Andrew: Alright, so if anyone misses anything we will have this recording posted onto our website in the next couple of days. So everyone will be able to refer back to this, we will also have the slides ready and then we will have a transcript after a couple of days once we send out the audio recording and get that returned to us. So with that, good afternoon everyone; we are excited to get back to doing webinars and as … this is an exciting one to explore the partnerships between universities and transit agencies on exploring emerging technology. There is a lot of great stuff out there and it is a great opportunity to be able to combine the research capacity of universities and on the ground knowledge of transit agencies and work together in building out and iterating on new technologies. So before we get started just for those who are new to in cap the national center for applied transit technology we are an FTA funded technical assistance center. We are operated by the community transportation association of America and we focus on small urban rural and tribal transit agencies. We walk them through emerging technologies and existing technologies and how to apply those different technologies to their transit agencies and the goal is to help to accomplish goals with a transit agency and instead of looking for technology for technology sake identify where agencies can move forward in better serving their communities.

And so this can fall under a pretty broad umbrella, we have worked on items such as your mission vehicles, green infrastructure, data and software scheduling and dispatch and fair payment technologies and we really like to focus on lessons learned and trends and strategies that you can apply to your transit agency and then we also provide in depth technical assistance. So we have what we call our innovative technologies strike teams and that is one on one technical assistance with small, urban and rural and tribal transit agencies and this helps to work towards accomplishing technology related challenges or goals and then we also have our state technology summits where we work with state DOTs and their transit agencies within the state to also accomplish more state wide goal or challenge and address those.

And the goal is to enable technology transfer and help provide more access or at least lead to more access to different technologies and tools that can help small urban rural and tribal transit agencies. We are also working on different workshops, in the past we have held workshops on data management and digital tools for system redesigns. We are also going to hold a workshop on geographic information systems in Louisville, Kentucky in May at CTAA's expo. So you can find all of that information about us at n-catt.org. Also feel free to reach out to us if you have other questions. Also being a technical assistant center we are part of the suit of TA centers that FTA funds, and so these are our various partners and in the spirit of coordinating and complementing all of our efforts there is the transportation technical assistant coordination library. So we encourage you to check that out and find resources on coordination across different TA centers.

So with that I am Andrew Carpenter I am the director of N-CATT and I will hand it off to you my colleague Marcela to introduce herself and if you need to contact us at any time about this webinar or any other questions you have, our emails are at the bottom. It is our last name at CTAA dot org. so I will hand it off to Marcela.

Marcela: Good afternoon everyone, my name is Marcela Moreno. I am the transit technologist with the national center for applied transit technology. I am really excited about this webinar as someone who has a past in high education and is now in the public transportation. I think there is

some really cool partnerships and I was excited to learn more about this one. So I am going to pass it off to our speakers, we are going to start off with Jesus Gomez … regional transit system and followed by our guest … so I will pass it off to you all. Thank you again for your time and for our journey.

Andrew: One housekeeping item I forgot about before Jesus begins is we have our QNA box. So please feel free to submit questions at any time throughout the webinar. We will keep an eye on the box. During the webinar we might answer during that or at the end; we will have time for questions as well. So please submit questions throughout the entire time; alright, thanks.

Jesus: Okay, good afternoon. This is probably the, well a lot of percent the bray background is capable in both their phases so this is probably what we learn and what we have for future phases if we get funding. This is probably what Bunny should be doing at the university of Florida … transit system. Probably they wanted to have our test for resource public, so this was one of the public. There was an idea and in 2018 we started applying for funds for these bright, so we selected a vendor for the service for these AV product and they contracted a vehicle manufacturer EC Mar; that's a French company and the vehicle was a second general for that vehicle which is what we are currently using. So the idea was to safely introduce autonomous vehicle on product approach.

We are talking about traffic lights, roundabouts, four ways stops next to bike lanes and pedestrian access. So the DOT was pushing that envelope on this product to see how to test data on these normal conditions. Charter between the university downtown that's the owner and location that is kind of on BC world and also open the door for all of the research products. The product was four phases initially the plan it was 100% funded by FDOT. So one of these wanted to test how these charters can be used for transit applications so also connected vehicle technology to test that and that is as one of the phases. How that is going to be on the four straining how is that going to change for transit applications. Also how are these vehicles going to take pedestrian and bikes how that is going to work and you convert even cost of operating with between these little charter and the fix route services.

So the first phase was by one mile and we started with two vehicles from 9 to 3pm in a timing frequency from the city parking garage to the innovation squire. The second phase that we are currently doing is we are extending that like half far mile more on the city parking garage to the university. And this was testing vehicle technology to why I guess we call it vehicle to infrastructure. So connecting the vehicle to the traffic lights touching on the vehicle how much time you have while on green light. So two vehicles running every 15 minutes that we currently have and we have funding all the way to July this year and hopefully we are getting additional funds to extend the project. So what we are learning about this dealing with the national highway transportation safety administration this was essentially a vehicle we have to get a waiver but the way was only for demonstration research. We initially we saw that was just for regular transit operations but no. was for research only and no transporting any passengers; so we spent a lot of time trying to work with the NITSA to get that waiver.

So finally in December we received that waiver to start transporting passengers and we started in January but our then Bella suspension on vehicles using my vehicles … so we had to redo, retest the vehicles and we finally we resume operations and that was 2020 picking up passengers we

got the waiver for that but with a lot of conditions. We need to have an operator on the board, we are going to need an operator on a desk, we had conditions like can be rain, winds more than 30 miles per hour and temperatures over 94 degrees for our camp. So they only let us to use two vehicles even though we had more but they said only two that we need to have seat belt on each position and we need to have audio alerts for warning passengers no standing on the vehicles. We had to do media recordings, additional trainings and we needed to brighten this with the monthly reports. So we did all of that and one of the things that we keep initially planned was to learn at least 20 to 25 miles per hour but we currently operated on 9 miles per hour. That is the number one complaint that we have for any people inside and outside being behind out vehicle running 9 miles per hour created a lot of feedback for that.

So the vehicle sizes are being an issue for when you convert to regular operation because we only have 12 passengers but since the restriction was to no standing rule we can only carry 6 passengers at one time. So the sitting capacity was our restriction so for regular … The sensors we have issues with the heavy rain and a lot of wind the vehicles stop. You have a bicycle passing by the vehicles slow down and doesn't detect anything under 18 inches. That's happening with this generation two vehicles that we have them change the location of the sensors and now the things can be adjusted and is performing a lot better on the new generation of easy mile vehicles.

In terms of the ADA we find that was ADA compliant in Europe but wasn't an AVA compliant here in the states. So we had to live with that situation, the vehicles didn't have any wheelchair restraints and there were no ADA announcement devices on the vehicles so we had to work that out to put that vehicle in service. Operations, we have a lot of service interruptions when body was down so we had to start service debris, rain and even software updates since there was a French company we didn't check initially that they were doing the software update at the time that we were opening the vehicle. So there was an operation inches there that we had to work out; so mainly the schedule was based on the vehicle charging needs that more than instead of operational needs so we have to adjust the schedule for that.

Navigating through roundabouts now is a lot better but initially we had to do it manually. So 75% on the times on automatic mode but 25% is manually; the operation has to work. So there is extra need for training the IT technicians and AV operators than we do regular transit drivers. So in terms of research I guess I will pass that to Dr. Pruthvi to address that.

Dr. Pruthvi: Okay, thanks Jesus. So we did a couple of research projects this shuttle and I will talk about one of them and Justin will talk about the other. So for the first one we wanted to do a free and post exposure surveys to capture how the public perception changes over time. For this our survey had like three major components, so the first one was understanding the travel behavior of the survey respondents. The second was looking at our respondents in three different categories. We saw that in literature more survey are just survey this on the basis of potential shuttle riders. We also wanted to take a look at how they would respond when their drivers are operation by settlers operating on their road that would have the shuttle and then the demographics.

So because of all the technical issues that Jesus mentioned so we did before our three exposure service back in 2018 with about more than 500 folks and we did our post exposure in post Covid

world in 2021 with about 150 respondents. So our post exposure survey was predominantly online with some QR coats on their shuttle of course and as our pre exposure survey were hybrid and I would say more than half of it were actually in person surveys that we had students interview our folks near to the bus stops and land route at that time. As you can see the demographics are different based on the survey, so our post survey has more women responding that's usually seen in the online surveys that women are more likely to respond for online surveys than often surveys? We had very less 18-25 years olds, this is again as a predominantly college found, we did have a lot of younger people in our pre survey but as in the post survey a lot of the classes were hydrid format or virtual format. So similar to the folks in the city our survey respondents the younger probably missed out a little bit on our younger population.

So this was the summary from before study online a third of the survey knew about the games autonomous shuttle although there was a lot of publicity and a lot of articles out there in newspapers and in the media; only a third were aware of what was going to come to games will. A lot of them 77% of them in fact said that once the shuttle operates they would use it. Between different roads drivers were more confident that they would be able to maneuver themselves in the road they would share with the shuttle but as the cyclists and pedestrians were concerned as to how will I let my intention known to the shuttle. If I want to cross the road, how can I be confident that it will stop for me?

So these are sort of the apprehensions where it doesn't predominantly involve bicycles and pedestrians but drivers were much more confident of dealing with the technology. And we also saw that we had a seven point scale ranging from strongly deserving to strongly agree, we saw a lot of new trailer somewhat some would disagree kind of responses. So because it is understandable that it is difficult for someone to answer about a technology that is not yet seen. But as in the after survey the people that were aware of the shuttle were of course much more, so it double so from one third to about 70% of the survey they knew about the shuttle, heard about it or they had taken a ride in some, they had interacted in some sort or the other and actually the people who would want to take a ride in the shuttle went down from 70 something percent to 62%. But the people who took the ride in the shuttle they said they were comfortable and decided to start with the ride but generally even as to use the shuttle went down.

And contrary to what happened in the pre exposure survey, drivers were dissatisfied with the shuttle. Before survey they were quite sure that they would be able to share the road with the shuttle whereas in the after survey they expressed a lot of dissatisfaction and that is predominantly due to the speed of the shuttle that Jesus mentioned. The expectation was these shuttles would go around 20-25 miles per hour whereas in reality it goes at 9 or 10 miles per hour which results in a lot of frustrated drivers. But for the pedestrians and cyclists, all the concerns went away so they saw that the shuttle responds well to detecting them and a lot of the times some of the fast bicyclists were able to even pass the shuttle and they all had positive shifts and attitudes towards the shuttle. So unlike the pre exposure survey where there were a lot of neutral responses the cars kind of skewed both ways in the after survey. So a lot of divided opinions people were either extremely satisfied or extremely dissatisfied whereas moderate to somewhat responses.

So if we have a deeper look so the slide has not changed completely on my screen; has it changed in your screens? Okay let me try it again; okay there we go. So one of the questions was

I am comfortable when I am either riding in or driving around or walking or biking around the … shuttle. So you can see the level of satisfaction is super high on the riders of the shuttle where very few people rode compared to drivers and bicyclists. So the number of people who actually took a ride in the shuttle was smaller but people who rode they were very happy with it. Same thing with bikers and pedestrians, they were pretty happy like the pink line shoots up in the after survey in both of the graphs but as on the driving side you can see like the left hand side of the graphs were after was the strongly disagree or moderately disagree is up.

We also looked at the comment box and we built a text cloud out of the comment box to understand what are the other concerns which we didn't capture in the survey. So first and foremost was obviously speed; why is the shuttle so slow, my granny could overtake it or whatever. So that was the main concern; the second one was around equity actually. So the thing is was some sort of in a way research oriented funding, so obviously a common person would not understand where the money is coming from. So they kind of assume that the city is paying for this and if the city can pay for it why can't they pay for an extra bus route to my locality? So there were questions on equity, so are the funds being appropriately utilized? And then availability of information still like 30% of people in our after survey they were not aware of that shuttle and 70% was much higher compared to before survey but it is still a lot of people needed to know that the shuttle exists even though against the smarter on.

Again in the post Covid world there were concerns about social distancing and the shuttle being so small and things like that. So I wrap the whole thing up after we get into just the studies that we have common lessons learned and where to go from here and things like that. And we would also like to highlight something we built together as a stakeholder group which consists of not only Jesus and Justin; it is monitored by our transit lead Dr. Jacob Yang. So we had different operators participate on this call so we will talk more about that after Justin.

Justin: Thank you, okay got it, don't worry. One second; okay, so I will talk about the setback and entries myself. My name is Justin Mason I am a junior faculty in occupational therapy department. We kind of have a different view in the OT world and then with my background in psychology we are more looking at the vehicle is accessible if people are going to be able to use it whereas there is a lot of different ways to look at ATs. So when I was brought here in 2018 that's when I started working with Jesus, Pruthvi, with my boss and mentor at the time Charlene Coustine who is the PI on this project and on the next project I will present. We began looking at older adults first because that aligned with our background, we are in custody in can older adults use this technology, are they willing to use it, will it help them or do they just want to stay away from it all together. After that older adult project we started branching into younger adults, middle aged adults, people with the spinal code injuries; right now we have an ongoing project with the veterans and a two different population and those are the disabilities as well.

So right now our focus on spinal code injury and our media brief run down as that without providing too many key values I promise. So this project was among individuals with the spinal code injury, they could not be an acute injury they had to have the injury outside of the 6 month period meaning they have been living with it and they have been used to the injury to a certain extent. They had to be an adult over the age of 18 and they had to show no signs of cognitive impairment because that's a very heterogeneous and there is a lot of variability within that group.

So what we did is that we found 16 age in gender match controls to compare with these 16 people living with the spinal code injury and then we use the similar design as Pruthvi mentioned we use a pretest course test design but we used the same individuals and exposed them to the shadow. So they completed a whole clue of on and very interesting questionnaires that we were able to analyze the first one being the automated vehicle user perception survey about 28 items and that would then be representing 4 factors or constructs which would be intention to use perceived barriers to adopting this technology perceived wellbeing. So then they think there will be any benefits to them if they were to use this technology and then their overall total acceptance.

So they rode in that beautiful shadow that Jesus showed us and then we had to complete that survey again. And then we just did it two way next to noble looking at time which would be then riding in the shadow green post group being that they have a spinal code injury or where they are controlled and then that interaction between riding in the shadow and then their STI condition. And then we are currently doing the qualitative analysis now which takes a bit of time which is why I don't like to do it.

The time effect really was really the only thing we found as far as significance because it was a pretty under powered study. So we found that perceived barriers as you can see in the second set of figures looking at a lot of the perceived barriers it decreased after riding in the shadow and that basically dropped from about 30 which is relatively low because the scale was out of 100 and it dropped down to 20. So after riding in the shadow they didn't think that there would be as many perceived barrier to adopting or to using autonomous vehicles specifically related to the shadow.

And then here this is really just kind of detailing the differences; so on the left side those first two figures, the first two boxes are going to be the control groups whereas the next two would be those with the spinal code injury. So you can see that they followed similar trends, there was a slight increase for both groups and intentionally used but nothing to ride home about. You can see on the next factor being perceived barrier which is on the X axis you can see that perceived barriers decrease for both groups and there was about the same decrease whether they had a spinal code injury or they didn't. Wellbeing was pretty static, it didn't have much of a change, it slightly increased but it wasn't significant and then the forth factor was acceptance and that stayed relatively the same.

So that would be the results for the first study and then the second study the discussion real quick to kind of wrap that up the study was under powered it was very difficult to get people to participate with spinal code injury during the pandemic. Some say that it is over some say that it is still ongoing the university authority is not sure.

So the trends are similar between groups, that is something worth noting, so it really didn't matter if they had a spinal code injury or not. They had similar views of the shadow. We had a lot of weekly meetings, by weekly meetings and then we had really the team here; me, Pruthvi, Jesus, Derrick from transfer. We start off our relationship with emails and we realized that we all had different timelines, we had different priorities but we all wanted to make sure that this shadow demonstration works. So then we started setting up meetings and it was smooth throughout. Once they started setting up meetings and discussing and working together it became

very clear that we all wanted to have the same outcome and that we could work together and that turned out to be probably the most spoon standing meeting that I have had in the last year or so. And again this started in 2018 so it has been a long process and a lot of good relationships that we have built up. So that would be my number one suggesting for making this happen and in any other city and in any pother location.

And then I also want to mention that the next thing that we need to look at would be the first smile last smile of problem or dilemma which would be really getting someone out of their house to maybe their main stop or say via bus or whatever transportation they are using and then that last mile where they are getting dropped off at a location but they may not be able to get to their final destination due to it being too far of a walk and unsafe walk or a lot of different reasons by that first mile last mile that will happen.

Moving on to the next study we have presented on our older adults, we had 106 older adults. We have had a bunch of webinars related to that, so I will just post a link to that specifically related to so I am going to ignore this call real quick. So I decided to be a little bit more complicated here. If we use the same exact research design as a pretest posttest same questionnaires the same shadow the same team, the same route and the same outcome matrix but what we did was we exposed 106 younger and middle aged adults and then 104 older adults and we grouped them all together. So we have a huge sample of 210 participants that all rode in the shadow and we found no differences or associations meaning that there is no correlation between the participants age and their perception of the autonomous vehicles.

So that was shocking to begin with because we hadn't really seen that in the literature and from previous demonstrations project. So we also had them complete a questionnaire looking at their technology rates. So how ready are they to use new technology. So I did a late class analysis on their responses to that and there were 16 items for domains and the four domains were optimism where the optimistic towards new technology, did they consider themselves to be innovative, were they open to trying new technology, do they have discomfort when they are trying a new technology and then was there a bit or insecurity when discussing or thinking about new technology. So that way in class analysis group them into five groups and they were known as hesitators which means that they had low innovativeness or avoiders meaning that they have higher of the negative side, the negative values being discomfort insecurity but having low optimism and low innovativeness. The explorers were very optimistic and innovative but they had low discomfort in insecurity.

So avoiders and explorers are very contrasting, they are on the two sides of beyond spectrum. And then step takes they have kind of a detached fear of technology it is okay that they are neutral about it not really positive or negative but as a pioneer it is scored both strong positive and negative use about this technology. And age is not related to their TRI scores as well, so now to have a very complicated box spot we are going to take a look at this and I will talk you through it.

So on the X axis which is the bottom we have all of those same port factors that I talked about; their intention to use perceived barriers, wellbeing and total acceptance course. So this was all based on before riding in the shadow or before seeing the shadow at all. So just based off of their general preference and readiness to use any form of technology we are able to group them and

show that that somewhat predicted how they felt about the shadow. So that is kind of great news for the future if we made this look and talk to someone and thought how they feel about new technology in general it is likely that it may relate to autonomous vehicles.

So the hesitators who had low innovativeness they had decreased intention to use, they had increased perceived barriers and they had decreased acceptance or lower acceptance compared to the explorers, the skeptics and the pioneers. The explorers who were very optimistic had a higher intention to use, decreased perceived barriers and higher acceptance compared to skeptics and pioneers. And just a reminder the skeptics for the neutral ones the pioneers were both strong and positive and negative beliefs and the avoiders were opposite of explorers. So again just looking at their technology readiness we could get a pretty good idea of how they may feel about riding in the shadow.

So then after that we had them actually ride in the shadow and the Y axis is 0-100 is the total acceptance core and then on the bottom we have the group based off of the five groups; hesitators, explorers, skeptics, pioneers and avoiders and you can see that they were mainly relatively static throughout the experiment. So before and after riding in the shadow their perceptions didn't necessarily change that much, there was nothing significant about it although you see little trends and increases whereas the hesitators they had low values at the beginning, the rode in the shadows and they have low values again. So that's kind of the take away that technology proficiency might be an easier way to look at it rather than having to spend a lot of money on exposing them one time to a shadow. But this is again only a one time so maybe those hesitators just need to ride in the shadow more often or they need to experience different forms of automation, this is not tentative in any manner.

So it doesn't necessarily mean they are stubborn it just means that it may take more than one ride to change their opinions. And then now I will pass you back over to Jesus or Pruthvi or myself.

Speaker: Sure, I can talk about it. So thanks to Jesus of course just like you mentioned we had the stakeholder groups. So myself, Justin and Jesus would be usually the primary participators in this call and we would have once in a while guest on our show like somebody from easy miles, someone from class lockers or Siemens for example. So a lot of good things came out of it so when our clients applied for … for example there was a construction going on at the university so they had to slightly modify that out and they needed certain traffic data for example to make sure that the shadow can go easily on some of the segments and we were able to do that out of the group and as Jesus mentioned the shadow was idea compliant according to European standards and when Justin and his team wanted to do some studies there they realized hey this is not ADA compliant from the US standards.

So that was a wakeup call, so we were able to keep that off the shadow, we were able to solve a lot of technical issues once in a while just like it happens within the technology one of the key things was if significance played a video on the mute video Andrew thank you so much so the connectivity piece I think Jesus mentioned this again so Siemens now they go by your next traffic. They had this road side unit installed in one of our signals intersections as part of a different project. So I manage a program called … so we were able to bring them onboard, talk to folks at FDOT get their certification done so that the onboard unit inside the shuttle could talk to the road side unit that is installed in the intersection. So you can see the countdown at the

pedestrian thing matches with the countdown on the screen on the shuttle so now it has got like 5 seconds of beginning to make done.

So this is automatic like there is no human input needed, so as for this our knowledge is concerned there are like almost hundreds of bio limitations of this shuttle going across US. I believe there are only few instances where even the donning within signaling intersection is automated. So even though it looks very simple on the video I took a lot of different stakeholders to come together and sort through all issues so having a stakeholder alliance or monthly, bi weekly whatever meetings is very important for not only this but any kind of emerging technology. So that is one way to go and to wrap everything up so what have we learned from these studies from both the research that my team and Justin's team it is true that the riders become more and more comfortable on the experience of technology. Anecdotally as our last surveys slow speeds of the AS automated shuttle is going to frustrate a lot of viewers and right now thankfully the shuttle has a lot of stops and there are separate bus base for the shuttle to make their stops. So a lot of time if there is cue buildup but this is a thing that is happening all across US but even though they say their shuttle will be going at 20-25 miles per hour when they have to read the actual alignment the sensor data it has from our conversations with easy mile and other shuttle manufacturers it looks like this is a limitation of the sensor suit and with the kind of budget those budgets sensors they have for the shuttles it can only go at a certain speed being safe.so things have to improve on both ends, partnerships is very important and essential and community engagement is also essential because we saw that there are a lot of misunderstandings within the public.

So when we introduce new technology there is a community engagement aspect that needs to go in. so where do we go from here? A lot of this is happening in this area so where do we go from here so first of all passing opportunities still the sensors influence the speeds go up for the shuttles and then find use cases where shuttles it would be able to reiterate obviously making the shuttle go on a congested road and making all kinds of dances is obviously not a good use case but what are the good use cases to have this kind of implementation; that is one thing that needs to be looked back and engage communities. So we are very hopeful especially on the riding aspect, we see a lot of positives but having improvement on speeds or dealing with slowed speeds would be a critical element for success for success for automated shuttles. And as we saw with the connectivity it is very much possible to offer peacefully autonomously so that is a silver line.

In the future this is a plan so that the shuttle is supposed to go all the way to the depot park so Jesus pick it up and close our presentation.

Jesus: So this is watching the plan phases three and four to go from the university to the depot park is a big city parking here in Gatesville and to test the phase three was to actually connect it with the vehicles the BS technology and phase four was to be how can we have these shuttles on demand that can pick people up from where they live and so on and take them to any stops along the road. Funding required for that so we are talking to the DOT and see if we can extend that probably a little bit longer so we will see. So I guess with that this will open for questions.

Marcela: It is amazing how many questions you are able answer from this pilot and it is really exciting. Just a reminder if you have any questions feel free to put them into the QNA box or the

chart either one will be monitoring both and before we kick off with the QNA I want to start off with the question the automated vehicle pilot was one of the various research initiatives between Gatesville RTS and the university of Florida; how did the partnership begin and from your perspective what has been the most beneficial outcome from these partnerships?

Speaker: I can go ahead and answer. So from UF especially UNSF Florida transportation institute group we always had a working relationship with city of Gatesville and the transportation department not just Jesus being the transit director also with the traffic operations manager as well as the director of the Gatesville transportation. So our partnership was more so formalized through the program that I currently manage for the 'I' street. So 'I' street is a collaboration or partnership between city of Gatesville, Florida department of transportation and UFDI; so that is the original story of how this kind of partnership started.

Speaker: Yeah and I kind of want to want to take you back off of that. I think this open communication and the flexibility no one could really predict the pandemic occurring, I would say that Jesus and Derrick from transit they had a lot of fun networking with NITSA and getting that waiver approved continually over and over again. Pruthvi had his own set of issues, I had to work with the IRB, we had to train research staff, Derrick was training operators to operate the shuttle. So we were all kind of having our hands a little bit everywhere and this working together to then reach deadline and just be flexible because we really couldn't predict everything that would happen. I didn't realize that the lamp wasn't combined so then when we started to get wheelchair users I reached out to Jesus and asked what can we do and then it was like within a month almost like there were modifications and the vehicles remediated.

So yeah really communication and then that allowed us to implement future studies and build relationships outside of the shadow which is really nice.

Jesus: This probably opened the door to all publics too. So there are a lot of applications going on through the FTA on different research project and this just was one of the projects out of the 'I' street. They have a lot of different research going on right now that allow our partners with the traffic corporations or transit.

Speaker: I just pasted the link to the 'I' state project. So it lists all the collaborative projects that we are doing with the city of Minnesota and Florida DOT. Thanks Jesus this is something that …

Marcela: Awesome, thank you. We also have a question from Richard Ride; would the vehicle know if someone walked against the rail which is a very good question.

Jesus: Well I am not aware that the vehicle … going through the light.

Speaker: The answer is yes. The vehicle only moves if it has positive information from both there is the green and there is open port. So even if the light isn't green, if there is a moment of a pedestrian it still would stop from our observation at least.

Speaker: And that was the main reason for not putting it on campus. College student are ruthless so it better be operating on somewhere in downtown rather than on campus we didn't want that shadow being abused.

Marcela: Very true. College students can be chaotic and their movement patterns; that leads me to another question, what has the student experience been like to work on research projects that have direct implications for the gains of all community?

Justin: Both Pruthvi and I have had students working on this. We probably have had like four or five members in my lab working on this, it has been their projects that they have kind of started, they have learned the ropes of it, they helped with IRB, they helped with data collection, recruitment, aligning with the operator's schedules. If the shadow is down they are communicating, if the weather is not idea they are also communicating, so again the communication really helps all of us and this has been a really great opportunity I think for all of our PhD students who had occupational therapy doctorate students working this and then we have had undergraduates as well. So we have really exposed a lot of students to this learning opportunity while we are all learning as well. So I think it is probably cool to see them or have them watch us and learn as we are still figuring out as we go and I will hand it over to Pruthvi because I am sure he learned a lot along the process.

Pruthvi: I second what Justin said. Working on this project has helped in the several undergraduate too like helping with the late elections and things like that they were exposed to what was going on in the field and other things not just this project. Thomas I forgot his designation, he is from Jesus office and he helped us with another study that we did in understanding the mobility needs of different neighbors in Greenville. So some of the kids had not been outside of the college but Greensville is also a historic town rather than being a college town. So they were exposed to people living in some of the neighboring and they would have to change the bus to get to where they want to. So the experience put the students away from their little college bubble they live in to look at the real world and start thinking on the lines of what are the problems and how do we solve them.

Jesus: We work with the urban planning officer at UF and we get a lot of interns that they do a lot of transit research probably for us and then after they finish with their TCs they get hired really quick. We have excellent PhDs and masters students that have done projects that they have helped us. Our 0:51:09.3] any kind of analysis that we want and we have implemented and all of those projects with the … so it has been a big partnership with the university and real life projects the interest is they are not making copies you do actual projects.

Marcela: That is amazing to be able to apply to your studies in the place that you live and get that real world experience and from the agency perspective have a poll of potential applicants for the future so it is awesome. The next question is for everyone; what are some of the different funding sources available for research initiatives like this one that you have encountered in your work? I know FTA funding this project was for the DOT, I would love to hear more.

Justin: So we have expanded our project and we have attended a few other agencies. We started with Stride which was really the university transportation center and that was kind of like a subsidiary funding from NITSA our USDOT. We also could go for NSF funding, we have had some pilot funding from NIH national institute of health and then we have received a lot of funding from FDOT because we are starting to move around the shadow a different shadow in different areas throughout Florida. So we have five different areas and that project will begin soon, we have developed surveys and started validating other tools. So I think Ashville has really

bought into this as well as USDOT; so yeah, it has been really nice and PDA as well they are veterans of America.

Pruthvi: Justin pretty much covered all the funding sources. So coincidentally the survey we did the pre and post exposure surveys that part was actually funded by US itself. So the US Florida itself but other than that it's all of the sources that Justin mentioned.

Jesus: The different DOT offices they have the IT, they have the transit and transportation development funds from DOT; so different offices and also together out of DOT working with us.

Pruthvi: We have someone from DOT transit office so I would just like to say hi David thank you so much.

Justin: They also have funding from the office of rural health which falls under the veteran health administration so I should also mention that.

Marcela: Very cool. It is always nice to see that all of these different initiatives or different funding sources can center around initiative like transportation because it has so many implication for other agencies or other government office missions. So thank you, another question this one is for Jesus and I know you have touched on it a little bit but could you describe some of the other opportunities that come from partnering with the research university from the transit agency perspective?

Jesus: Different projects like I said one example is prevention detection agreement on buses. We work with the university and they collected a lot of information, they did analysis on campus but we also did analysis on city streets. So we identified like a potential conflict for prevention in vehicles. So we mark 'aha' spots that will help us for potential pedestrian groups on the roads. So that is one example of that application, there other one is where they put bike track sensors on the buses. So, the ... could tell you how full the bike rides were on the buses. So with that information we see bikes on and off buses by location and we identified buses that we boom for bikes. So a lot of different researches like that and we are working on maybe on demand now that we react enough to call it we have seen the way it could change the transit service and we have our potential project with the university on identifying mobility hops and limiting stops service things like that on demand modification to the on demand service to accommodate after Covid service.

So a lot of different ideas, we meet, they have their own projects and we have our own projects and we combine it and we all have something in common that we want to pursue; so a lot of collaboration between all of the DOT university.

Marcela: That is wonderful. A lot of people power over common objectives and it is great to have that to answer some of those questions like the bus stops and bicycle improvements like can you place bikes and just be aware of your lighter shift and that actually cues us for our last question very well. for any agencies that are seeking partnership with the university or college in their community, what advice do you have to get the conversation started or to keep that work going and I know you all touched on weekly meetings and staying in the know of what everyone is up to.

Justin: Yeah I will just highlight that one more time; standing meetings that's probably the most important thing. We all have chaos and chaotic schedules and we are kind of mishandling everything and we have that standing meeting and it really you to say oh okay we will talk for a couple of minutes we don't need to fill the entire 30 minutes, we can call it a day and I will see you next week. So there is always something to talk about, we always hope that there is always something so it just kind of works out well and I think we have probably cancelled maybe two or three meetings out of the year of meeting together. Usually we talk about something briefly but Jesus of Pruthvi may know better how to initiate or how to start it but again we all have the same mission so that makes it easier.

Pruthvi: One of the things I would say in addition to whatever already been said is I meet the city of Gatesville in traffic operations manager over lunch once in a while sometimes we don't even talk about work or sometimes we do talk about work and sometimes we talk about ideas which don't have our separate meetings scheduled right. if he says something that can be useful but certain research has to be done before the implementation he is saying something in the video and he says something in the data when he is monitoring traffic he can hint that idea to me so that then I can formalize it put it in the proposal and try to get the funding of that. It would be more practice oriented rather than me as a researcher thinking what the traffic problem is; I will just go talk to someone who sees traffic problems all day. Something like that would help try to have like find a way to meet or talk to the people in charge what the format that is not necessarily agenda driven.

Jesus: I will say meetings to find mutual beneficial brakes that we can all get something out of it. If it is only to one side it doesn't usually work too well, if it works for everybody; everybody will work on it.

Justin: And I will say the same thing whenever we meet with them. They said we don't need to create problems we have plenty of them. So those are the district levels, go wherever have a meeting and we will tell you what we need and that is all it takes.

Marcela: It is so true and I know we are hitting 3 o'clock so to be of respect of everyone's time thank you so much for joining us and inputting your experience and best practices with the group. We really appreciate it and for everyone on the audience thanks for joining us. Like Andrew said this will be posted on our website ncat.org in the next couple of days and feel free to follow us on social media or sign up for our newsletter for upcoming webinars like this one and so of our publications around emerging trends and technology. So thanks again you all.