

Keynote Address: It Takes an Ecosystem: Incentive, Partnership, and Impact Design is Critical to Advancing Technologies and Sustaining Translation Culture.

Tuesday, December 6, 2022

Session Transcript:

>>Ian D. McClure: Thanks Matthew. I am going to try to share my screen here see if I can do This. Perfect. Okay, I'm assuming everybody can see my screen. Thanks Matt for uh giving me the just the opportunity to speak with this group, and what I'm what I'm hoping to do for the next 30 minutes or so in this talk is to take this group of about 100 people and take a step back to look at uh the Proof Of Concept Network that's being led by all the great programs just described uh by Matt. Take a step back and look at where the meaning of those programs as they fit within the current Innovation landscape in the country, and perhaps more importantly the evolution of that Innovation landscape as we move forward.

When Matt and I were talking about this keynote and what I would try to address for this group, I really wanted to just capture sort of a an intersection of uh the experiences that I've been able to have, most pointedly in the last couple of years as it relates to my role as Chair of ATUM, thankfully not chair elect because it is currently my chair term and I'm counting the months for only four months left in this effort, although very important work and I've enjoyed it, this effort ends actually in February. But, my role as Chair of ATUM, the experience is drawn from that, as well as uh on um as a member of NACIE the national advisory council on innovation and entrepreneurship, and the role it is currently playing advising the department of commerce with leadership from the NSF from NIST from the USPTO from the EDA as it looks to look at how can we devise a path design a path for our entrepreneurship ecosystem uh across the country.

I'm going to focus this talk really on the importance of ecosystem, and really when I look at the Proof of Concept Network, what it takes really to develop an ecosystem and how to look at the programs like REACH, the NIGMS IDeA hubs, the NAI programs, all of it fits like a puzzle right as a part of an ecosystem they all play a role. I'm going to talk about the importance that each of those pieces play. But first I mentioned, we're going to take a contextual step back I always like, and if you've seen me present before, I love this slide because it allows us to take a step back

and look both historically and contextually about where we are now and why. I like to first answer the why question. Why are we seeing what we're seeing right now and as we look at the importance of ecosystem in the process of translational research.

Taking a step back, this is a graph that I developed a number of years ago. The top, excuse me, the bottom red line here that you can see is the country's GDP gross domestic product which most people would agree is at least one strong indicator of the health of our economy, and as it flows ebbs and flows over the years. The top red line though, this bright lead red line is actually patent filings relative to GDP. Right, so importantly you can see as GDP has significantly grown, we can go back to 1975, we're looking at maybe a snapshot of the last 40 years. As our gross domestic product goes and has grown, patent filings relative to GDP have grown exponentially actually. So, what does that tell us?

If we think through about what intellectual property actually is right, it's an investment not just in R&D but in the outputs of R&D. It's an investment in the opportunity that those outputs from R&D um uh mean to us - what is the possibility of those outputs. Well, I juxtapose that but with this bar graph right behind it. This bar graph is a depiction of our S&P 500 market value. The S&P 500, some of the largest, the 500 largest public companies that are publicly traded on our markets. Many of us have diversified retirement funds invested in some, to some extent, in the S&P 500. Well back to 1975, of course these are public companies you can look through securities filings, um uh a firm called Ocean Tomo that I used to be a part of looked at those securities filings historically and saw that those companies were representing to us, that in 1975 only 17 percent of them were made up of intangible assets. And the best way to measure intangible assets is of course through intellectual property. Well, we fast forward we've done a complete inverse over that 40-year period. As you see, the patent filings relative to GDP growing and growing and growing, it should be intuitive that the firms that make up our markets right, that we rely on, those companies that do R&D in our country and across the globe are now representing 80 percent of them, are attributable to intangible assets. That was back in 2005 and actually, if you take this study out another 10 years, we're actually closer to 90 percent now.

So I like to show this because I like to represent the difference between science, research and development, and actually the investments in translation of science uh represented by intellectual property. That difference in language and terminology is something that we talk to our faculty actually a lot about. Well, let me shift the contextual and historical context to research itself and R&D. This graph here on the left uh intentionally stops at 2015 because what I'm trying to do is show a snapshot in time of why the evolution we're currently a part of started. And, if you look at R&D over that time period, we'll look specifically at 2010 to 2015, overall R&D in the country was growing like it usually has um over that period. But if you look at the portions, the proportions of that R&D uh as between industry and federal federally-funded R&D, we see that industry actually makes up the most or all that growth during that time period.

We saw a decrease of federal funding and R&D over that time period 2010 to 2015 actually 2014 to 2015 I think was our largest year on year decrease in federal R&D funding. So let's take our ourselves and maybe just step into the shoes of policy makers back to 2016 right. Well, let's look take a little deep dive into that R&D which a portion of that R&D is of course performed at universities in the form of University Research. We're all familiar, most familiar, with that portion of the R&D landscape. Well of course that portion uh you might imagine also decreased during that period. Of course we rely pretty heavily, as I'll show in a few slides here at my own University pretty heavily, on federally-funded R&D Federal research funding.

So again take us back to 2016. We're at a period where Federal funding is stagnant at best for R&D uh and something might have to change. But contextually, we look take a step back 30,000 foot level what else was happening across the world. We see that's the pace of R&D expenditures across the world was not doing what it was doing in our country, in fact in many other countries it was increasing, and of course the spotlight on China and what they were doing during that same five-year period between 2010 and 2005. in fact, if you look at the right bar graph you can see that over a 20-year period all the way through 2020 the pace that China was increasing its R&D especially federal R&D was outpacing the rest of the world – not just us everyone. And around 2015 actually is where they picked up a lot of that pace.

But I like to show a snapshot. I don't know if this is going to work. I'm going to try to all right um if you can see this video and I'm hoping if um that this works and everyone can see this video. I want you to watch this one minute, takes about 40 seconds, and then then we'll talk about it.

So I take us back to the first Slide the bar graph juxtaposed of the S&P 500 against the against the patent filings and GDP. I open this move forward for me, there we go. I want to take us back to the context of, um sorry uh, of the importance of intellectual property and the difference between IP investment and R&D investment. Intellectual property investment, and that was a that that sort of short video, was of course International patent filings by country uh over the last 20 years. And you saw the pace of growth starting around 2015 to overcome the United States in international patent filings for the first time uh by China over that over that period.

Well what does that represent that represents innovation, that represents an investment in Innovation not just R&D not just in science but also in the translation of science and an investment in intellectual property is a an investment in the promise of what the results of that science and research and development work can mean. So we're being outpaced in that and then now we can take a step forward to the last couple of years and the evolution that's currently going on and why as I'll close out this talk with the comment that this is currently a moment a moment in time that's quite important. And this Proof of Concept Network in particular plays an enormous role in the innovation landscape and the ecosystem building that we're trying to effectuate, and actually leads the way.

My example, so of course the post pandemic spotlight that the pandemic caused on research and science is a part of this preparation for investment, and in the innovation infrastructure. Here in the country we know about the NSF TIP uh being the first new directorate of the NSF

launched in 30 years, and it's focused on use inspired research and partnership of course we know about the CHIPS and Science Act that was passed this year in July of 2022. I got a front row seat for the advocacy and the process. My Chair term at ATUM, certainly ATUM played a large role at many tables in the process, not just to advocate for the importance of University research, but the importance in the translation of the results of that research importance, and I'll get back to that.

We've seen also just again looking at the contextually the importance of this moment now. We've seen the number one defense think tank in the country, this is the Center for International um the Center for Strategic and International studies CSIS, normally focused just on defense and national security, they've made Innovation a focal point of their national security conversation. And then of course we have seen many new Publications right? Multiple think tanks on place-based investments talking about regional hubs, ecosystems, the language the terminology that has come uh sort of come tip of tongue uh in the last couple of years is all because of this contextual, what I've shared, this historic um the historical uh context, and where we are now and we can talk about the landscape.

So a lot of people like to focus on the pandemic and I'll talk a little bit about this spotlight. I mentioned of course it was easy that with the research related to COVID treatments, even the PPE and equipment, immediately we had a focus on science. We were asking science to help us get out of this quickly when we didn't understand where we are, how do we get out. But I want to remind people that really what has come out of this is a focus on translation, um and not just science alone. And this is critical and an important piece of the CHIPS and Science Act. And most people seeing the title of that bill might look at CHIPS and they think it's just about chips manufacturing. Or they might see the science and they think it's just about let's do more science related to COVID. But if you read important aspects of that bill, and even taking a step behind the bill, and at the conversations that I was a part of in the advocacy process uh and through ATUM and now at NACIE, there's a focus on translation, translational research translation activities, commercialization that I've never seen before. And therefore it's currently a time when networks like the Proof of Concept Network, um uh that we're all a part of here, are so important.

Here's what's if we take just a look at what's been authorized by the CHIPS and Science Act you can just see the magnitude right uh the increase in uh belief right in the importance of research we're talking about an almost tripling of the size of the budget of the NSF, the DOE, NIST are all receiving enormous for this is the largest investment in Innovation infrastructure that we've seen in decades and literally 50 plus years. And we can't just think about this in uh this is sort of more basic research because if you look behind the tent if you look at the actual language what we're talking about is ecosystem development. We're talking about around research, we're talking translation, we're talking about use-inspired research, and the importance of those aspects of the results and the impact. We call it research impact design and I'll get to that in a little bit.

In fact, I was actually um uh sort of surprised but one I got a front row seat in the drafting even of language. If you haven't noticed, and I know that if you're a member of ATUM you've heard me talk about uh the importance of this, but in 1980 the Bayh–Dole Act you know, allowed universities to own and manage the intellectual property that resulted from federal funding. That was uh, prior to that the government actually owned and managed intellectual property that resulted from their funding. A really critical importance act that has shocked sort of been a shot in the arm for our technology transfer landscape here in the United States. But tech transfer itself, the resources to do it, has never been funded by the federal government. I was actually a part um of a small group that was able to draft language that made its way into the bill, uh section 10391, uh called its capacity building if you look at that section is what they call it. But there is an earmark of even uh over three billion dollars set aside specifically for translation activity. Specifically for technology transfer resources.

That's never happened before and I know that might surprise some people, and it I continue to talk to people that that surprises, and they couldn't believe that we've never funded that before. Many other countries by the way, across the world as I'll talk about in a minute, do fund uh those activities but that's the importance that is layered on top of this new spotlight on science and renewed investment in R&D. So, for universities like mine at the University of Kentucky what does this mean? How do we prepare for sort of this new terminology around ecosystem building and focus on uh impact from research?

We are land grants institution here in the state of Kentucky and not surprisingly we rely very heavily um on federal awards right? And here's just a depiction. Over the last 10 years uh, we are at our height in research expenditures and grants and awards at UK. We're very proud of that, but a large majority of that is federal awards, we're not one of these institutions like NC State or Virginia Tech, we don't rely as heavily on alternate funding sources and Industry uh partnering. We rely very heavily on federal funding and a large component of that is DHHS NIH funding, which means a lot of that research is going to be basic research which is sort of um what we're good at. We know it well, and that's never going to be taken away.

In fact and that's a point I want to make. Here is that the conversation that's happening across our country right now at many universities on campuses just like ours is the sort of the dichotomy between at minimum basic research and applied research, but more pointedly on this new language of use inspired research and whether that's mutually exclusive to basic research. And the answer to that fairly easily is no. What we're talking about is additive complementary focus on research impact. Not to sort of be uh, to supersede the importance at all of basic research that will always be as important and more important than it than it ever was and become more of a of a focus than it ever was before.

But at universities like ours, we're now sort of, we have working groups and new strategy development groups looking at, “okay now what are we talking about here?” So we've been doing this basic research where we're high in citations and publications, and we're well known in certain research areas. So what does this all mean to build ecosystem around research impact? Well, the case for ecosystem can start with a conversation around place-based

Investments. If you're paying attention to just the conversation nationally as it started, and I take us back again to sort of that 2016 period. Right after that lull in federal funding and as we were being outpaced by the rest of the country, what we saw was some think tanks like the Brookings Institute and Jonathan Gruber the MIT Economist who published *Jump Starting America*, they started drafting these publications around 2017 2018. These were, these two publications were published in 2019 making the case for innovation landscape investment, innovation ecosystem investment, looking more particularly at data related to R&D and then layering it on top of what can we do to equip that R&D process - to catalyze it.

How do we build new process and talents mechanisms and capital to make it go. And that's what CSIS is now focused on as part of its National Security conversation they're focused on Innovation hubs and democratizing the Innovation landscape as one as part of the terminology and language that's a piece of that conversation. So places like Kentucky and the University of Kentucky are now we're newly focused on this right this is what's happening, and this is across health research, this is across engineering, uh this is across food and environment agriculture you name it right. So what do we have to look at? Well of course every ecosystem has strengths and weaknesses it's almost as if we're all across the country right now doing SWOT analysis - what do we have, what do we not have, how do we fill those gaps, what are those threats to us? Here in Lexington, this is sort of some of the data that we've put together as we look at sort of strengths. We were ranked, even surprisingly to many of us, fourth on that Brookings Institute case for growth centers list. But if you look into the data it made some sense because they had an index that they used in their calculations that draw, that that waited fairly heavily, the density of stem talent in a location. Well we were just above the threshold. The 500,000 people in Fayette county here. And so it would make sense to have a university of our size with STEM degrees and research that we have, that we would rank fairly high in having for example the fifth most among those potential U.S growth centers of bachelor degrees in the STEM fields, or stem doctoral degrees per 100,000 people, or university STEM research per capita.

But of course every ecosystem has, you know, um opportunities for ROI as I like to call it. And ours, uh one of ours that you could look at, that we've had to take a serious look at, is our access to capital right? If we're talking about the translation process and being good at it, we have to think about uh the fact that if you look at every state that borders the state of Kentucky, we are third in number of deals, we are I think uh third to last in number of deals, second to last in size of those Venture investment deals. But most pointedly we have uh only \$74 million total in venture assets under management to deploy to our companies that are helping to sort of get across this valley of death.

Well this bottom point on the right is actually a really important thing that people don't think about, and that is, it's not just about sort of access to capital. It's the fact that our researchers actually have to spend more time looking for capital than they would otherwise, be spent on product development and accelerating things through the process. And so you know ecosystems like ours are taking a deeper look at what do we have that helps in the translation process, and what do we have that hurts uh in that translation process from an ecosystem perspective. And I think we've all for years thought about what do we have? What do we not

have? But the you know the um the startups that we spin out, the technologies that we spin out of university research are only going to be as good as the products of their environment right? Their environment is more going to make them up or else they're not going to must leave their environment.

So in the discussions for the National Advisory Council on Innovation and Entrepreneurship (NACIE), we've been focusing on three really important things among many other things, um but three things I'm going to just talk through with this group as its importance to ecosystem development um are these. The first is partnership. I'm going to talk through the importance of partnership as we think about regional things ecosystem-type terminology, the role that partnership plays in network effects. The next is incentives. You can have an ecosystem of partners but it's not going to work as well as it needs to without the right incentives amongst all of the stakeholders. and then finally impact design. You have to have process and you have to have programs to make the partnerships with the right incentives work in the right way. And so we're going to talk about how many of us focus often in the translation process on customer discovery, that's a term that many of us especially if you're a part of I-Corps you know customer discovery, but the new conversation that we're having is, and this is you know instilled deeply in the language of CHIPS and the NSF TIP for example, and even in the NIH Proof of Concept Network, is moving the customer discovery process earlier in the research design process. Not just after discovery has happened, and now we're finding out who wants this but earlier on in the in the research design process. What we're looking at scope of research, the fail fast mentality, actually becomes very important at that point if we're being serious about translation.

So I'm going to start with partnership of course, I mentioned the terminology, this is really key and it's important to pay attention to this new terminology that's being used. If you just do like a search and find for these words in the CHIPS and Science Act, you'll find many mentions of hub and of innovation ecosystem collaborative Innovation resource center engines. We all know about the NSF Regional Innovation Engines program, and then the word regional comes up over and over and over again it's in everyone's mouth, all of our policy makers, our senators our congressmen and women, our state governments, our universities we're all talking about regional right now.

So partnership of course plays an important really important role, this uh and any of my team that are on here right now are probably going to giggle at me, because when I started to design a model for our translation, our commercialization programs, at the University of Kentucky, I actually pulled this uh very flat linear map out, and I said "here's what we want to do you know, these are the key steps right in the commercialization process." But then through lots of thinking whiteboarding experience failures successes, we've learned that this is a very very limited view of the commercialization process. To do translation right, you can't really depict it as a linear process at all. The starting points for example are not always the first block on the left and the ending points aren't always the last block on the right. And the steps in between require not just sort of milestones and steps but they require something much different. An entrepreneurial ecosystem one that really works has ingredients, not just sort of steps right in a linear process, but they're it's made up of ingredients of the right culture, it has regulation

right? It has um sort of monitors of accountability. It has social capital and human capital uh it takes a lot of work right people that are that are committed dedicated to the ecosystem itself and having these pieces in place financial capital education and training is an enormous one right? To have culture building right, so culture the blue circle, can't really happen without the orange circle, education and training.

So, if you have those pieces in place, what you then do is you wrap programs and processes around it that draw from each of these circles, and this is the way that I envision the NIH Proof of Concept Network. Right, what the NIH has done is designed, at least laid out the framework for, a network to draw upon these six circles, or other circles probably two right. But you have to have the programmatic approach and process to do that in the right way. And if you can do that, you have a series the entrepreneurial ecosystems that work well don't just have sort of a single linear process that everyone ushers through. It has a it has a portfolio of programs and processes that draw from the right ingredients that are available to it in that entrepreneurial ecosystem, and I'll talk about both the Inside-out approach and the outside-in approach to make those pieces of the ecosystem available. Then you have startup success, then you have commercialization success in the end from an ecosystem.

But there's a really, um it's not as easy as just sort of bringing a bunch of people together. Let's talk about the importance of inclusive innovation in this process, and one of the things that I know that we focus on a lot in our KINETIC REACH program, and why we made it sort of a top focus of our Hub, is the importance of being inclusive for culture building and for diversity of perspective. I've been studying a lot recently of what's called the Ashby's Law of Requisite Variety, and I encourage any of you to look and just go read a little bit more about um about this sort of Law and economic theory which is quite simple. It means sort of, the box on the left, the control system must have as many possible states as the system it wants to control. Well, if our system that we would like to control is an entrepreneurial ecosystem that has as we all know a lot of stakeholders right? There's a lot of steps, there's a lot of moving parts, there's a lot of ways that can go wrong, there's a lot of influences in opportunity right. So the pieces of the control system which would be those programs those processes the people that are influencing advising managing, must come from a whole lot of backgrounds. That also includes the innovation pieces, the researchers that also must come from a diverse set of backgrounds and perspectives if we're really trying to tackle the problems the right way.

This is better said actually on the yellow box here on the right, Ashby's Law of Requisite Variety states that in order to deal with the world around us, we need a repertoire of responses that are equal to or greater than the problems we face. Of course the complex problems that we're all trying to solve in health research, in health tech, med tech, bioengineering, and all of it those problems are complex and we can't have sort of draw the answers the solutions from one type of person right. We need to be inclusive in and intentionally inclusive and the way that we draw from ideas from innovators, from networks, from people. And so that's one really important aspect of this Proof of Concept Network and especially the NIH PACE committee and it's ability to sort of help the NIH and the NIH Proof of Concept Network think about the importance of inclusive innovation from this Ashby's Law of Requisite Variety. If we're trying to really tackle

the world's problems, these complex problems, and if we're trying to tame or create an entrepreneurial ecosystem that has so many moving parts, we have to have a whole lot of different partners, different perspectives, involved in that process.

Depicted and then maybe a little bit just a different way is, and this is maybe a little easier as it relates to the entrepreneurial ecosystem as we understand it, the entrepreneurial ecosystem is a chaotic regime. And maybe at minimum it's a complex regime, it is certainly not an ordered regime as we all know. And so that you can think of that's the variety of stimulus this, uh the y-axis here, the variety of stimulus in any entrepreneurial Innovation ecosystem is quite great right. It is up to, I would surmise, it's a chaotic regime um with how many stakeholders are involved and influences and pieces necessary to make it work. Therefore you need a variety, a large variety of responses, if you're truly trying to be on the left side of this 45 degree line right. To manage it, if we're trying to manage this chaotic regime, you have to have a variety of people involved. it's depicted as simple as this Ashby's Law of Requisite Variety.

Well, this is something that we've tried to sort of uh participate in by example right, and Kentucky, we truly believe that we're stronger together. It's why our KINETIC program includes every university and community and technical college in our state. Why University of Kentucky and University of Louisville work together with all of those other universities through our Kentucky commercialization ventures program to do that. We believe that deeply, that this inclusive innovation approach is the best way that we can create ecosystem. The accelerator Network, NIGMS IDEa Network, now the NIGMS I-RED program that we just kicked off, also is a network of 25 universities believing in this "we must have diversity" perspective. Diversity of innovators involved in in what we do if we're really trying to solve the world's most complex health problems.

Kentucky Commercialization Ventures is another example. In Kentucky we believe that partnering and by believing very intentionally, and sort of this this notion, that innovation happens everywhere – commercialization only happens where it's resourced. And so we created a resource for every institution and community and technical college across the state to make sure that we were at least serving the opportunity for every idea across the state. But let's get back to regional right. When we think about partly the importance of partnership in region, in this regional language. Now everyone is doing exactly what this map is doing right here. Everyone's looking at their own their own University campus, then they draw a ring around it, that's our community. Then they're drawing a bigger ring around it and that's their region, Because that's how they everyone is thinking now with the engines, and the regional tech hubs, and even the way that they probably should be thinking around their Proof of Concept Network program. Well in Kentucky, we know when our health uh research strengths are: Oncology and CI designated cancer Center for example, neuroscience. But as we look at potential partners regionally, We think about "oh there's West Virginia with strength and health equity." and then Tennessee was strengthened biomedical engineering about manufacturing. And up in Illinois they're strength in nanotechnology and biotechnology, and we with these pieces together now we're thinking about regional strengths.

Well in the corporate world they call this Open Innovation right. Henry Chesbrough, the Harvard expert that sort of coined this Open Innovation concept, because he says open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market as the firms look to advance their technology. Alternatively, it is innovating with partners by sharing risk and sharing reward. This is not a foreign concept. It has not been for many years, really to be honest since um since the Ford assembly line when everything was internal and sort of done internally including ideas you know, the industrial revolution really produced a focus in the corporate world around Open Innovation and it's really all about sharing risk in the development uh research and development process.

We see a lot of that, but why can't universities also do this and think about it as Open Innovation? If we think regionally about what strengths we don't have, but if we map with uh as I showed earlier, West Virginia Tennessee Illinois, and put some of those strengths together. We're practicing in the Open Innovation product development process, we're taking ideas in through partnership, and then we have outputs that look very different than they could have looked if we just worked in a silo of just us. This is research ecosystem building right, um at its finest.

So, if we think partnership is an important thing here we have to look at incentives in those partnerships right. I mentioned this is a heavy conversation uh at NACIE, and NACIE has made up of leadership of the ED the National Science Foundation, the USPTO, and NIST, and then of course the private sector and other universities are a part of this important conversation. And the conversation often gets to culture right. If we're trying to develop an entrepreneurial ecosystem, and Innovation ecosystems across the country, you have to have culturally alignment right, to that and the pieces in place. But then we think, well what builds culture right? And the incentives right. You have to have the right incentives. Well think about the different stakeholders in the translation process. We have the tech transfer offices who view opportunity as everything is opportunity, everything has promise right. Everybody knows the story of the researcher at Stanford that had the idea, brought, um Lawrence page brought his idea to the Stanford tech transfer office for a search function using databases right. The tech transfer office couldn't find a partner uh interested uh they themselves not sure they believed in it so much, but they decided to develop a startup with Mr. Page and the startup became Google. They had the foresight to actually collect some financial economics in that deal, but to them it still was an opportunity.

But if you look at from our partners perspective, everything that we bring to them, everything that is produced through basic research to as an idea with promise that still needs to be de-risked, these are the three things that, the lens right, through HR departments look at is: cost, effort, and risk. And as businesses we can't forget that not everything is just opportunity right. So the incentives must be in place in these translational ecosystems, so that things are aligned. Now most, many would think that, and this is some empirical studies that have produced the data that shows that, you know. this should be good for our innovators and our researchers that involve themselves in entrepreneurial and have represented patenting. Those empirical

studies show that for example, you know those that those you university innovators that do this work are 29 more productive than their collaborators. They're greater than 25 percent increase in citations, of course that's something they all very much care about. They, I like the one on the bottom left, they are 12x more likely to be among the top 10 cited, highest cited in their fields if they simply patent their inventions. Now you see that that would move the needle, but is it the needle that we want it to move? Because the incentive there is, just but just by depiction of these six stats here, the incentive is to do this so you can have your publications generate more reviews right or reads and you're becoming yourself a bigger brand or more prominent. But is that the incentive that we need for real research impact?

So what are the options that we have with our innovators? There's leadership signaling. University leadership can signal that innovation and research impact and commercialization is important. Monetary incentives, Universities have played with this to provide a larger piece of the economics for example to researchers. Recognition, things like awards celebratory events we have one at the UK that we call Patent Palooza. Those things move the needle a little bit but if we really are serious about the things that create real incentive, it's career advancement just like anyone else right. Tenure in promotion, grant competitiveness, making yourself more - what we've learned is that researchers care most about is not just how many citations they have on their publication, but does it help them get or continue to get more grants and will it help them get continue to fund to their lab and the work.

Well what are the options that we have with partners or investors right. Companies industry love additional supports. They might like to see decreased product development, risk certainly, that is um one huge advantage they have to look at the basic research and the results that come out of university federally funded university research. Recognition, just partnering with the land grants university for example. There's advantage or benefit to that, but what they really want to see is grant funding access. They want to see that they can be a part of some of this grant funding access, and also they would love to see that there's no interference in the economics. This is where we get back to when I the conversation around Bayh-Dole and the unfunded mandate. This is a conversation of topic in Geneva Switzerland where ATUM invited 36 tech transfer leaders of all of the associations around the world, similar to ATUM there are many others in other countries, and I led a half-day conversation on government funding of Technology transfer, and the incentives that it would change in the translation process. Because if we remove the incentive to generate monetary return just to continue to fund the operation, to pay for the next year's patent expenses for example, what incentives does that change to partner and to create a quicker partnership opportunity? And does it remove the economics from the equation that is sometimes a barrier to advance things and find partners in industry. And then finally we talked about, I mentioned, um talent earlier as one of the benefits or strengths that was noted at least in Lexington, well we've been having a conversation at NACIE around the importance of at this outside-in concept. If we're trying to grow ecosystems sometimes the quickest way to advance talent in the ecosystem is not just to train it internally, but to bring those from outside that are experienced in to do some of that advising and training.

We've seen this work really well with our KINETIC REACH hub for example. Our external review board is one of the best things I've ever seen in this in its level of impact on the feedback that they give, and all these people are, not all many of these people are, external to our own ecosystem.

Finally, I want to talk about impact design. This creates impact literacy. It focuses us on the what's changes, what is impact, how research can mobilize into that action, who has to be involved, and why impact is pursuit right. Why do we do research impacting includes, you know, effects on process, people, and places. This is not just impact on science and advancing the literature, but how do we define and see sort of the good that professor Mark Reed says down here, the good that researchers can do in the world. This has a lot to do with the relationship between researcher and society. That relationship has to be strong, the recognition has to be strong. It's absolutely conceivable and reasonable that many of our university researchers may not prioritize this right, over teaching, over students' career developments, upskilling job seekers, those types of important things that we know that our faculty also have on their plate.

So not everyone is going to be inclined to do this. But if we can engage them in, sort of and support the process of looking deeply at engaging in impact design, we might find that those things that find their way into impact by chance through basic research, can more intentionally find their way to impact their design. And that's a really important thing because many unexpected and significant societal benefits come out of basic research, but it's not always intended. Can we design a process that helps that intention?

And here's my last two slides I promise. This impact exploration process is really important through end users right. And I mentioned I'll go back to my customer discovery. We talk a lot about customer discovery in the sort of commercialization pathway development process. But what about also in the research design process? We just launched a training program at UK that's purporting to do this. To focus some of our researchers that are inclined, not everyone is going to be, to help them focus through end users on designing the impact that the research can have. And if we do this, then we'll see the economic impacts right.

This is a long-term thing, ecosystem building doesn't happen overnight. But as we've looked at in Kentucky, like if we've asked ourselves, if we were really good at ecosystem building around research, what would be the impact on the economy in 10 years for example. Well we look at where the things that we're strong at. We have strong manufacturing, we have strong labor force, we have strong stem talent and university research. But what we don't have is industry R&D in the state. We rank actually quite poorly for that, but you could expect that if we did research impact design, well if we built an ecosystem really well around this, then you would expect that over time we would increase the amount of Industry R&D, knowledge type jobs, Innovation investment, and venture capital in our community. And that's the importance right that's why we do this. And so that's the role that the united Proof of Concept Network plays.

I'll tell one last story, and this is um takes one minute. The very the last meeting that we had in NACIE, it was the first meeting right after the passage of the CHIPS and Science Act, and uh our Co-Chair Steve Case, former CEO founder of AOL, now head of the Rise Fund, and the director of the NSF, they spoke together, and they talked about they both used the language this is a moment right now. They said this is a moment, and secretary Gina Raimondo, Secretary of Commerce, was not in the room at the time. She walked about 15 minutes later and gave her own sort of five minutes of comments, and she said the same thing, she said this is a moment. And that has stuck with me because where we are in the Innovation landscape and it's evolution is truly a moment and the NIH proof of concept network certainly has a role to play in that.

>> Question by Stephanie Fertig: Thank you so much Ian. So I know we have a break here at two, however we got a great question in the chat, and I and I'm sure you know that was uh such a great kind of comprehensive overview and a great talk, that um it would be, what we're going to do is we're going to say you know certainly willing to and encourage to take a break before our next panel, but Ian going to ask you to answer the question from the chat because I'd love to hear the answer as well. So the question in the chat was "how far is the community integration with Kentucky's minority population. Has any work regarding transit translation science with any HBCUs? What's the University policy with extending this REACH with others for the work and investment by the federal government?" So really, how are you incorporating um kind of the broader community in what you're doing?

>>Answer by Ian D. McClure: Really good question and one that we love to talk about so certainly when we were designing for example that ducky commercialization ventures program, um you know uh, we had to overcome early objections. Some of those first objections were, well why would we do this where there's not research first work going on right? The answer to that was when I said earlier, the belief, the strong belief and now the validated belief, that Innovation happens everywhere but commercialization only happens where you resource it. Well of course inclusive in the institutions that that program works with is Kentucky State University KSU, a four-year HBU in Kentucky, and we've had some really great impactful outcomes from the involvement of Kentucky State University, for example, in what is their first time ever even having dedicated translation resources right. As an example, we actually filed the first patent ever filed by the community and technical college system in the state. They had never filed a patents ever. Think about how many ideas have come out of years of thousands of students and subject matter experts that are involved on those campuses. And so yeah, there's an intent you have to be intentional about it, and in Kentucky we're trying to be as intentional as we can. Always improve, we have to be as intentional about it as we can, to invest in this sort of this notion that is validated. Inclusive Innovation, and I'll talk again the Ashby's Law of Requisite Variety. It's important that we invest in the diversity of perspective.

>> Question by Stephanie Fertig: Well, we did get one other question, and this is I think going to be the last question but I'm going to sneak it in there and beg a little bit more time from you. "What some of the proven strategies are that the tech transfer office can deploy to enable

deliberate Innovation at their institutes without directly dictating the research programs? So how can they better work together but still allow for that you know great Innovation comes in from all sorts of interesting places that we might not have expected?

>>Answer by Ian D. McClure: Okay yeah so you know go back to my talk about incentives. It's important that you start with, you know not everyone is going to be inclined to do this kind of work and to adopt this open Innovation mentality where part through partnership you can access more opportunity. And not all faculty researchers are going to be inclined to do that. But if you can open their eyes through training programs, and then you have to incentivize working through those training programs, the ones that I mentioned we launched at UK innovate has a micro certification involved so there's sort of recognition of faculty that might do that, then you were you're hoping that you're shifting the culture right. And then they orient themselves to looking at who else would be, um who else would have good ideas here, what other Innovation processes are going on that I can intersect with, interact with, and adopt through this open Innovation mentality. Open Innovation is not meant to be just sort of a process adopted by the corporate R&D environment, it's is the entire Innovation ecosystem and universities certainly should can adopt that um that perspective.