leading venture capitalists and entrepreneurs. And our members -- more than 500 and growing daily -- are entrepreneurial high-growth businesses, pioneers, innovators, investors, and technologists committed to taking action on policy issues in Washington -- from young companies making products ranging from semantic search tools to heart scanning technologies, to MIT physicists building satellites and thriving businesses such as Yelp. Across the country, Engine members are driving our economy.

New and young firms are responsible for all new net job growth over the past few decades, according to research from the Kauffman Foundation. Our own research has found that employment in science, technology, engineering, and mathematics, or STEM, occupations has been continually robust, gaining 27 jobs for every 1 job gain in all other occupations between 2002 and 2011. These jobs have boosted local communities as well; for every job created in the high-tech sector, 4.3 additional jobs are projected to be created in the local goods and services economy, including barbers, lawyers, and health care professionals. Startups are small by definition, but their impact across the U.S. economy is enormous.



While startups have different growth paths than conventional small businesses, like hardware stores and restaurants, they face many of the same challenges. They must find funding, employ the right talent, and constantly work to develop better products in increasingly competitive markets. While we need to understand that startups are akin in some respects to brick and mortar small businesses, we should also acknowledge that they overcome unique challenges to growth and prosperity. In addition, government should acknowledge the importance of startups to the national economy, and to communities around the country when crafting policy.

As risky investments, startups are unlikely to receive conventional bank loans. Instead, our members rely on angel investors and venture capitalists, who are willing to take the financial risk in exchange for equity. To ensure that these fledgling businesses can prosper, angels and VCs will often offer advice and mentoring in addition to a financial investment. That's why hubs like San Francisco and New York, but also Austin, Kansas City, Boulder, and Des Moines have grown as centers of new business formation. Investors steer companies toward success by quite literally being present as the startup grows. These interactions, together with hard work and late nights, grow truly innovative companies.

It would follow logically that in one of these hubs, finding a co-founder, funding and talent should be easier. But for some of our members, the opposite is true. Take Fabien Beckers, for example. Fabien created a 3D heart imaging system that could revolutionize how we diagnose and treat heart disease. He has a PhD from Cambridge and an MBA from Stanford. Despite having funding -- contingent on his ability to stay in the country -- Fabien was not technically employed and so did not fit the requirements for an H class visa. Instead of working on his product, Fabien had to spend months being rejected by visa category after visa category. Finally, he proved he was "exceptional" enough in his ability (as defined by the visa class) to receive an O visa that allowed him to stay in the country.

In the long term, we need to continue working to evolve our American education system to help power growth and give young people the skills they need to compete in a global marketplace. But in the short term, we must realize that our most valuable resource, talent, is already on our shores. Unfortunately, in many cases we seem to be looking for ways to send smart, talented, entrepreneurial individuals either back to their countries of origin, or to places like Canada, Chile, and South Korea where they have hung out the welcome sign to these promising minds, as we did so long ago at Ellis Island and Angel Island. It is imperative that we find a way to keep knowledge here, working and building business in America, so that our economy can continue to grow and our businesses continue to thrive.



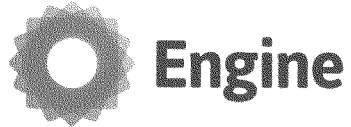
Startup founders must be included in any comprehensive immigration reform effort. There are a number of proposals that have been introduced both in the House and the Senate -- some create a new visa category for startup founders and others expand the current visa categories. For Engine, the outcomes are more important than the mechanism.

Once funding is secured, startup founders need a path to come to America -- and that path should lead them to permanent residency, or even citizenship. We believe that the requirements in Startup Act 3.0 are reasonable: \$100,000 in investment and a promise to employ two American citizens in the first year are goals that a promising startup can meet. However, requiring startup founders to already be in the country on an H-1B or F-1 visa will prohibit innovative entrepreneurs in other nations from founding their companies here.

As startups grow, it is also important to ensure they are able to hire the right people. That is why we also support the Immigration Innovation Act, which creates a flexible market-based supply and demand system for the H-1B visa cap. In addition, we suggest tying the H-1B approval system to the needs of the economy; because they do not have a masters degree or PhD, startup employees are often pushed to the back of the line, despite being some of the most economically productive immigrants joining our workforce.

Like any small business, startups also need protection from bad actors in the marketplace. Patent trolls, or "non-practicing entities," are companies that operate by collecting fees on the patents they own instead of actually developing products. The financial consequences to a startup are so dire that patent trolling potentially impedes some inventors from even bringing an early product to market. In 2011, U.S. companies were subjected to \$29 billion in direct costs from patent infringement claims filed by patent trolls. These non-practicing entities are perfectly content settling matters out of court for a five- or six-figure "nuisance" payout from a startup. 40 percent of startups who have received threat letters from patent trolls said that the matter had caused at least one "significant operational impact" to their businesses.

PureDiscovery, a startup based in Dallas, TX, is building an innovative platform for information sharing. Since their first customer was the U.S. Patent and Trademark Office, they are well aware of the threat of patent trolls. To be prepared, they have reserved \$10,000 per employee they hire per year, just to ensure that a lawsuit will not destroy their small business. They plan on hiring 50 employees this year.



We ask that Congress continue to reform the patent system. A good first step is the SHIELD Act, which introduces fee-shifting that moves incentives away from filing lawsuits and toward keeping companies building great products. According to recent findings by the Electronic Frontier Foundation "Non-Practicing Entities" account for 56 percent of all lawsuits filed against innovators. We need to find a way to prevent the abuse of overbroad software patents.

Startups can power the next generation of growth in the American economy if we let them. Entrepreneurs and innovators need the support of Congress to continue to build the businesses of the future. We hope that you will consider these measures that will allow for that future, our future, to be prosperous.

Thank you.



THE DIRECT COSTS FROM NPE DISPUTES

Boston University School of Law Working Paper No. 12-34
(June 25, 2012)

Revised June 28, 2012

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This paper can be downloaded without charge at:

<http://www.bu.edu/law/faculty/scholarship/workingpapers/2012.html>

Electronic copy available at: <http://ssrn.com/abstract=2091210>

The Direct Costs from NPE Disputes

By James Bessen and Michael J. Meurer (Boston University School of Law)

6/22/12

Abstract:

In the past, “non-practicing entities” (NPEs), popularly known as “patent trolls,” have helped small inventors profit from their inventions. Is this true today or, given the unprecedented levels of NPE litigation, do NPEs reduce innovation incentives? Using a survey of defendants and a database of litigation, this paper estimates the direct costs to defendants arising from NPE patent assertions. We estimate that firms accrued \$29 billion of direct costs in 2011. Moreover, although large firms accrued over half of direct costs, most of the defendants were small or medium-sized firms, indicating that NPEs are not just a problem for large firms.

We thank David Anderson and the staff at RPX for invaluable assistance. We thank Brian Love, Michael Risch, and Catherine Tucker for helpful comments, and Cong Yao, supported by funds from the Coalition for Patent Fairness, for able research assistance.

Executive Summary

This paper analyzes the direct costs of patent assertions by “non-practicing entities” (NPEs) against operating companies using a survey of defendants and a comprehensive database of NPE lawsuits. The main findings include:

- NPE litigation is growing rapidly, affecting 5,842 defendants in 2011.
- The direct costs of NPE patent assertions are substantial, totaling about \$29 billion accrued cost in 2011, including the costs of non-litigated assertions. This figure excludes various indirect costs to the defendants’ businesses such as diversion of resources, delays in new products, and loss of market share.
- Much of this burden falls on small and medium-sized companies. The median company sued had \$10.8 million in annual revenues. 82% of the defendants had less than \$100 million in revenue and these accounted for 50% of the defenses. Small and medium-sized companies account for 37% of the accrued direct costs. Moreover, compared to revenues, the direct costs of NPE patent assertions are relatively larger for small companies.
- We find little evidence that NPEs promote invention overall. Publicly-traded NPEs cost small and medium-sized firms more money than these NPEs could possibly transfer to inventors. This reduces the net amount that firms of any size have available to invest in innovation.
- NPEs appear to be highly heterogeneous. Much of the litigation appears to consist of nuisance suits that settle for a few hundred thousand dollars. But some NPEs are “big game hunters” who seek and get settlements in the tens or hundreds of million dollars.

Introduction

What sort of costs do Non-Practicing Entities (NPEs) impose on firms targeted for the assertion of their patents? What do target firms spend on legal services and how much do they pay for licenses? And what sort of firms do NPEs target? We present answers to these questions based on a unique survey of defendant companies and a comprehensive database of NPE litigation. The survey, which covers 82 firms who mounted 1,184 defenses against NPE litigation, is unique in three ways. First, it includes defendant companies that are privately held, including small firms. Second, it reveals information about costs associated with cases in which NPE patents are asserted but which are resolved before a lawsuit is filed. Finally, it provides aggregated information about NPE patent license fees. These kinds of information have not been available, in part, because the terms of patent licenses are often secret, and in part because previous surveys have simply not asked about assertions that did not advance to the filing of lawsuits. The costs disclosed by this survey are significant and should play a prominent role in policy debates about the treatment of NPE patent lawsuits.

NPEs are individuals and firms who own patents but do not directly use their patented technology to produce goods or services, instead they assert them against companies that do produce goods and services. In the past, some NPEs have played a valuable role in bringing innovations from small inventors to market. Some inventors lack the resources and expertise needed to successfully license their technologies or, if necessary, to enforce their patents. NPEs provide a way for these inventors to earn rents that they might not otherwise realize, thus providing them with greater incentives to innovate. But in

the past, also, some NPEs have used patents opportunistically. During the late nineteenth century, “patent sharks” were widely seen as extracting money from innocent individual farmers and railroad companies (Magliocca 2007).

However, while NPEs have been around for a long time, over the last few years, NPE litigation has reached a wholly unprecedented scale and scope (Patent Freedom, 2012; RPX, 2012). In 2011, 2,150 unique companies were forced to mount 5,842 defenses in lawsuits initiated by the actions of NPEs.¹ Moreover, the number of defenses has been growing rapidly (see Figure 1). Part of this growth has been fueled by new sources of funding and new business models.

The costs born by defendants in these assertions are key to evaluating the private and social impact of this new phenomenon. In previous research with co-author Jennifer Ford (Bessen et al. 2011), we have estimated the total costs of NPE litigation for publicly listed firms using stock market event studies. This study complements our earlier study by obtaining estimates of the direct cost portion of total costs using data from a survey of defendants.² Direct costs include the cost of outside legal services, licenses fees, and other direct costs incurred in response to NPE litigation risk.³

This study also complements our earlier study by providing information on companies that are not publicly listed, including small companies. This information helps

¹ These figures come from the RPX database described below. About 4% of these defenses were mounted as declaratory actions rather than infringement suits; these were nevertheless initiated by the NPEs. The figure for 2011 reflects, to some extent, an effort by NPEs to initiate litigation before the America Invents Act took effect, restricting multi-party lawsuits. Nevertheless, the trend shown in Figure 1 illustrates rapid growth before 2011.

² The survey was conducted by RPX, a firm that helps companies manage risk from exposure to patent litigation. The Coalition for Patent Fairness reimbursed RPX for part of the expense of conducting this survey.

³ Indirect costs captured by our event study methodology include the opportunity costs of the effort exerted legal, managerial, engineering, and scientific personnel inside the firm, and other business disruption costs such as loss of goodwill, loss of market share, or disruption of innovative activities.

reveal the extent to which NPEs help small firms realize profits from their innovations and the extent to which small firms, to the contrary, incur costs as the targets of NPEs.

Literature Review

Large scale NPE patent litigation is a recent development, thus the empirical literature is thin. Our NPE lawsuit event study is the most closely related piece of earlier research; in it we found that the annual wealth lost from NPE lawsuits was about \$80 billion for publicly traded U.S. firms (Bessen et al. 2011). In theory, this cost could be composed mostly of transfers in the form of royalty payments to NPEs. Indeed, a number of papers argue that NPEs play a socially valuable role by enabling small inventors to realize greater profits from their inventions (Hosie 2008, McDonough 2006, Shrestha 2010, Myhrvold 2010, Morgan 2008). These papers, however, do not provide empirical evidence to support that assertion.

Our 2011 paper rejected that possibility based on the evidence available to us; we concluded that much of the cost borne by technology companies as they defend against NPE lawsuits is a social loss and not a mere transfer. The survey results we describe below provide strong additional support for our view that much of cost imposed on defendants is a social loss. In particular, the current study finds that NPEs impose costs not only on large technology companies, but also on very many small and medium firms, making it even less likely that innovative start-ups are net beneficiaries of NPE activity.

One other researcher has quantified the costs to defendants from NPE litigation. Catherine Tucker examines the effect of a lawsuit by an NPE (Acacia) against several firms that make medical imaging software. She compares the impact of the lawsuit on sales of both medical imaging and text-based medical software produced by the targeted firms. She

also compares the sales by the targeted firms to the sales of medical imaging software made by other firms in the industry who were not targeted with a lawsuit. She finds that sales of medical imaging software declined by one-third for targeted firms. She attributes the sales decline to a “lack of incremental product innovation during the period of litigation,” and she conjectures that incremental innovation was deterred by concerns it would create additional risks in the on-going litigation. (Tucker 2011).

Two other strands of previous research are especially relevant to this project. First, earlier work has quantified legal fees associated with patent litigation. We collected data about legal fees that were made public in court decisions concerning fee-shifting in patent cases (Bessen and Meurer 2012). Also, the American Intellectual Property Law Association conducts a biannual survey of its members and includes questions about fees in patent lawsuits (AIPPLA 2011). The sources are helpful and we report some of their findings below, but they do not contain information about NPE litigation in particular, and they do not contain information about assertions that never reach the filing of a lawsuit.

A better-developed strand of literature reports various characteristics of NPE litigation.⁴ While not measuring costs, these studies do shed light on the question of whether the private losses to firms targeted by NPE patent assertions also tend to be social losses. The answer appears to be yes. NPE patent litigation has all the hallmarks of patent notice failure that distorts the patent system and makes it impede technological progress. In *Patent Failure* (Bessen and Meurer 2008) we show that the U.S. patent system works well for chemical and pharmaceutical inventions because the system provides clear notice to the world of the scope and existence of patent-based property rights. For most other inventions,

⁴ This includes Allison et al. (2010), Chien (2009), Love (2010), Risch (2012), Schwartz (2012), and Tucker (2012). Other studies have looked at the characteristics of NPE patents asserted in lawsuits, including Shrestha (2010), Allison et al. (2009), Risch (2012), and Fischer and Henkel (2011).

especially software and business methods, notice failure means that innovative firms are targeted in patent infringement suits through no fault of their own.

Notice failure is likely for NPE lawsuits. Sixty-two percent of the time they feature software patents (Bessen et al. 2011) which are notoriously difficult to interpret. Allison et al. (2010) study patents litigated multiple times and usually asserted by NPEs; they find that software patents account for 94% of such lawsuits. The patents asserted in NPE lawsuits are often subject to lengthy prosecutions which delays public access to information about patent claims (Allison et al., 2009, Love 2010, Risch 2012). Rather than transferring technology and aiding R&D it appears that NPEs usually arrive on the scene after the targeted innovator has already commercialized some new technology (FTC 2011).

Data

Survey

Between February and April 2012, RPX invited about 250 companies to participate in a survey of their NPE-related costs. The pool of invitees included RPX clients and non-client companies with whom RPX has relationships. Most invitees were technology companies, but certain non-technology companies with NPE exposure were also invited (for example retailers with e-commerce exposure). Participants provided information to the extent that doing so was consistent with their obligations to third parties. The information was aggregated and anonymized such that individual data was not disclosed.⁵

Participants filled out a standardized Excel template that included a range of questions about their NPE-related costs. The instructions for the template asked that participants include certain statistics estimating all of their direct (external spend) NPE-

⁵ Although RPX provided data for this study, RPX did not exercise control over the substance of our text.

related costs from 2005-2011. An NPE was defined to include patent assertion entities, individual inventors, universities, and non-competing entities (operating companies asserting patents well outside the area in which they make products and compete). This is the same definition of NPE used on the NPE Lawsuit Database (see below). A list of each participant's NPE litigations from that database was provided to ensure alignment between the survey response and database. Templates were submitted by email or directly into a secure online data room. To the extent possible, an RPX study team reviewed the submission for quality and completeness. If needed, the company was asked certain follow-up questions. Finally, RPX aggregated the submitted data within a secure computing environment. The resulting dataset forms the basis of the data tables provided in this document.

Of the 250 companies invited to participate, 82 provided data on lawsuits and of these, 46 also provided data on non-litigation patent assertions and related costs.

NPE Lawsuit Database

In addition to the survey, we also used a comprehensive database of NPE litigation developed by RPX. These NPE litigation statistics are based on cases coded "830 Patent" in the PACER database which is maintained by the Administrative Office of the U.S. Courts.⁶ In case counts, RPX excludes misfiles, non-patent, false marking and other non-core patent infringement cases. When a case is transferred, RPX counts it as one case and allocates it to the venue to which it was transferred. When several cases are consolidated into one, RPX counts it as one case but with multiple defendants. When a case is severed RPX counts it as separate cases. In defendant counts, RPX rolls up operating company subsidiaries into a

⁶ This database does not include patent disputes before the International Trade Commission.

parent entity (Samsung Group and Samsung Electronics count as one defendant).

Declaratory actions are included in case counts unless otherwise noted.

RPX defines NPEs as discussed above and identifies NPEs through a manual review process. In this review process, RPX reads patent complaints found in PACER and checks information in the complaint against its NPE database. RPX also checks its database of plaintiff counsel, searches public filings and performs web research. Some of the factors they consider when determining whether a company is an NPE (or more specifically a patent assertion entity “PAE”) include: Is the entity the same as or share a substantial financial link with a known PAE? Is there any evidence that the company sells a product or offers a service? Does the entity webpage prominently mention technology, licensing, and patents; and not offer a product or sales? Does the complaint indicate whether the entity has a product in-market or in-development that is being harmed by infringement? Are the lawyers involved known to specialize in representing NPEs? Is this entity known as an NPE or as an established operating company?⁷

Sample characteristics

Table 1 compares characteristics of the survey sample with RPX’s database of NPE lawsuit defenses. Data for the survey are on the left while data for the entire database of NPE defenses are on the right. The 82 surveyed companies collectively mounted 1,184 defenses in NPE lawsuits beginning between 2005 and 2011. Of these, 784, or 66%, were resolved by adjudication or settlement and did not involve indemnification or other factors that cause costs to be atypical.

⁷ There are a range of views among scholars and policy-makers about the appropriate definition of NPE, and different analysts are likely to assemble different NPE litigation databases. Based on our experience researching patent litigation, we believe that the RPX database yields statistics that are consistent with information about NPE patent litigation from other sources.

Note that a possible truncation bias arises because so many lawsuits were unresolved at the time of the survey. Because lengthier disputes tend to be more costly, at least as far as legal costs are concerned (Kesan and Ball 2005), and because the number of lawsuit filings has risen sharply in recent years, cost estimates based only on resolved lawsuits might be understated.

We divided the companies into sub-categories based on their revenue in the most recent year reported. We categorize companies as small, medium or large depending on whether reported revenue for the most recent year is less than \$100 million, between \$100 million and \$1 billion, or above \$1 billion. The \$100 million revenue cutoff for small companies corresponds roughly to 500 employees, which is the cutoff used by the US Patent and Trademark Office and other government bodies to categorize small companies. While we have revenue data on all of the companies in the survey sample, the RPX database reports company revenue for only 74% of the defenses. These data come from public reports and from Dun and Bradstreet, which estimates revenues for private companies. It is thus likely that almost all of the companies without reported revenue are small companies. In much of the analysis below, we explicitly assume this to be the case. This assumption is conservative in that it results in a lower estimate of aggregate costs of litigation.

We also divided companies into two broad industry sectors depending on whether they were in the broad software industry, including e-commerce and finance, or instead in a hardware industry (everything else).⁸ The latter distinction might be significant because most

⁸ To preserve data confidentiality, statistical analysis was performed by RPX personnel working under our direction.

hardware industries involve greater sunk capital costs than do software industries or finance and for this reason hardware industries may be more at risk of hold up.⁹

The right panel shows that small and medium firms dominate the universe of NPE defendants. Small and medium-sized companies make up 90% of the defendant firms, mounting 59% of the defenses. Firms making less than \$100 million in revenue account for 82% of the defendants and 50% of the defenses, assuming that firms with unreported revenue are small.¹⁰ The median revenue of a defendant company reporting revenue is \$10.8 million.

As the Table shows, our survey sample consists of companies that are larger, more likely to be public and which experience relatively more lawsuits than the average NPE defendant firm. In the rows that control for size and industry sector, survey firms appear to experience about twice as many lawsuits as companies in the comprehensive database. This is not surprising, however, it raises the possibility that our sample might be unrepresentative of the broader population, possibly experiencing costs that are greater or smaller than those of the universe of sued companies. Below we do a check on legal costs to test whether the survey appears to have unrepresentative costs.

⁹ Readers should be mindful of the distinction between the industry of the defendant and the technology covered by the patent asserted by the NPE. In particular, it is important to recognize that problematic software patents are often asserted against hardware manufacturers.

¹⁰ If, instead, we look only at firms with reported revenue, 66% are small, accounting for 33% of the defenses.

Findings

Mean and median costs

Table 2 provides estimates of mean legal¹¹ costs, licensing costs and total costs (the sum of these) with standard errors in parentheses. The table also shows median costs.

Median total costs per litigation defense fall roughly around half a million dollars, smaller for small and medium firms, larger for big ones. However, mean total costs are *much* higher, nearly eight million dollars for our survey sample. This difference implies that the distribution of costs is highly skewed, as we explore below. Thus one must be particularly careful in extending judgments about the costs of litigation based on small samples. While “typical” costs might only be a few hundred thousand dollars, mean costs—reflecting the large costs in a small number of very costly lawsuits—are an order of magnitude higher.

Mean total costs are, not surprisingly, significantly greater for large companies than small and medium companies. This difference is significant at the 1% level.

The first column reports the legal component of costs. Mean legal costs per defense range from \$420,000 for small/medium companies to \$1.52 million for large companies.

Column 2 of Table 2 reports the dollar amounts paid to the plaintiff to settle the case.¹² Column 3 reports the total costs, the sum of legal and settlement costs. The mean settlement costs for small/medium companies are \$1.33 million and for large companies,

¹¹ In the survey estimated legal costs for a particular case were specified as: “Value of any legal costs related to this matter through December 31, 2011. Include outside counsel (lead and local), experts, discovery costs, prior art searching, jury consultants, graphics, other expenses, and other related costs. Include any costs that were ultimately recouped or expected to be recouped by indemnification agreements or other mechanisms. Exclude in-house legal costs.”

¹² In the survey estimated settlement costs for a particular case were specified as: “Value of settlement. If a running royalty, estimate the present value of royalties. If there was an exchange of patents or other non-standard deal structure then estimate expected present value cost of that deal.” Settlement costs include damage awards in a small number of cases.

\$7.27 million. Mean total litigation costs are \$1.75 million for small/medium companies and \$8.79 million for large companies.

Legal costs are about a third as large as settlement costs, or about one quarter of total litigation costs (slightly larger for small/medium companies).¹³ This implies that a substantial part of direct costs of NPE litigation is a deadweight loss to society.¹⁴ For the median case, legal costs are roughly equal to settlement costs.

Also note that NPE litigation is relatively more costly to smaller companies. In our sample, the large company litigation costs were five times as high as small/medium company litigation costs. But (see Table 1) the mean revenue of large companies in our sample is nearly seven times the mean revenue of the small and medium companies. This means that, roughly speaking, smaller companies pay more in direct NPE litigation costs relative to their size.

Hardware firms have higher costs than software firms. This difference is significant at the 5% level. Since hardware firms generally have greater sunk costs than software firms, this difference is consistent with the interpretation that hardware firms are more easily subject to holdup and hence they have to pay more to settle litigation.

Comparison to other studies

As noted above, the survey sample was not randomly selected and hence it could be unrepresentative. In particular, it might be that survey respondents tended to be firms with higher than average litigation costs.

¹³ Weighting the ratios in Table 2 to represent the relative weights of small and large companies in the total database, legal costs are 23% of the total and licensing costs are 77%.

¹⁴ The indirect costs of NPE lawsuits, such as those measured by Tucker (2011) and Bessen et al. (2011) are likely to be a more significant source of deadweight loss.

We can check the representativeness of our sample by comparing our findings to other empirical evidence. In particular, legal costs can be compared to estimates derived from two other sources. First, AIPLA conducts a bi-annual survey of its members who estimate typical legal costs through discovery and through trial. They report these estimates for three categories of patent lawsuits depending on the amount at issue in the controversy, specifically, whether the amount at issue is less than \$1 million, between \$1 million and \$25 million, and greater than \$25 million. The first and third categories provide the ranges shown in the addendum to Table 2.¹⁵ Few patent lawsuits go to trial (Kesan and Ball 2005), so the figure for costs through discovery is probably closer to the mean cost for patent litigation. On this basis, the AIPLA cost estimates are comparable or even higher than the mean cost estimates from our survey.

We also compared the survey means to means from 137 cases where one party in a lawsuit had been required to pay the others' legal fees. These were for cases between 1985 and 2004 (Bessen and Meurer 2012). Converted into 2011 dollars, the cost for lawsuits that ended in summary judgments was \$840,000; the cost for those that ended in a trial verdict was \$3.64 million. Since most lawsuits are not settled by an initial summary judgment but are settled before trial, mean legal costs should fall between these figures. Again, the survey estimates seem broadly comparable. This suggests that our survey sample is not unrepresentative.

It is possible, of course, that our survey might report representative legal costs but unrepresentative licensing costs. This might happen, for instance, if our survey over-represented hardware companies who tend to have relatively higher licensing costs. However, Table 1 suggests that the share of hardware firms in the survey roughly matches

¹⁵ For the middle range, the estimated costs are \$1.6 million through discovery and \$2.8 through trial.

the share in the universe of NPE defendants found in the database. Generally speaking, firms with higher licensing costs will tend to have higher legal costs, all else equal. This is because firms facing a large payout can typically reduce the payout or the likelihood of having to pay damages in trial by mounting a more aggressive (and more expensive) legal defense. That said, we cannot be certain that our estimates are representative, nevertheless, the representativeness of our legal cost estimates provides some comfort that licensing cost estimates are not too far off.

The distribution of litigation costs

Sample means do not capture the distribution of costs. In fact, litigation costs are highly heterogeneous. Figure 2 shows cumulative distribution plots of total litigation costs for the small/medium and large companies in our sample. The smooth curves represent lognormal distribution functions fitted to the data.

As can be seen, the distribution is highly skewed. The median total litigation cost for small/medium companies is \$318,000 and for large companies it is \$646,000. A large fraction of lawsuits cost less than \$200,000. But a small number of lawsuits cost much, much more. For large companies, 5% of the lawsuits cost more than \$22 million.

This heterogeneity likely arises in part from variation in NPE tactics. Schwartz (2012) reports that some NPEs pursue nuisance suits in which they sue many companies, big and small. Plaintiffs using this tactic are willing to settle for small payments, often no more than the amount a defendant would spend on legal fees to defend the case. As one such plaintiff lawyer put it, “An NPE intuitively understands that we could go for triples or home runs, but we can also go for singles and get a good return and work on other things (Schwartz 2012).” Alternatively, NPEs may act like big game hunters, targeting only one or a few firms, but hoping to win tens of millions of dollars. The lawsuit by NTP against BlackBerry maker

RIM is a good example. NTP asserted patents of doubtful validity but managed to win at trial and obtain a settlement of \$612.5 million from RIM (Bessen and Meurer, 2006). The survey data does not permit us to clearly identify NPE tactics, but it does suggest that NPE activity is not uniform.

While there are far fewer suits initiated by “big game hunters,” they represent a disproportionate share of the cost. The distribution of costs is such that the top 5% of defenses for large companies account for about two thirds of the total cost of defense for large companies.

Costs from cases settled without litigation

Many NPE patent assertions are settled without a lawsuit being filed. To gather information on non-litigated assertions, the survey also asked a series of questions regarding these. Rather than count assertions, the survey asked respondents to report cumulative costs. Most reported costs for the period from 2005 – 2011, but some did not have data for the entire period. Moreover, only 46 of the companies completed this section of the survey.

The costs of assertions settled without litigation consist mainly of legal fees and settlement costs paid to patent holders. They also include smaller amounts spent on NPE-specific patent buying programs (including RPX services), on NPE-specific clearance searches and on re-examinations of NPE patents.

The means of these components are reported in Table 3 along with the cumulative litigation costs incurred by these same companies. For the sample as a whole, NPE costs from cases without litigation were about half of the comparable costs of litigated cases. For small/medium companies, in particular, however, costs of non-litigated cases exceeded litigation costs. This might be because smaller firms lack internal legal resources, making it relatively more expensive for them to pursue litigation. Also, costs of non-litigated cases

were higher relative to litigation costs for hardware firms, perhaps again because hardware firms, being more at risk of hold up, find it less costly to settle sooner. This difference is not, however, statistically significant.

In any case, it is clear that non-litigated patent assertions are responsible for much of the direct costs imposed by NPEs on operating companies. In this regard, it is likely that our sample under-represents these costs because we have only surveyed companies that have been involved in litigation. That is, we have not included potentially large numbers of small companies that have only settled NPE patent assertions and have not gone to court. Anecdotal evidence from small companies suggests that there might be very many such firms and their costs are missing from our analysis.

Aggregate Costs of NPE Assertions

Aggregation

What is the aggregate cost of NPE patent assertions, including both litigated and non-litigated assertions? To estimate this, we began by estimating the mean cost of resolved litigation for small/medium firms and for large firms. We could have directly used the data in Table 2, however, this might overstate costs because the average small/medium firm in our survey sample is larger than the average small/medium firm in the entire database (see Table 1).¹⁶ To correct for this within-category variation, we regressed log cost against log revenue for the survey sample and, using this, computed the predicted mean cost over the actual distribution in the database for each size category.¹⁷ In using these means, we assume

¹⁶ In fact, we calculated aggregate costs using the data in Table 2, including the software/hardware categories. These estimates came out about 5-10% higher than those reported in Table 4.

¹⁷ Regressions are reported in the Appendix. We used a regression that also included a dummy variable for firms with less than \$100 million in revenue in order to capture a non-linearity in the relationship between log cost and log revenue. The predicted mean cost per litigation was \$1.527 million for small/medium firms and

that the lawsuits in each category in the database will on average accrue costs equal to these respective mean values. That is, for lawsuits where the defendant was indemnified by a third party, we assume that some party will pay an amount equal to the mean cost for defendants in that category, even if the defendant firm itself does not necessarily pay this amount. Also, we assume that lawsuits that are still underway will eventually accrue costs equal to these means, even if the current out-of-pocket costs are not yet equal to this accrued cost.

To adjust these figures to account for assertions that are settled without litigation, for each category we divided the total cost of non-litigated cases by the total number of lawsuits filed, including lawsuits that were still active. This gave us a pro-rated cost of non-litigated cases per lawsuit filed. We added this to the mean litigation cost for each category to give a total cost of NPE assertions per lawsuit filed.¹⁸

The second part of this exercise consisted of breaking the cases in the RPX NPE database into the two size categories. Where revenue was reported (about 74% of the database), we allotted the defenses to small and large cells depending on whether the revenue was smaller than or larger than \$1 billion.¹⁹ We conservatively assigned those companies without reported revenue to the “small” cells.

Year-by-year accrued costs

The left portion of Table 4 reports the number of defenses reported in the NPE database by year for each size category. The right portion shows the aggregate cost of NPE assertions per year calculated by multiplying the number of defenses reported on the left by the prorated total cost of defense per cell (where the cost of defense includes license cost).

\$5.641 million for large firms. We also ran regressions using hardware/software dummy variables, however, the coefficients on these dummies were not statistically significant.

¹⁸ These are \$3.17 million for small/medium firms and \$7.59 million for large firms.

¹⁹ RPX gathered revenue data from financial statements of publicly listed firms as well as estimates based on information such as number of employees available for private firms. Revenues were not reported when a private firm could not be definitely identified in their data sources.

The final column reports the aggregate cost, summing over both categories for each year. Aggregate direct costs of NPE patent assertions grew rapidly from about \$7 billion in 2005 to \$29 billion in 2011.²⁰

It is important to note that these totals represent *accrued* costs, not necessarily the immediate out-of-pocket cost. That is, we accrue the projected cost of a lawsuit in the year in which the suit was filed, even though the lawsuit might not be resolved. This is important because about half of the lawsuits filed in 2011 were not resolved at the time of our survey. The implication is that substantial sums will be flowing to NPEs over the next several years from lawsuits already filed. Because the number of NPE lawsuits has been growing so rapidly, the current revenues of NPEs likely understate the total costs of lawsuits already filed.²¹

Moreover, the effect of these assertions does not just fall on a small number of large companies. Some NPE advocates have argued that NPE litigation is largely a matter of lawsuits against a small number of large “serial infringers.” These data show, to the contrary, that about 59% of the litigation events are directed to small and medium-sized companies and about 37% of the aggregate cost falls on small and medium-sized companies. Moreover, this share is likely understated because, as discussed above, this analysis does not include those companies that have only had NPE assertions that did not go to court.

Finally, these tabulations do not include the indirect effects of NPE assertions on the business of defendants. Case study evidence suggests that there are significant indirect costs of NPE patent assertions (Tucker 2011). These include diversion of management or

²⁰ As a point of comparison, Polinsky and Shavell calculate “the litigation costs associated with the U.S. tort system are approximately \$46 billion per year.”

²¹ We also caution readers not to rely on intuition based on the median cost of defending against NPE patent assertions. Median cases are “typical” but of course it would not be correct to multiply the median cost by the number of assertions to calculate aggregate costs numbers.

engineering resources, delays in new product introductions and improvements, loss or delay of revenue, and credit constraints. Bessen et al. (2011) estimate the total business costs of NPE litigation for public firms using stock market event studies. Although the samples and methods are not directly comparable, they find an aggregate loss of stock market capitalization of around \$80 billion per year during recent years, corresponding to an aggregate cost in operational funds to the firms of about half that amount. This suggests loosely that total business costs of NPE assertions might be at least twice as large as the figures reported in Table 4.

Benefits to innovators

It is sometimes argued that NPEs facilitate innovation by providing incentives to small inventors who would not otherwise be able to license their patents. In this view, “NPEs create patent markets, and that those markets enhance investment in start-up companies by providing additional liquidity options. NPEs help businesses crushed by larger competitors who infringe valid patents with impunity. (Risch 2012)”

Michael Risch (2012) looks at the original assignees of patents used in NPE lawsuits and finds that the David vs. Goliath narrative is not representative. Few of the patents in his sample came from venture capital financed startup firms. Although 29% of the patents in his sample were originally filed by individual inventors, 43% were from large companies. The median revenue of a company filing an NPE patent in his sample is \$6.3 million. Given that the median revenue of a company in the RPX database of firms sued by NPEs is \$10.8 million, it appears that the typical firm sued by an NPE is roughly the same size as the typical firm benefiting from NPE activity.

How much of the costs accrued by defendants actually flow to inventors? We can gain some indication of this by looking at the expenditures of publicly listed NPE firms.

Table 5 reports cumulative figures in 2011 dollars for 12 NPE firms that were active from 2005 – 2011.²² During this period, these firms cumulatively earned \$5.8 billion in revenues. If we assume that these revenues consisted entirely of licensing royalties from resolved patent assertions and we assume that defendants in these cases also incurred legal costs in the same ratio as those reported in Table 2, then these NPEs were responsible for \$10 billion in direct accrued costs to defendants from 2005 – 2011, about 10% of the totals reported in Table 4.²³

Looking at the financial statements of these NPE companies, we find that the cumulative net increase in intangible assets—acquisitions of patents from small inventors would be included in this accounting category along with acquisitions of other intangible assets—amount to \$679 million, or about 7% of the direct costs to defendants. Two of the publicly listed NPE firms also perform their own R&D. That amounts to about 14% of the direct costs to defendants. These two categories might overlap somewhat if R&D generates intangible assets. Nevertheless, these figures indicate that for publicly listed NPE firms, no more than a quarter of the direct spending by defendants flows to innovative activity.

Based on these figures, it seems difficult to make a convincing argument that the effect of NPEs is to increase innovation incentives. First, previous research has shown that the defendants in these lawsuits are largely tech companies that invest heavily in R&D (Bessen et al. 2011, Chien 2009). This estimate suggests that their losses are much larger than the possible flows to small inventors, especially if one adds indirect costs of NPE litigation to the direct costs reported in Table 5. Effectively, what defendants pay in costs as a result of

²² Not all of these firms were publicly listed all years. Note that we perform a similar exercise in Bessen et al. (2011).

²³ To calculate accrued costs from lawsuits already filed, we divide revenue by .75. That is, since 75% of lawsuits in the total database are unresolved (Table 1), we assume that these NPE firms have so far received only 75% of the revenue they will receive from the lawsuits already filed.

NPE litigation reduces their own R&D budgets. This is because companies become targets for litigation mainly when they introduce innovative products.²⁴ Hence R&D managers must anticipate NPE costs as part of the cost of innovating. Small inventors would have to be an order of magnitude more innovative per dollar of R&D than the defendant companies, in order for the net effect of NPE activity on innovation to be positive.

Second, to the extent that small inventors are important for innovation, NPE patent assertions hurt small inventors in at least two ways. As we have seen, the majority of defendants in NPE lawsuits are small/medium companies and these companies accrue larger costs relative to their size. Small/medium firms accrue 37% of the costs, but small inventors receive at most 21% of NPE costs. Also, these costs make things more difficult for small inventors who wish to license their technology—not just their patents—to other firms. If the prospective licensees expect NPE-related costs, they will be less willing to license from small inventors or they will not be willing to pay as much.

Third, the incentives provided to patent holders by the current crop of NPEs may be the wrong kind of incentives. NPE activity may skew the research agenda of small firms away from disruptive technologies and toward mainstream technology and associated patents that can be asserted against big incumbents. Even worse, small firms are encouraged to divert investment from genuine invention toward simply obtaining broad and vague patents that might one day lead to a credible, if weak, lawsuit.

Policy implications

The rapid growth and high cost of NPE litigation documented here should set off an alarm warning policy makers that the patent system still needs significant reform to make it a truly effective system for promoting innovation. The heterogeneous nature of NPEs –

²⁴ Bessen and Meurer (2012) find that the hazard of being sued increases with firm R&D.

ranging from universities, to patent brokers, to trolls²⁵ – suggests that policy reform should address troll-like behavior rather than merely status as an NPE (Geradin et al., 2008; Merges, 2011).

The top priority is reform of the patent system to improve notice; this kind of reform will make the patent system perform more like an idealized property system (Bessen and Meurer, 2008; FTC, 2011). More rigorous enforcement of the claim definiteness standard would be an excellent step forward. Likewise, we favor rigorous implementation of recent Supreme Court decisions restricting the patentability of business methods and other abstract processes that are difficult to propertize. It is also crucial to provide greater transparency in the patent system. Feldman and Ewing (2012) document the remarkable opaqueness of Intellectual Ventures in connection to its patent ownership and patent assertion. Finally, courts should rigorously supervise patent damages awards to make sure that damages are proportionate to the value of the patented technology (Lemley and Shapiro, 2007). These reforms should not harm genuine inventors who crave publicity rather than secrecy, and who should still be able to obtain broad, but clear patent protection.

It is also instructive to look for policy reforms suggested by the law and economics analysis of the generic problem of frivolous lawsuits. One promising policy reform is greater use of fee-shifting to favor defendants in cases brought by trolls. Allison et al. (2010) find that troll patents fare poorly in court. The bargaining power of a troll seeking a nuisance settlement would be great diminished in an aggressive fee-shifting regime. Similarly, more

²⁵ “To some the use of the troll “moniker might be considered derogatory, [but] recently, in *Highland Plastics, Inc. v. Sorensen Research and Development Trust*, 11-cv-2246 (C.D.Ca. Aug. 17, 2011), the court denied a motion to strike the term “patent troll” from the complaint, stating that patent troll “is a term commonly used and understood in patent litigation and is not so pejorative as to make its use improper.” *Id.*, Dn. 21 at 3.” Ralph Dengler, *Is It Open Season Now for NPEs?* IPLaw Alert, Oct. 31, 2011, available at: <http://www.iplawalert.com/2011/10/articles/patent-1/is-it-open-season-now-for-npes/>

stringent pleading requirements have been justified in other areas of the law as a method of reducing frivolous lawsuits; this strategy might also work for patent litigation (Blaze, 1990).

Conclusion

Using these survey data and the associated database of NPE litigation our major findings are these:

- The direct costs of NPE patent assertions are substantial, totaling about \$29 billion accrued in 2011. This figure does not include indirect costs to the defendant's business such as diversion of resources, delays in new products, and loss of market share. Even so, the direct costs are large relative to total business spending on R&D, which totaled \$247 billion in 2009 (NSF 2012), implying that NPE patent assertions effectively impose a significant tax on investment in innovation.
- Much of this burden falls on small and medium-sized companies who make up 90% of the companies sued, accounting for 59% of the defenses, and who pay about 37% of the direct costs. The median revenue of companies sued by NPEs is \$10.8 million. NPE litigation costs smaller companies more relative to their revenues. In addition, smaller companies pay relatively more to NPEs from assertions that do not go to court. The burden of all of these costs appears to rebut the assertions that NPEs play an important role in improving the profits of innovative start-ups.
- About a third of the cost to defendants involves patent assertions that do not go to court. Moreover, we have likely underestimated these costs because we

have not surveyed small companies that do not also have NPE patent litigation.

- NPEs appear to be highly heterogeneous. Much of the litigation appears to consist of nuisance suits that settle for a few hundred thousand dollars. But some NPEs are “big game hunters” who seek and get settlements in the tens or hundreds of million dollars.
- Much of the cost to defendants implies a net loss of social welfare. About one quarter of the cost of NPE litigation consists of legal fees. Of the total direct cost, no more than a quarter could possibly represent a flow to fund innovative activity.

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Tables and Figures

Table 1. Summary Statistics of Sample

	Sample				All NPE lawsuits			
	Companies	Lawsuit defenses	Lawsuits / company	Mean Revenue (\$million)	Companies	Lawsuit defenses	Lawsuits / company	Mean Revenue (\$million)
Number	82	1,184	14.4	\$12,474.7	9,385	20,565	2.2	\$3,243.3
Resolved lawsuits		784				15,486		
Percent resolved		66%				75%		
Company size	Share	Share			Share	Share		
Small/medium	44%	13%	2.7	\$297.1	90%	59%	1.4	\$82.6
Large	56%	88%	14.9	\$22,005.0	10%	41%	9.0	\$16,666.4
Company industry								
Software	37%	26%	6.7	\$7,103.1	22%	31%	3.1	\$3,654.8
Hardware	63%	74%	11.2	\$15,573.7	78%	69%	1.9	\$3,087.2
Public company	72%				14%			

Notes: For 2005 – 2011. The left panel describes the sample used for this study. The right panel reports summary statistics from RPX's database of all NPE lawsuits. In the sample, all companies report revenue. In the RPX database, only 74% of companies have reported revenue; we assume that companies without reported revenue are small/medium sized. The resolved lawsuits have been terminated due to settlement or adjudication. The number of resolved suits excludes those that were simple transfers, had zero litigation costs (e.g., for incorrect defendants), where the company was substantially indemnified, or where the costs born by the company do not reflect the total direct costs of litigation for other reasons. Revenues are for the most recent year. Small/medium companies are those with revenues less than or equal to \$1 billion; large company revenues exceed this amount. Companies identified as "software" include companies whose main product is software, e-commerce, finance, or undefined. "Hardware" includes everything else.

Table 2. Mean Litigation Costs per defense in million dollars

	Direct legal costs		Licensing costs		Total cost	
	Mean	Median	Mean	Median	Mean	Median
All	1.38 (0.26)	0.20	6.53 (1.76)	0.22	7.91 (1.86)	0.56
<u>Company size</u>						
Small/medium	0.42 (0.12)	0.07	1.33 (0.42)	0.18	1.75 (0.49)	0.32
Large	1.52 (0.30)	0.23	7.27 (2.01)	0.23	8.79 (2.13)	0.65
<u>Industry</u>						
Software	1.50 (0.41)	0.17	1.82 (0.45)	0.30	3.32 (0.81)	0.55
Hardware	1.33 (0.33)	0.21	8.14 (2.35)	0.18	9.48 (2.48)	0.59

Addendum on legal costsAIPLA survey (2011)

Cost through discovery 0.49 – 3.60

Cost through trial 0.92 – 6.00

Fee shift cases (Bessen and Meurer 2012)

Summary judgments 0.84

Trial 3.64

Note: Standard errors in parentheses. The total number of cases is 666; sub-category shares are listed in Table 1. Fee shift data have been deflated to 2011 dollars.

Table 3. Costs for cases settled without litigation
(per company in million dollars)

	Mean cost by type			Total Cost per company, non-litigated cases	Comparable Litigation Cost per company
	Legal	Licensing	Other	Mean	Mean
All	0.50	24.59	4.66	29.75 (13.89)	58.38 (19.18)
<u>Company size</u>					
Small/medium	0.05	7.85	0.23	8.14 (7.68)	7.06 (3.15)
Large	0.77	34.40	7.25	42.43 (21.22)	88.47 (28.95)
<u>Industry</u>					
Software	0.38	11.83	4.14	16.35 (9.14)	38.34 (20.74)
Hardware	0.56	30.76	4.91	36.24 (20.03)	68.08 (26.46)

Note: Standard errors in parentheses. Results are for a sub-sample of 46 companies that reported full litigation and non-litigation costs. Figures are totals over 2005-11 per company, although not all companies reported all years.

Table 4. Aggregate Accrued Direct Costs of NPEs by Year

Year	Number of Defenses		Aggregate Direct Accrued Costs (millions)		
	Small/medium	Large	Small/medium	Large	TOTAL
2005	919	482	\$2,916	\$3,657	\$6,574
2006	899	530	\$2,853	\$4,021	\$6,874
2007	1,238	976	\$3,929	\$7,406	\$11,334
2008	1,571	1,004	\$4,985	\$7,618	\$12,603
2009	1,461	1,198	\$4,636	\$9,090	\$13,726
2010	2,588	1,857	\$8,213	\$14,090	\$22,303
2011	3,424	2,418	\$10,866	\$18,347	\$29,213
Size shares	59%	41%	37%	63%	

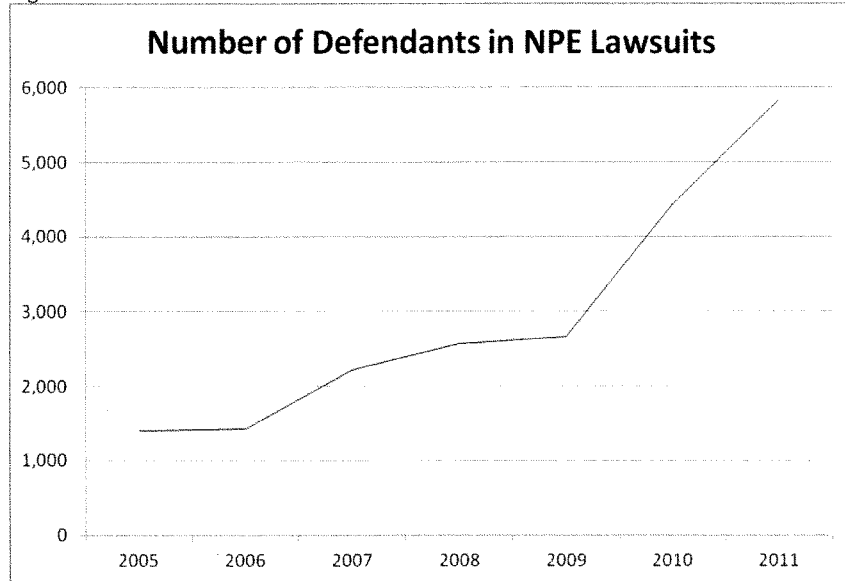
Note: Aggregate costs are calculated by the method described in the text. Aggregate costs include legal costs, settlement costs and other costs for resolved lawsuits, unresolved lawsuits and non-litigated assertions. These report accrued costs, that is, we include the full projected cost of currently unresolved lawsuits.

Table 5. Public NPEs: innovation investments relative to costs to defendants

	<u>Millions (2011\$)</u>	
Revenues	\$5,782.9	
Implied accrued direct costs	\$9,924.1	100%
Net increase in intangibles	\$679.4	7%
R&D spending	\$1,369.1	14%

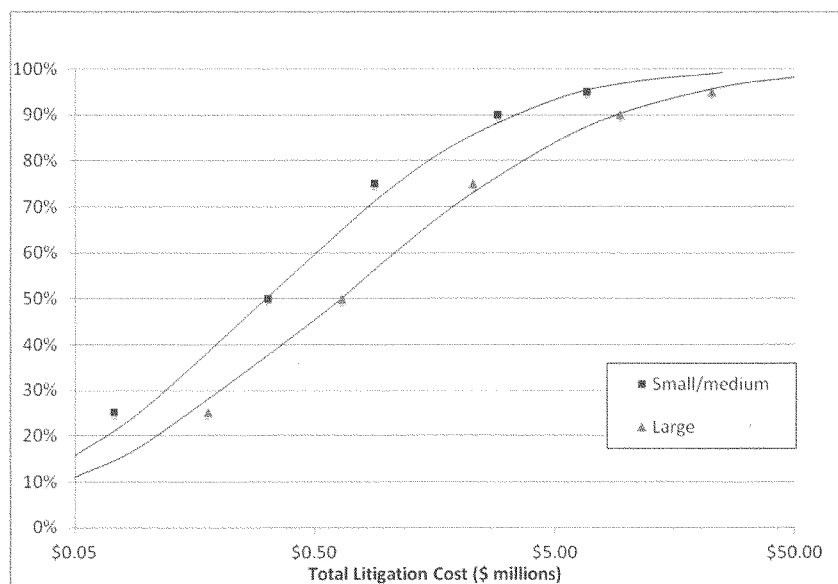
Note: For 12 publicly listed NPE firms. Assumes that all revenues are royalties from licensing patent assertions. The implied accrued direct costs are calculated by adding legal costs to defendants to the assumed licensing payments, using the ratio of legal to total costs in Table 2, and then dividing by the portion of lawsuits that have been resolved in the database (75%) to capture costs that have been accrued but not yet paid. All figures are in 2011 dollars.

Figure 1.



Source: RPX database

Figure 2. Cumulative Distribution of Total Direct Litigation Cost by Company Size



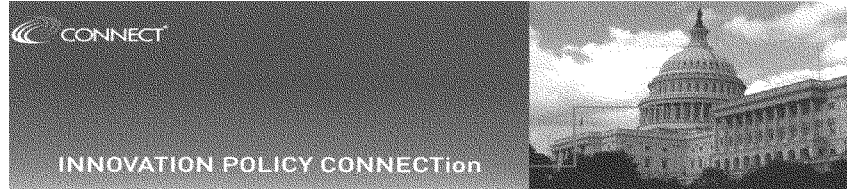
Note: Horizontal axis is logarithmically scaled. Distributions are fit with lognormal cumulative distribution functions. The distributions are for resolved lawsuits.

Appendix

Table A1. Log cost regressed against log company revenue

	(1)		(2)	
	<i>Coefficients</i>	<i>Standard Error</i>	<i>Coefficients</i>	<i>Standard Error</i>
Intercept	10.30	(0.85)	10.90	(0.91)
Ln(Rev)	0.13	(0.04)	0.10	(0.04)
Revenue < \$100m			-1.11	(0.63)

Note: 784 observations.



An Innovation Agenda for the 113th Congress

Eleven Innovation Policy Ideas to Advance American Competitiveness

Two years ago, CONNECT introduced its first "Innovation Agenda" for the 112th Congress. In those intervening years both the President and Congressional leaders recognized the need for Washington to be more assertive in advancing policies that promote the innovation economy in order to sustain America's competitiveness globally. Notably, matching rhetoric with action, Congress worked in a strong, bipartisan and bicameral way to pass the JOBS Act. The JOBS Act is a significant accomplishment because it should increase the number of pathways startups and emerging companies can seek to access capital and solidify their commercialization efforts which will bring new technologies to market while creating jobs.

Despite the resounding support the JOBS Act garnered in the innovation community, the President and Congress still have much more work to do to ensure that America's innovation economy moves forward. Many missed opportunities from last Congress, present themselves to this new Congress. However, as we noted two years ago, while Washington waits, other countries are aggressively copying America's innovation playbook by enacting and implementing pro-growth, pro-innovation policies. Washington must recognize that America's status as the global innovation leader is by no means secure or guaranteed into the future. As the urgency to act intensifies, CONNECT submits this multi-faceted Innovation Agenda to help the U.S. preserve its global innovation leadership.

Retain top-level, foreign-born talent from American universities while welcoming immigrant entrepreneurs

Both the President and Congress are fully aware that a major missed opportunity in strengthening America's innovation ecosystem is fixing federal immigration policy. In addition to needing to increase and update the cumbersome H-1B visa system, America's immigration policies do not allow foreign-born science, technology, engineering and math (STEM) talent to work in the U.S. after graduation from an American college or university. The President has repeatedly talked about stapling a green card to college diplomas of foreign-born STEM graduates and the House has passed such legislation. Despite the supportive rhetoric, the President and the 112th Congress missed the opportunity to keep thousands of talented STEM graduates in the U.S. who would have filled vacant, well-paying, innovation-related jobs. Such high-wage employment,

dispersed across the U.S., could have provided a private-sector stimulus and advanced technology development while increasing revenue to the Treasury. Although the importance of solving the nation's challenge regarding undocumented residents and their families is clear, high-skilled visa reform has made substantial bipartisan progress and should remain a top and urgent priority for the 113th Congress as part of comprehensive immigration reform.

Additionally, Congress should streamline procedures that create too many barriers for modern-day immigrant entrepreneurs to successfully build companies and create jobs in the U.S. It is well known that some of America's biggest companies were started by immigrant entrepreneurs. The American landscape is replete with stories of immigrants overcoming odds to come to the U.S. to make a better life. This pool of talent, that would like to legally come to our shores, instead remains overseas, generating new competitors to American companies and undermining America's status as leading global innovation. Congress and the President should welcome them to our shores and transform them into American innovators.

Provide entrepreneurs, innovators and investors economic certainty by reaching a grand deal to reduce federal deficits and restrain the national debt

With great challenges, come great opportunities. Negotiating and enacting a grand deal is fraught with political pitfalls and technical complexities. However, uncertainty is anathema to a thriving innovation ecosystem.

For too long we have heard entrepreneurs, innovators and investors worry that the economic uncertainty caused by Washington's inability to stabilize America's fiscal problems is leaving too much capital on the sidelines until some long-term certainty materializes. Entrepreneurs need to know the legal and regulatory rules to play by while investors need to know the startup they've invested in has a reasonable and fair chance to succeed. Yet, uncertainty seems to be the status quo Washington is giving to innovators and investors.

The American people are ready for Congress and the White House to go big and reach an agreement that not only injects certainty into the markets and economy, but demonstrates to the world that the U.S. is serious about retaining its place as the world economic and innovation leader. Despite the divisions in Washington, the chance for a big solution is still on the table and should be anchored in fostering long-term economic growth and competitiveness, not near-term political expediency.

Seize the opportunity to reform the tax code to incentivize and reward innovation

The effort to undertake comprehensive tax reform, for the first time in nearly 30 years, will be no easy task. Nevertheless, the opportunity to create a pro-growth tax code that incentivizes and rewards innovation is indispensable as global competitors race past the U.S. in creating tax codes that draw capital, talent and innovation to their shores.

Reducing the corporate tax rate is an obvious place to start as the U.S. now leads the world with the highest corporate tax rate. In considering a move to a territorial tax system, with a limited window to allow the return of currently held foreign earnings, Congress should consider a further rate reduction if such earnings are returned and deployed in a way that will infuse capital into early-stage innovation and emerging technologies. Such pro-innovation purposes would include sponsored, purchased or collaborative R&D, funding proof of concept centers, early-stage venture investments, expansion of R&D facilities, or to create/expand U.S. manufacturing including contract manufacturing.

Additionally, Congress should carefully consider how to specifically incentivize the tax code to promote startup growth and enhance the ability of young companies to scale up, expand and produce in the U.S., not overseas. Although the R&D credit should be simplified and made permanent, startups do not generally benefit from the credit. Thus, Congress should also consider renewing the R&D credit in such a way that startups can utilize.

Recognize the importance and numerous benefits of federal research funding

As Congress and the President consider where the federal budget needs to be pared back, careful consideration should be given to the pivotal role federal research funding plays in supporting America's innovation ecosystem. It has been repeatedly demonstrated that federal research funding is a wise investment, directly linked to technology development that changes lives and improves the public good while also creating new companies and high-wage jobs. These new companies and jobs return revenue back to the Treasury, help communities successfully grow, and enhance the American innovation ecosystem. Few federal efforts can highlight such an extensive, long-term, positive record.

Congress should rightly fulfill its oversight role in uncovering waste and duplication in federal spending. The Government Accountability Office has done extensive work identifying federal programs that are wasteful, overlap and are duplicative. Inspector Generals at federal agencies regularly report on programs that don't work or are subject to fraud. Using the work of GAO and Inspector Generals as a guide, Congress and the President should seek to eliminate waste and fraud, while consolidating and right-sizing duplication in order to reduce the deficit. Such a targeted approach will ensure that indiscriminate cuts will not leave lab benches empty, life-saving experiments stalled, high-wage jobs vacant, and game-changing technology trapped in development stages without a pathway to commercialization.

Continue to encourage the proliferation of more spectrum to fuel the revolutionary advancements in mobile technology

One of the most dynamic areas of the American innovation ecosystem is the development of mobile technologies. From distance education to energy efficiency to wireless health diagnostics and monitoring, the

mobile revolution has the potential to substantially transform the every-day life of all Americans in less than a decade. The core fuel of the mobile revolution is spectrum. The 112th Congress took positive and important steps to allow more spectrum to be made available. The 113th Congress should continue to build on that record by learning more about unused spectrum and federally-held spectrum while paying close attention to FCC actions related to incentive auctions. Wise decisions now about spectrum allocation and efficiency will pay handsome benefits in years to come not only for society in general but also in increased revenue to the Treasury.

Encourage increased technology transfer and commercialization of federal research

The President has already directed federal research agencies to increase their efforts to accelerate technology transfer of federal research and support private-sector commercialization. The President's directive is a win-win for both the federal government and the private sector as federally-funded technology is propelled into the marketplace allowing new products to improve society and expand commerce while producing a greater return on federal research investments. As Congress searches for new avenues to increase revenue to the Treasury, Congress should strongly encourage federal agencies to become more assertive in efforts to transfer and commercialize technology. The Administration should further direct federal agencies to proactively seek out regional innovation accelerators across the U.S. that already possess the expertise and capacity needed to move technology from the lab bench to the marketplace.

Conduct vigorous oversight of federal agencies with innovation-related regulatory authority and require Innovation Impact Statements for all regulations

Currently, a host of major innovation-related regulations are weaving their way through the administrative process at several agencies including the Food and Drug Administration (PDUFA/MDUFA Reauthorization), USPTO (America Invents Act), Securities and Exchange Commission (JOBS Act and crowdfunding), the Small Business Administration (SBIR Reauthorization) and the Federal Communications Commission (incentive auctions and spectrum.) Each regulatory proceeding carries the potential to spark greater American innovation or dampen development. Additionally, the President's cybersecurity Executive Order will require implementation from several federal agencies.

Although agencies specialize in certain areas, agencies should respect the significant need for regulatory humility, bearing in mind that the speed and progress of innovation will invariably outpace the ability of regulations to stay ahead of the innovation curve. By the time final rules are approved and implementation begins, market dynamics may make the rule outdated. In addition to seeking public comment, agencies should proactively and regularly interact with the startup community since startups often aren't aware of the abbreviated administrative timelines for public comment periods. Even if they are aware, startups and emerging companies frequently don't have the resources to hire advocates to help shape and draft public

comments because their main focus is making payroll, raising capital and making their venture sustainable. Regional innovation incubators and accelerators provide a rich supply of entrepreneurs and investors that can help educate and inform federal agencies on the hurdles and needs of startups and emerging companies.

To protect startups and emerging companies, Congress should require all federal regulatory rulemakings to include "Innovation Impact Statements." The purpose of the Statements would be to provide more transparency and accountability in the regulatory process and could explain to the public such considerations as 1) what impact the regulation will have on innovation, 2) what data and processes were used to reach the agency's conclusion on how innovation will be impacted, 3) the particular impact on emerging technologies in the industry or related industries, 4) the cost to startup and high-growth businesses in the industry or related industries, and 5) the trends in the public comments related to the regulation's impact on innovation and startup/high-growth business.

Protect and extend America's global edge in medical technology innovation by fully repealing the Medical Device Tax

One of the few bright spots in this stuttering U.S. economy is the medical technology industry which combines life-saving med-tech innovation with domestic manufacturing, leading to a vibrant export sector that benefits the world, not just the U.S. Yet, med-tech innovation faces incredible headwinds at the hands of the Affordable Care Act's Medical Device Tax.

Data reveals that the ACA rationale for taxing med-tech innovation, that the industry would enjoy the windfall of millions of new patients to offset the cost of the tax, was simply wrong. It is now clear that the tax is unwarranted and inequitable, especially since small and mid-cap companies, which tend to drive innovation and job growth, will bear the brunt of the tax. Even before the tax was effective on January 1, 2013, companies were downgrading their upbeat forecasts and laying off high-skilled, high-wage employees. That trend will only continue as the calendar turns each page.

If there was ever an industry that embodied the underlying premises of the ACA, to improve patient care while decreasing healthcare costs, the med-tech industry is that industry. In order to protect and extend America's global edge in med-tech innovation, preserve and create high-skill, high-wage jobs, and save lives, Congress should fully repeal the ACA's misguided medical device tax and the President should sign it.

Foster improved STEM education including workforce development partnerships

While STEM visa reform addresses the immediate need to expand America's innovation talent pool, the long-term solution resides in America's elementary and secondary education system. For too long, America's public schools have simply not made the grade when endeavoring to produce enough talented STEM graduates who are ready for either college or the workforce.

STEM-related companies have already recognized the underperformance of public education and are creating their own parallel schools or programs to educate children in order to adequately prepare them to successfully contribute in the marketplace. Philanthropic foundations are also getting involved with teacher training programs and grant programs to elevate the STEM experience for students.

With this backdrop, Washington must have a more robust discussion on how to improve STEM education recognizing that one size does not fit all. Special attention should be given to how best to unleash all 50 states to become laboratories of STEM improvement without excessive fear of running afoul of federal regulations. Additionally, industry stakeholders should realize that their participation is valuable and necessary so schools can better understand the specific needs of that region's innovation economy. Top-performing programs should be heralded and their best-practices shared so other states, cities, corporations and foundations can multiply success across the country. Improving STEM education in elementary and secondary schools will be a long-term effort that should be promptly undertaken.

Promote energy innovation to foster an environment to further propel clean tech advancements

Part of an "all of the above" energy policy should not only include innovation in safe domestic production to alleviate America's reliance on foreign oil, but must also include facilitating the future of clean energy production. Congress should advance innovative policies that incentivize a more favorable business climate for the clean energy sector so startups and emerging companies can continue to spark the clean tech revolution while creating new jobs and securing long-term economic security. Congress should also consider the benefits of clean energy to national security and in meeting current and future military fueling needs.

The selection of a new Secretary of Energy will also be significant as the selection will need to exercise regulatory humility so startup and emerging companies are allowed to inject disruptive technologies into the marketplace in order to meet differing regional energy needs.

Strengthen intellectual property protections while fully funding the Patent and Trademark Office by providing full access to user fees

Congress and the Administration should continue their aggressive focus on strong U.S. intellectual property and trade secret protection. As foreign competitors continue to use IP theft as an economic weapon to impede the growth of American startups and established companies alike, while also eroding consumer confidence in American brands, Washington must not tire in its efforts to strengthen IP protections and enforcement both domestically and globally.

Congress must also monitor the success of one of the most important innovation-related federal agencies, the U.S. Patent and Trademark Office. Unlike most federal agencies, the USPTO does not receive any taxpayer funding but is fully funded by user fees paid by the innovation community as they apply for and

maintain their patents and trademarks. Despite being funded solely by user fees, USPTO must wait on the budget and appropriations process before being able to access the user fees that fund the agency. Thus, the USPTO is hampered in its effort to produce prompt action on patent and trademark applications when USPTO appropriations are held up in Continuing Resolutions or when Congress restricts full access to the user fees.

Although the 112th Congress had a golden opportunity to restrain itself and permanently end fee diversion, which has accounted for over \$1 billion in user fees Congress has diverted away from USPTO, the America Invents Act left the fee diversion issue unresolved. This \$1 billion diversion has caused a massive backlog of patent applications which impedes the speed of startup company growth and threatens patent quality.

It is no secret that the strength of a startup's intellectual property portfolio is a key factor in whether it will be able to attract the capital necessary to grow into a viable company. Consequently, USPTO's prompt action on a patent application can hinder or accelerate a startup company's evolution. Past performance has shown that when USPTO has full access to its user fee funding, the patent application backlog decreases.

Congress should also carefully monitor USPTO's regulatory implementation of the America Invents Act since so many of the new regulations will specifically impact how startups wade through the patent application process. Particular attention should be given to how the new First to File regulations are administered especially in relation to the American Grace Period which plays a vital role in intellectual property protection but is at serious risk of being undermined.

Additionally, the Administration and the Senate have a tall task in replacing the previous USPTO Director. The mix of skill sets needed—technical proficiency managing the agency, effective Congressional relations and positive employee relations—will be hard to duplicate but should not be compromised.

Conclusion

We recognize that this Innovation Agenda is broad and touches on policy issues within the jurisdiction of various Congressional Committees and federal agencies. However, we believe that for far too long Washington has approached innovation policy in a fragmented and uncoordinated way. By bringing these wide-ranging ideas into one agenda, we hope to impress upon policymakers and thinkers the need to approach innovation policy in a more comprehensive and systemic way. We stand ready, willing and able to assist this Congress and Administration in advancing innovation policy to help spark an American recovery.

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CONNECT is a nonprofit organization that is dedicated to creating and sustaining the growth of innovative technology and related businesses. Since 1985, CONNECT has assisted in the formation and development of over 3,000 companies and is widely regarded as one the world's most successful regional programs linking inventors and entrepreneurs with the resources they need for success. CONNECT focuses on research institution support, business creation and development, entrepreneurial learning, access to capital, protection of intellectual property, public policy advocacy, awards, recognition and networking. More than 40 countries and regions have adopted the CONNECT model, including New York City, the U.K, Sweden, Norway, Denmark, Australia, Colombia, and India. CONNECT is the recipient of the 2010 Innovation in Economic Development Award in the "Innovation in Regional Innovation Clusters" category presented by the U.S. Department of Commerce's Economic Development Administration.



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