

NWX-DOC-NTIA-OTIA

**Moderator: Elaine Sloan
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Coordinator: Good afternoon and thank you all for standing by. For the duration of today's conference, all participants' lines are on a listen-only mode. Today's conference is being recorded. If you have any objections, you may disconnect at this time. It is my pleasure to introduce Ms. Katherine Bates. Thank you, ma'am, you may begin.

Katherine Bates: Hello and thank you for joining us today for BroadbandUSA's monthly Webinar on broadband topics and issues of interest to the public. I'm Katherine Bates, the Manager of State and Local Partnerships with NTIA's BroadbandUSA program. Today's webinar focuses-on Measuring the Economic Impact of Broadband.

This session will show that understanding how to measure and communicate the benefits of broadband is critical to building support for efforts to expand connectivity and use. We are pleased to have three leading US researchers who will discuss their evaluations of the economic impact of broadband deployment and adoption in the US

Our presenters today are Alison Grant who is a Research Assistant and Instructor at the Department of Agriculture Economics at Purdue University, Brian Whitacre, Professor at Oklahoma State University and Roberto Gallardo, Assistant Director at the Center for Regional Development, Purdue University.

Before we begin though, I would like to review the logistics for today's Webinar. First, we will open-up the Webinar for questions after the completion of the presentations. As you hear from each presenter, please use the question box on the right-hand side of the screen to submit your questions or comments.

We do not take live questions on the phone, just through typing them in the box. Second, the presentation along with the transcript and audio recording of today's session will be available on the BroadbandUSA website within seven days of this Webinar under the events past events tab.

Finally please visit our BroadbandUSA website for information about our technical assistance program including useful guides, products, publications and other tools that can assist you with planning, funding and implementing your broadband project.

So as we begin I'd like to introduce our first speaker, Alison Grant. Alison's trained as an Agricultural and Applied Economist and her current research focuses-on the economic impact of public policies with particular emphasis on the livestock sector. She is a Ph.D. candidate at Purdue University in the Department of Agricultural Economics.

Her other research themes include the cost benefit analysis for broadband implementation in rural Indiana, examination of the factors that affect

farmland values and rental rates and determining the economic cost of policy scenarios in food, environmental and natural resource markets.

She has published a policy brief and two white papers with Purdue University's Department of Agricultural Economics during the first two years of her Ph.D. program. In addition to her research, Alison currently teaches an undergraduate course and works as a research assistant for Purdue extension. I'll now turn this over to Alison. Welcome, Alison.

Alison Grant: Thanks so much for that introduction, Katherine. This is an empirical study on the net benefits of broadband implementation specifically for the State of Indiana but I'd just like to point-out now that the methods used here can be used for application in other states.

Dr. Wallace Tyner and I co-wrote this study on the benefit-cost analysis and Dr. Larry DeBoer then subsequently estimated the tax revenue benefits from implementing this statewide network. In the two links here you can click on them and they're specifically going to the specifics of two studies and I'll explain how they're broken-out into these two studies in a minute.

So the next slide, the current media has a host of stories about the digital economy focusing-on the importance of digital access to all people, regardless of geography. The Economist magazine in this first quote called data the fuel for the future. This quote states that digital information changes the roles for market and they demand new approaches from regulators.

Now let's transform all of that into what that means for broadband and specifically broadband access in rural areas. It was estimated that there are 6.2 million rural US households without good broadband access. Many

studies have made it clear that without good connectivity, rural areas can fall into the losing end of the digital divide.

Kuttner in his broadband report puts it this way. In the long run the economic impact of rural broadband will be more important for the role it plays in changing what the economy is and it goes-on to talk about the transformative nature of the digital age so I think it's important to make it clear now that one cannot even envision all of the benefits that high-speed Internet access provides.

I can tell you what we estimated in monetary terms, in terms of the benefits we can see with our own eyes and what we've tried to calculate but this only scratches the surface and I say that the benefits are transformative in nature because we can't fully quantify those benefits we can't see or those future benefits that we can't even predict.

So moving into the next slide, this presents an overview of the information that I will provide to you from our study. I'll try to quickly go over the benefit categories and you can view them in more detail in those blanks on the first slide.

Originally we wanted to analyze the railroad cost of providing broadband service households in a targeted multi-county area of Indiana and estimate those benefits that can accrue to these houses and not just local surrounding economies.

So we then ended-up providing a second analysis for the entire State of Indiana using data from six other geographically-spaced rural electric cooperatives. The first (mere) contracted by one rural electric member

cooperative, they were called Tipmont REC which is in Tippecanoe and Montgomery Counties in Indiana.

They were interested in getting a study out there that explored the benefits of cost ratio in order to express the need for investment. The Tipmont upon getting investment will provide their current electric consumer base with fiber broadband as a package deal.

Tipmont provided us with all of their real-time cost data so all of the system and operating costs so first I'll go into the total numbers, what were the benefits found, what were the costs, and then I will provide the other metrics that you can see here in this slide.

And then at the end I can talk a bit about the extrapolation of these benefits to states but just know that the procedure was the same for each cooperative, the only difference being the specific data used for each geographic location.

So the next slide presents, I'm sorry, this provides a summary of results for the entire statewide study for the benefit-cost ratio is around 4 to 1, that is for every dollar invested in rural broadband, \$4 in benefits are returned to the local economy.

And statewide the net benefits or these are the benefits minus the cost amount to \$1 billion per year. In addition to the net benefits, federal and state governments would have increased tax receipts and lower Medicare and Medicaid costs. These tax revenues and cost savings amount to about 1/4 of the total net benefits.

For the next slide here is our study approach. The idea is that some benefits cannot be captured by private market because they are in the form of

extremities or considered public goods for which there is no market price. However, they do represent genuine economic gains.

So for instance if I wanted to get my degree online, there are obviously economic gains such as the revenue for the education provider, gas and mileage saved by me not having to drive to a campus but there are some not-so-obvious other economic gains such as the possible time saved by not driving, knowledge gained from these online learning tools and applying that education for something useful and productive to the economy.

So some of the most important areas for benefits provided in the literature are telemedicine, education, business investment and general economic development, farm income changes, civic engagement and property value increases.

So while benefits are not limited to these areas, these represent the areas that have received the most attention in past studies. We build on existing literature and established benefit-cost analysis methods to estimate the benefits in these areas.

And remember those system and operating costs all came directly from the current Tipmont numbers and we use these costs such as the cost per line of fiber per mile in the state extrapolation as well so moving to the next slide, this presents some of our assumptions.

Other assumptions used were the 6% discount rate so to estimate these future values and we ended the time horizon at 20 years even though the benefits would clearly extend beyond that and then we used this take rate to list previous Purdue willingness to case study conducted by Professor Nicole Widmar.

So the next slide shows the benefits and costs over a 20-year time horizon for the Tipmont cooperative so on the left here is all of the categories that we attempted to quantify. The important thing here is that in Year 3 when the benefits are fully realized, net benefits are \$560.2 million and that's just for this one rural electric cooperative area.

So if we move to the next slide, this presents all of those benefits that I mentioned in the last slide in a pie chart so it lists them as a percentage of the total benefit to give you an idea of the shares of the benefit categories so telemedicine comprises of the largest proportion of benefits.

This is at 30% and this is followed by all the other categories as you can see here such as system revenue, so this is the money coming from the consumer once the fiber is up and running.

So moving to the next slide, we found a per-customer net present value of approximately \$25,000 so on an annualized basis, this amounts to an annual net benefit per customer of approximately \$2000 and remember, every dollar invested in broadband returns \$4 to the local economy. That's that 3.96 there.

And another metric that could be used is the ratio of benefits received per dollar spent by Tipmont customers so this is approximately 4.5 and if we take Tipmont revenue and divide by the cost incurred to them, the ratio is 0.54 so this result highlights the fact that many of the benefits accrue to the local economy and not to the broadband provider.

So there's here provides a clear example of a case for which public support may be needed to achieve the high level of public benefits possible so in the

next slide I'd like to step inside each of the benefit categories quickly in order to create a clear picture for you all.

We split-up these categories in telemedicine, in benefits that accrue either to the patient or to the provider and you can see each subcategory listed here so for telemedicine we relied heavily on our recent study from Anthem in the State of Indiana.

The study had a treatment group so at the meeting telemedicine and a control group, those seeing the doctor in person and they found that the health outcomes over a few months were identical across both groups and they also found that fewer tests were ordered for patients that were receiving telemedicine.

So the Year 2 value is \$20.5 million for telemedicine for the Tipmont cooperative so in the next slide we see that there are numerous possibilities for benefits and education. With rural broadband, citizens have access to lower costs but effective education and job skill upgrade options.

It also increases the number of learning environments so different people have different styles of learning and online learning adds to that diversity and has proven to enhance learning outcome.

So we estimated the benefits separately in the K-12 category and the adult category so this slide's the K-12. We decided to assume a productivity increase based on education expenses for teachers so we called the school districts in order to get the budget for K-12 teachers' salaries and benefits.

And we believed it reasonable to assume a 5% improvement in teacher function with the increased ability to use high-speed Internet in the classroom

so this ended-up being \$1.5 million in Year 3 so moving to the next slide we have adult education. We used the median household income of the Tipmont service area and then in each respective coop area for the statewide analysis.

And we assumed that a higher percentage would get college degrees so 46% of our sample had listed high school as their highest form of education so we assumed 1 in 5 households will get new or better jobs valued at 5% of household income so the benefits amounted to \$9.6 million in Year 3.

So moving to the next slide, from the literature we found that rural broadband adoption leads to improved median household incomes and an increased share of non-Farm Bureau businesses. However, we decided to assume that this was included in the adult education and multiplier categories just to avoid any double-counting going on here.

The next slide presents the multiplier benefits so these benefits essentially derive from the fact that any investment increases spending and increases elsewhere in the local economy so the well-established literature provided multipliers ranging from .99 to 1.99 so we decided to use the most conservative estimate of .99 which amounted to \$188 million in Year 3.

So now moving to the next slide, this is consumer savings. Many studies estimate that consumer savings from Internet connection in insurance, energy, general shopping and for services online to compare item prices so here think Amazon which is a useful tool to compare item prices per unit of product so we used this study to estimate household savings per year and apply that to get a benefit of almost \$10 million in Year 3.

Moving to the farm in the next slide, we see that increased farm profitability comes from things like access to market prices, easier communications with

suppliers in the market outlets, access to extension or other farm process information, quicker access to weather information that could impact management decisions and just this greater access to technology such as geographic information systems, getting drones and precision agriculture.

So we measure this with an increase in total farm revenue using total agricultural crop sales in each county studied and then use the profit increase over time yielding a benefit estimation of over \$600,000 in Year 3 for Tipmont so the next slide, this goes into the civic engagement category.

Civic engagement included things like development and use of rural social networks and then stimulating volunteer activity and community involvement so again no doubt that these are genuine benefits, we were unable to quantify them and therefore this category has been left-out in our analysis.

But in the next part of the Webinar Brian will talk about how this category is indeed important. It was just difficult to quantify in economic trends for this study so the next slide I wanted to show this table to provide you with the cost data given to us by Tipmont just to show you what was involved on the cost side so we have distribution, fiber, core network installation and then finally that total build capital cost.

And then in the next slide this is just a bunch of numbers but it looks at the operating costs and I just put this table up to show you that there are numerous categories and complexity that went into these operating costs and how they were calculated so there's fixed costs, labor, tax, billing, marketing, access fees and that was all calculated over this 20-year time horizon.

So the next slide this presents kind of a recap of what was found in terms of net present value of benefits for Tipmont so the important number is that

benefit to cost ratio being 4 to 1, yet Tipmont revenue can only cover about half of the system cost which stresses the need for additional dollars for the local economy to experience the benefits for them adhere.

And then the next slide here, this shows how we extrapolated to the state. We had data from six other geographically-spaced rural cooperatives in Indiana so the total net present value per member ended-up being around the same as the Tipmont study and we extrapolated this to the entire state by using the number of members not included in the seven cooperatives that we quantified.

So at a 6% discount rate, the benefits ended-up being a clean \$1 billion per year and to conclude in the next slide, it was an act of State of Indiana would invest \$100 million in rural broadband in 2019 citing this study I just presented to you as part of the rationale behind the investment.

We like to compare investment in broadband to past investment in rural electrification so in the '30s when the Rural Electrification Act was passed, the country started to get electricity out to all rural areas of America through these rural cooperatives. Electrification of rural areas only happened because the government subsidized it and those benefits are still realized today.

We can see a great parallel between that time and now by just substituting electricity with high-speed Internet access so the State of Indiana shares this sentiment as they are now committing dollars into broadband so that rural residents of Indiana may gain access to the benefits explored in this study.

So I think again it's important to note that this study can be replicated in other states that are interested in looking at the benefit to cost ratio using their own data and that's all I have, thank you so much for listening.

Katherine Bates: Thank you, Alison. We did get a question in, I'm trying to harken back to my economics days in college but can you clarify what net present value means while you're still on the line?

Alison Grant: Yes, yes, so that's just when we include that discount rate in there so basically what we're doing is we're taking the benefits in this time period and then we're measuring the future benefits using a discount rate so what would that benefit be in Year 2, in Year 3 all the way up to Year 20 and then we subtract-off the cost.

So the net present value is just the present value what we calculate today but we're estimating future benefits up to 20 years.

Katherine Bates: Okay, thank you, I know we said questions at the end but I was like what is that so thank you very much and as a reminder though we will have time for questions at the end of this session except for that one so just use the question box on the right-hand side of your screen to submit questions or comments at any time.

Our next speaker Brian Whitacre is a Professor at Oklahoma State University. Brian holds a Sarkeys Distinguished Professorship in the Department of Agricultural Economics at the Oklahoma State University. He has published over 50 peer review journal articles with most exploring the relationship between Internet access and rural development.

Brian has won many regional and national awards for his research, teaching and extension program. Welcome, Brian.

Brian Whitacre: Thank you, Katherine and before I get started on my piece, I wanted to give kudos to Alison and her team at Purdue. This is a - the study she just went

through is very widely-recognized in our kind of world that focuses-on rural broadband. A lot of people can quickly grasp that 4-to-1 benefit that they found and the \$25,000 per member net present value, those are great numbers to pass along.

And so I really wanted to congratulate her on a well-done study. I do want to note that Dr. Tyner who was Alison's advisor on that first piece, he was a real icon on the cost-benefit studies and unfortunately we lost him earlier this month and he unfortunately passed away but he was a real leader in the cost-benefits studies.

And I remember talking to him one time and he said, if you can tell me, you know, the benefit of something, I can put a dollar value on it and I thought that was really cool. He's a great guy who will be very much missed and then so as I get into my portion of the study, I wanted to say, you know, Katherine actually told us before we got started with this conference that this particular Webinar had one of the highest numbers of people preregistered for it.

So there is a lot of interest in this topic and I hope that you all take the studies that we're going to discuss and apply them in your own usage. Please do get in touch with Alison and myself and Roberto, you know, we do this for a living. We have pretty good knowledge about the studies that we're talking about and about how to apply these techniques.

And so we're very interested in helping you all do your jobs as well so I'll just put that out there so what I'm going to do is talk about some specific studies and some of the ones that I'm going to mention were used by Alison in her in that Purdue study that she just went through.

So let's go to the next slide and I'll talk about the categories I'm going to discuss so there is research to suggest that broadband really does matter for a lot of different things and here are some of the ones that I'm going to walk through today.

So my hope is that you guys can take these particular categories if you need to make a case for one particular outcome, there are some studies here that you can refer to and they're all linked in my presentation and again if you need help getting an echo study or diluting it down to a more speakable language, I'm happy to help with that.

So I'm going to go through the categories kind of one by one and tell you what the studies have said on these topics and so I'll walk through what the papers say about broadband and household income and employment levels, etcetera, and I want to point-out there at the bottom a note that, you know, some researchers including myself actually argue that broadband adoption is more important for these outcomes than is just availability.

Others may disagree with that and I'll mention some of that and then I'm going to finish-up today with a discussion about what the research says about very, very fast speeds going to a lot of people who are thinking of investing in, you know, gigabit networks and there's I guess just a few recent studies that looked into what that means for some of the economic outcomes.

So let's go to the next slide and we'll start with the relationship between broadband and household income and so these are all links here that you guys can go to after this becomes available and I'll just quickly go through basically yes, there is a positive impact of broadband availability on economic growth and on per capita growth.

It's just basically GBC growth and so those first two studies that are linked there, you and OECD countries so that, you know, organization of economic cooperation and development so that's your major countries, Germany, China, US, all the major countries are in there and they found that if you increase broadband expansion, it is going to have a positive impact on per capita and GDP growth.

The last study on there that I did with Dr. Gallardo and Sharon Strover, we looked specifically at rural areas and we found there that it wasn't so much availability that matters but you get rural areas to adopt broadband, they do have faster median household income growth than otherwise would be expected.

So let's go to the next slide and here's some studies focusing-on the relationship between broadband and employment and again we find the research shows yes, there is a positive relationship there. The first one says shows that access to broadband had a 2% increase in the employment rate and that was US data.

Jayakar and Park also looked at unemployment rates and they basically said if you have broadband availability that results in lower unemployment in your county. That was a study from around the 2010 timeframe, again Roberto and I had a study that focused-on rural counties and we found that higher broadband adoption in those rural places again was associated with more firms and more employees.

And then the Kolko study at the bottom focused-on local employment growth so smaller scale employment growth and again he found a positive relationship so there is plenty of evidence suggesting that broadband does positively affect employment levels. Next slide.

Then we also have some evidence about broadband and what it means for getting firms to come to your area, firm attraction and so we've got a couple of papers that have been published basically saying yes, again there's a positive relationship between the importance of broadband and knowledge-based firms.

So that first paper there looked I think focused around 8 megabytes per second for attracting knowledge-based firms and then again there was a paper focusing-on rural areas and this actually looked back in that early 2000s when broadband first became available and they found that rural areas that had early broadband available did have more firms locate in their areas that increased addition.

So there is good evidence for that and I should note that I have a working paper with Steven Deller at Wisconsin that looks at rural entrepreneurship and the results there are promising. We don't have anything published yet but it looks like there is a positive relationship between broadband availability and levels of rural entrepreneurship which we know is important for economic development in rural areas. Next slide.

Also there's a couple of papers on broadband and what it means for farming. The first paper there looked at the USDA and broadband loan program which a lot of you are probably familiar with and they found that of the counties that received those USDA loans for broadband, there was a positive impact on the farms in those counties on farm sales and on farm profits notably.

And then the Jeffcoat study in 2012 looked at farmers' willingness to pay for broadband access and they find that farmers that did not have broadband were

going to pay significantly more in property taxes to support broadband so they recognized that it was crucial for their business. Next slide.

Alison referred to broadband and civic engagement. She said they didn't try to quantify in terms of what a dollar value to put on it but the research is there to show that it does have a positive impact on getting people civically engaged so there's some sociologists here in these first couple of studies that note how important broadband is for just gathering civic information and this is the impact in now you know 2010 timeframe when we were just getting into higher-speed broadband.

And then the broadband in Papadopoulos' paper looks specifically at disadvantaged people so lower income, disconnected people and they found that individuals who were able to connect or use broadband did have an advantage in terms of actually connecting with friends and family and that was very, very important for these individuals.

And then I did some work with a graduate student back in 2016 that looked at specifically again rural areas and we found that broadband adoption rates were very important for encouraging rural people to be civically engaged so that pattern holds for rural areas as well. Next slide.

And then we have some papers on broadband what it means for housing value and as you might expect if you have a house with broadband, it does have an impact on what you can sell it for so the first couple of papers focused-on kind of urban areas. The first one is in US and the second one is in England and they found that if you do have a fiber connection or at that time it was the faster connection 8 megabits in 2014 that increased their property values.

And then I just published one with again Steven Deller at Wisconsin that looks more at rural housing values and we did find a positive relationship between rural houses and housing values and broadband access but interestingly it wasn't the very, very fast the gigabit speeds that increased broadband the housing values, rather it was just some type of access.

So because rural areas are typically more disconnected than urban areas just having some availability for rural house was more important to our housing values. Next slide. In terms of policy I want to point-out that we have a pretty good feel for houses that our efforts to increase availability have actually worked.

So there's some studies here that have evaluated the USDA's broadband loan program and the you guys probably remember the BTOP program that was part of the American Recovery and Reinvestment Act and the evaluations there show that yes, the money was effective in getting broadband provision in those areas.

But the programs we've tried to increase adoption have not really shown much of an impact so there's two studies there and then they evaluated broadband adoption programs and they really didn't find any impact with us so we really don't know how to effectively increase adoption yet we're still working on that, I wanted to point that out. Next slide.

And then I'm going to wrap-up here with the evidence on whether faster speeds matter and the truth is there's some mixed evidence on this so some studies have shown very positive results. We'll see that the dates on these are pretty recent.

These are all you know, relatively recent studies because you know, 100

megabit per second connections and gigabit per second connections are a relatively recent thing but there is some evidence that's shown a positive impact on these so the first one looked at German county-level data.

The second study looked at ultra-fast broadband in Tennessee which was one of the first places to get gigabit networks and we did find those places that got ultra-fast broadband had a reduction in county unemployment rates in that county and then in France, the rollout of high-speed broadband had a positive impact on companies created there and so next slide.

But that's not universal. There are other studies including one of mine that showed there's really no difference in economic outcomes between counties that might have 10 megabits per second versus 25 so that first paper shows that. My paper actually found an error in another paper that showed faster speeds did increase employment but we showed we kind of said once you correct for that, that finding is no longer valid.

So there was no positive evidence that faster speeds in that particular dataset for US counties and then (Haller and Lyons) paper found similar no effects back in for Irish manufacturing firms so there's the evidence is mixed. We still don't know whether investment in very, very fast networks is worth it yet. I think more research on that will be forthcoming. Next slide, and that's it for me so I'll turn it over to the real expert, Dr. Gallardo here.

Katherine Bates: Thank you, Brian. I believe you're an expert, too and again if you have any questions, just write them in the box to your right and know that we have the links to all these studies when we post the Webinar materials, the link to all the studies you can click through for that but I'm sure that Brian would be happy to share those with you too if you want to reach-out.

Our final speaker is Roberto Gallardo. Roberto is an Assistant Director at the Purdue Center for Regional Development and a Purdue Extension Community and Regional Economic Specialist. He holds an electronics engineering undergraduate degree, a master's in economic development and a Ph.D. in public policy and administration.

His work with rural communities over the past decade conducting local and regional community economic development studies including the use of technology for development, he has authored more than 70 articles including peer-reviewed and news-related ones regarding rural trends, socioeconomic analysis, industrial clusters, the digital divide and leveraging broadband applications for community and economic development.

He is also the author of the book *Responsive Countryside: The Digital Age in Rural Communities* which highlights the 21st Century community development model that helped rural communities transition to, plan for and prosper in the digital age. Dr. Gallardo is a TEDx speaker and his work has been featured in Wired Magazine article, a MIC.com documentary and RFDTV documentary. Please welcome Roberto.

Roberto Gallardo: Thank you, thank you, Katherine for that introduction. I'm happy to be here and I'm full disclaimer I'm the only non-economist of my wonderful panel here today. I also want to echo what Brian said about Dr. (Tyner) is he's going to be sorely missed. He was a leader in that area so we are very sad about what happened.

So now my colleagues have shown clearly the dollar figures, right, and the research. There is an overwhelmingly positive impact but now I'm going to talk to you on how to convey that message. It includes a broader story so

we're going to get started and so at the end of course if you have any questions, please let us know. Next slide.

So as we've seen, you know, the digital age makes possible a lot of stuff, right? E-mail, banking, commerce, education, employment, entertainment, I mean, it's clear with the research is, you know, the border one ratio that Alison was talking about, I mean, it's there. That's what's going-on. It did start as entertainment but it has outgrown that use.

Next slide so the BEA finally is kind of attempting to measure. This is a very conservative estimate, you know, almost 7% of the US GDP is because of the digital economy. What I want to highlight though is the average compensation of \$132,000. The median household income in the US was \$56,000 so you can see that it's twice that.

And the kicker here is that you know, most of these jobs don't necessarily need to be in dense urban areas. They can be in the suburbs, they can be in rural areas and so that's something to keep in mind. Next slide, please and then Amazon with the US Chamber of Commerce published this study about potential so Brian and Alison really looked at what we can see now.

This study is looking at what could be if rural areas had increased digital connectivity, if they increased the talent pipeline of candidates trained in digital skills and did they increase adoption of digital training and digital tools, we would see an impact of \$47 billion per year to the US economy and they would generate approximately 360,000 jobs in the next three years if the rural digital potential were unlocked. Next slide, please.

And this one was the USDA that came-out earlier this year, again it shows a clear impact if broadband infrastructure were adequate, if digital technology

then on-farm capabilities, you know, row crops, specialty crops, livestock and dairy, planning, production and market coordination, all areas regarding AG would be impacted and they could contribute collectively between 47 to \$65 billion per year to the US economy.

So the potential is there, Brian discussed what we have found that is already documented. Alison showed there is a great return on investment but yet again the story is how do we convey that message? How do we tell the story to get our local elected officials and residents kind of excited about this technology? Next slide, please.

So the culprit here is what's call digital globalization and here's how you can start telling the story. It is a teenager yet it has a larger impact on GDP than hundred years old goods trade and the reason for this is because now you have broadened the neck. Mostly anybody can participate and contribute but if you have adequate connectivity and if you have the know-how and if you have the devices.

So I'm going to get back to that but this is the culprit. It's widening. It should be more inclusive, the digital economy so what are your communities doing? That's a question you may ask. What are we doing to be part of this changing landscape? Next slide, so for example I show this one because it's very telling.

It took Airbnb four years to reach 600,000 rooms while it took the Hilton Hotel chain which is the poster child of the industrial age kind of mentality, it took it 93 years so of course I'm not saying you're going to live off your Airbnb income but you can supplement your other income with this but more importantly if you do leverage these platforms, it says a lot about you having the digital mindset.

That's really what's really, really important to convey to our elected officials at the local level and leidos and everybody at the local level. Next slide, please, so here's another good example. Kickstarter which is a crowd-funding campaign successfully funded or had 100,000 successful projects.

They say it's successful because they did meet the amount they were trying to reach, the fund, the amount of dollars. Ideas came from 169 countries, 9 million backers, 86,000 creators but the average distance between backers and creators was 2300 miles so let that sink in. It's a lot of distance between so what does this mean?

Next slide, please. Well, it means that according to the Wall Street Journal a third of rural banks, I mean, a third of rural and small towns do not have a local bank and so again this is just an example but what are you doing to help your nonprofits, your businesses have access to this amount, you know, to this resource?

Now it will not be effective if you do not have adequate connectivity and the skills which is really, really important and it tells a broader story than dollar signs. I know dollar signs are important. Again I'm the only non-economist here but we have to focus on a broader, broader story that conveys the message. Next slide, please.

And for that we turn to the term called digital inclusion. This report from the Community Development Investment Magazine, I think it's the best definition I've seen of digital inclusion. It refers to the adoption of broadband and its meaningful use for social and economic benefit so the keyword there is meaningful and the keyword there is adoption.

As Brian mentioned, research is showing that adoption has a larger bang for the buck than even access or availability so it's what do you do with it and do you have the skills and do you have the device and so digital inclusion looks at that.

And we're going to look at the next slide now about what are the elements of digital inclusion? Well, the National Digital Inclusion Alliance identifies five areas for this. Number 1 is affordable and robust broadband, Internet-enabled devices, you can read for yourselves but the key thing here is unfortunately many times we get stuck on Number 1, right, and we overlook the rest.

And if we overlook the rest, we will be a digital exclusive community and the community development effort will not be sustainable so that's another thing to really point-out to your leaders that are kind of hesitant to invest in broadband or not, it's all about digital inclusion really. Next slide, please.

So there are some implications for digital exclusion or digital inclusion, whichever way you want to see it. This graph is from Brookings. It shows manufacturing, I see a lot of rural communities still waiting for that industry to move-in.

This one shows 1980 and 2015, the red line is manufacturing employment. As you can see it has plateaued or even declined a little bit. We see the blue line which is productivity and then we see the gray bar in the background that shows the number of employees per \$1 million output.

In 1980 it was 25, it was 2015 it was 6 and so what I tell communities, look. If you really want to go after these industries, do you have those six workers, right? Is your community digital inclusive enough that you can have a talent pipeline that will meet those criteria.

Those six workers are really, really highly skilled and so you've got to keep that in mind so it has economic development implications to be digitally inclusive or exclusive. Next slide, please.

The future of work, I mean, you know, there's a lot of stuff going-on around right now, what's going to happen, what Mackenzie found is that there are 512 counties that at least 25% of its workers will be displaced in 10 years. This amounts to about 20.3 million people.

Most of these counties were rural, right, but the key message here is no sudden robot takeover but an ongoing and accelerated change in how work is organized and it is pretty clear that if you are not digital inclusive, you will not be able to react or proactively kind of absorb these displaced workers and help them kind of transition into other roles so that's again very important to keep in mind.

This is a huge implication of further sustainability of your community if you are digital exclusive and remember when I say digital inclusion, I'm talking a lot more than just broadband infrastructure. It's along those five dimensions and another way to understand digital inclusion is that it has three main components: connectivity, skills and devices.

Those are the three kind of big areas of digital inclusion. Next slide, please, to again workforce development, another study from Mackenzie as well found that up to 1/3 of US workers will have to switch occupational categories within 10 years if we round-up this year to the 2020.

So again what is your community doing about it and if you're digital exclusive, you're not going to be well-prepared to make sure that you can

accommodate these workers that will more than likely be displaced. Next slide, please.

Another implication again is middle skills jobs. About 46% - this is a report from Burning Glass - 46% of jobs were middle skill jobs that they typically don't require a bachelor's degree so I typically ask to see how many of those in the state or in your community have a bachelor's degree? Typically ranges from 1/5 to 1/3 so my question is what are you doing with the other 2/3 or the other 4/5?

And so these occupations don't typically require a bachelor's degree; however, 82% require digital skills so again if you're digital exclusive, you will not be able to address and equip your workers to be able to fill-in these jobs and I'm talking about kids all the way to adults.

As you saw from Alison's number, adult education had a big impact on that return on investment and so and as did telemedicine that we're going to talk about, next slide, please. Or in the next slide, sorry, well this headline again is very important because what will happen is, you know, tech companies start looking not at bachelor's degree but just anybody that has specific skills so again what are you doing to kind of work towards that objective?

Again, if you are digital exclusive you're going to have a harder time so that's why it's important to tell the story as digital inclusion. We have the research that supports many areas of digital inclusion. We have the ROI but we have to tell the story. Next slide, please.

And it is not only coding, this is a big, big assumption many people make. It's all about human skills, right, empathy and able to communicate and

creative thinking and problem solving and team, you know, being able to function in teams and you know, using virtual platforms and all these things.

It's not all about coding and so you've got to be mindful as a community, as a big implication for workforce development is to ensure that oh, okay, everybody knows how to code. There you go. It's broader than that and so if you truly are striving for digital inclusion in your community, you need to incorporate these areas as well. Next slide, please.

And again, you know, as public policy you've got to define the problem. You've got to frame it and homework app is one of the things that resonates across everywhere where you see that kids, most of the kids or all kids basically have online assignments.

They get home and oh no, they don't have access to the Internet. They don't have a device and so that's called the homework gap and then parents have to drive them, you know, 10-20-30 miles to the nearest fast-food restaurant or whatever to try and get Internet and let them continue to do their work.

This is a huge, huge issue so if you want to rally your community around the need for digital inclusion, you can frame it around either workforce development or the homework app. That's another big one to consider. Next slide.

Telework is another big one. It's starting to become more anecdotally it's a feasible alternative to economic development in rural communities, more and more companies are flexible for that. You will earn tremendous brownie points if you allow some sort of telework in your community be it the local government, be it your local businesses or if you train, you know, the workers

or your residents on telework skills that require additional skills than the actual job skills.

So for example again communication, project management, etcetera, etcetera, these are very important skills if you are to be a telework-friendly community and so ask yourselves, you already have some incentives in place for manufacturing more than likely. Why don't you incorporate those and target telework for example? That's another kind of thing you can do to convey the message or another topic. Next slide.

And then healthcare and smartphones, you saw telemedicine is the Number 1 driver of savings. It is gaining speed, it is becoming more and more proper. There is more and more application. Some of these do require live video interaction and so many times connectivity allows for just one way if you're lucky and all pixelated, this cannot be in place if you're going to truly leverage telemedicine.

There's this futurist that argues that the smartphone will be to healthcare what the printing press did to knowledge. It will liberate it and so you don't want to be on the wrong side of the divide when this happens. It's already happening but it's going to continue to accelerate.

This is another topic you can kind of convey the message and the urgency to invest in digital inclusion at the local, regional, state level. Next slide, please so but most importantly and this is what I tell communities every time, you do not need a fiber optic network to change your mindset.

You can change your mindset without a fiber optic network or without adequate broadband so we need an update. An update is required. We've got to change our mindset at the local level and you can do that by mentioning

these topics I just discussed with you to ensure that your community is willing to forward and, you know, kind of change, update your mindset. Next slide, please.

This is one of my favorite slides because I know that change is not easy and so you've got to be mindful though that even if it is at a slow pace, that's fine but you have got to start acting and thinking digitally. That is another message you can convey time and time again to your elected officials and stakeholders as you try to kind of ramp-up your digital inclusion efforts. Next slide, please.

And so in summary how can you frame the message? We've got the research that supports, most of it is positive as Brian pointed-out, there are some, you know, some mixed evidence in some areas but you know, in general broadband has a positive impact.

We saw Alison that she concluded with her study that, you know, for every dollar you invest, you get four back to your local economy so how can you move beyond these dollar signs? It's all about digital inclusion and it's all about quality of life. It is now a quality of life issue. It's no sugar-coating that.

You can frame it around homework app, and it's going to result in sustainable community and economic development, period. If you do not have a digital inclusion strategy, your community and economic development efforts will not be sustainable and workforce development, obviously that's a huge topic that you want to kind of mention.

This is not a comprehensive list but it's just to kind of get your wheels turning so thank you so much for this opportunity. I'm going to turn it over to Katherine.

Katherine Bates: Thank you, Roberto. It's a lot of information in a short amount of time so I really appreciate all three of you throwing everything out to us. We're going to begin the Q&A part of the Webinar now and I'm fortunate that my colleague Emy Tseng NTIA's BroadbandUSA program is going to facilitate this part.

If you haven't already done so, there's a lot of questions but type some more in in the question box and we'll try to get through as many as we can so Emy I'm going to turn it over to you.

Emy Tseng: Okay, yes, hi there so we'll now begin the Q&A part and if you haven't done so, please type your questions and we'll get through as many as we can. A number of the questions are being answered directly by the panelists but there are several questions that I think might be good for the panel as a whole to address.

One is when you estimate the potential benefits to consumers, do you account for the displacement of local businesses for example insurance, buying insurance online rather than through a local insurance agent or getting shopping online versus local retail businesses? How do you account for you know, things that might be positive to the consumer but may not, you know, have that positive effect on the local economy?

Alison Grant: Emy do you want me to answer that?

Emy Tseng: Sure, sure.

Alison Grant: Okay, yes, so I've actually been asked about this a lot. We do not specifically include that in our study but we assume that it's embedded in the literature

that we're using but possibly that might not be included. I'm unsure how you would quantify that unless we saw that in a specific area and then we could quantify it so I guess the general answer here is just no, we do not account for that sort of effect happening.

Brian Whitacre: And I'll just add on top of that - this is Brian - so one of our studies actually did find that might be a problem so I had a graduate student that looked at broadband and entrepreneurship levels and we did find that some entrepreneurs were basically some rural entrepreneurs were actually shifting to urban areas.

And maybe it was because they found better employment, you know, after going online or you know, whatever the case is, they just found a better job so I think that is something that needs to be accounted for and I don't know that it's really been captured in most of the studies that were used for them but it's a very valid point that I think we need to dig a little bit deeper into.

Emy Tseng: Okay, and we also got several questions on do you concur on a standard broadband definition for example the 25 down, 3 up or is I guess as these studies happen over a period of time so there are several questions on what do you define as broadband?

Brian Whitacre: Yes, the short answer is they all differ, I mean, the FCC definition itself has changed over time. It's now at 25/3, you know, before it was 200 kilobits back in the day so you have to dig through each of those studies and find-out what the official definition they're using is.

And even for adoption, you know, the FCC data they count a household as adopting broadband if they have a connection of over again 200 kilobit so that

certainly doesn't mesh well with the 25 megabit threshold and unfortunately there's just no universal threshold that's been used in most of these studies.

(Emy Tseng): Okay, and then we have a couple which I would classify as chicken and egg type questions, i.e., does broadband cost well or increase employment or does wealth and increase employment in that community, make it more likely that people will subscribe to broadband so how do you untangle those interactions?

Brian Whitacre: And again this is Brian, this is again one of those things where we nerdy economists get kind of excited about, kind of tease-out this causal relationship you're talking to and you have to go again and look at these studies. Some of them just simply show a correlation so one of the questions that I saw that someone wrote mentioned the Jayakar paper that looked at employment.

And they specifically just looked at a correlation between counties that had good broadband and unemployment rates and in fact when you start digging into it a little bit deeper in that same paper they looked at okay, let's look at counties changes in broadband availability so over three or four years let's look at how they increased their broadband availability and did that have a relationship with changes in employment and the answer there was no.

So that's a little bit closer to a causal relationship. There are even better techniques, the one Roberto and I used did some matching between counties that were otherwise similar and so that's we argued a better show of causal relationship and so some of those studies that I mentioned, the Kolko paper was really good at trying to tease-out causality but others are just a correlation and again it's a case-by-case basis.

(Emy Tseng): Actually another thing on the speed, there was a question is there a minimum speed that rural communities should strive for?

Roberto Gallardo: This is Roberto. I get that question a lot. There is like Brian mentioned there is no defined speed because the applications continue to evolve. As an example that I always tell them try to browse the Web today, not video stream or anything just browse the Web using dial-up and so you will see quickly how this technology has evolved and so pinning-down on a specific speed is really not the best way to go because the applications change so quickly.

What you can do though is look at those technologies that can offer or have ample room to grow regarding the bandwidth they can support and so that's always going to be, there's going to be a combination of technology but there is no unfortunately there is no magic number for you to shoot for.

I would argue though that instead of shooting for a number again is that you consider multiple technologies to ensure that all residents in your community are adequately connected.

(Emy Tseng): All right, I will I have one more question and again what advice do you have for a local and state government around increasing digital inclusion and broadband availability? I know this is a huge question but if you have any specifics on either barriers you've seen or just sort of techniques that have particularly worked.

Roberto Gallardo: Let me take a stab at that and then I'll let my panelist weigh-in, the Number 1 advice I give all the time is make digital inclusion a priority. If you don't make it a priority it'll fall through the cracks and there are other issues as well that, you know, states have to address so the Number 1 homework is make it a priority.

Once you make it a priority, there are some handouts and strategies that you can use or deploy to really kind of assess where you are in the digital inclusion landscape and then kind of come-up with what strategy. There are a lot of case studies out there that can help you kind of you know, put some teeth into these concepts of devices and the skills and connectivity.

But the Number 1 advice is make it a priority because I think it's pretty clear with the data that's been shown and where the socioeconomic landscape is going. If you do not make digital inclusion a priority, you know, you're going to struggle down the road.

Brian Whitacre: And this is Brian, I would echo that. I think what should be in the same conversation that people are talking about just general availability, you should in the same breath you should mention digital inclusion and the only other thing I'll point-out is there's actually a great national association that's dealing with this. It's called NDIA, the National Digital Inclusion Alliance.

And their director and other people involved are doing a great job of putting-out materials like Roberto was referencing about how you can measure it, what you can do to try to improve your digital inclusion and so there is some good work going-on here and there are some resources for people interested in that topic.

(Emy Tseng): Alison, do you have any last words?

Alison Grant: Yes, I'd just like to say just from looking at the success from this study, it might be important to show people some numbers so getting some estimates of what the benefits might be I think is important to showing how important broadband is and once people have numbers and dollar values on that, you can

really start to conceptualize how important it is. So I think doing something like replicating a study like this or giving some rough estimates of values is really important.

(Emy Tseng): Okay, and I'll just end by making a plug for BroadbandUSA. We provide technical assistance on both the broadband availability and deployment as well as digital inclusion so I will go ahead and turn it over to Katherine to close the session out.

Katherine Bates: Very quickly I will, thank you again to Roberto, Alison and Brian. We had a lot of questions that we didn't get to. I'm sure they'd be happy to answer these questions if you contact them directly. We are going to have another Webinar. We have them monthly.

The next one's October 16 at 2:00 pm Eastern Time. Broadband is revitalizing Main Street and as a reminder this information including links to all the studies will be up on our Web site within seven days so thank you for joining this and everybody have a great rest of the day. Thank you.

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