

Sheryl: Welcome to the first webinar of the National Center for Applied Transit Technology. Today we're going to address the framework for technology decision-making. Just to give you a little bit of a background about N-CATT. N-CATT is a technical assistance center funded by the Federal Transit Administration. We are housed at CTAA, the Community Transportation Association of America. We are tasked with doing a few things, one of which is doing this webinar series. We have a monthly newsletter. We are very active on social media, on Twitter, Facebook and LinkedIn. We will be having a series of white papers and this framework topic will also be addressed in the white paper.

We're generally here for you for rural and small urban transit systems, to help them make technology decisions, to show them what technologies are available. We're generally there for rural, small urban and tribal transit systems to help lead the way for them to adopt and make decisions about new technologies. Our first speaker today is going to be Kevin Chambers. I'm sorry, Andrew Carpenter - this whole COVID thing has switched my mind.

Okay, our first speaker today is Andrew Carpenter. Andrew is actually the Deputy Director for N-CATT. He's been interested in transit technology for the past five years and he's written about different text subjects for mobility lab for the National Center for Mobility Management where he used to work. He's also done a lot of technical assistance projects in the field for small urban and rural transit agencies to teach them about technology that is available and to help them apply new tools to serve their communities. Okay, Andrew, take it away.

Andrew: All right. Thanks, Sheryl. Welcome, everyone. We're excited to get started and to kick off these webinars. We figured that this was a good way to overview the approach that we're going to take when it comes to approaching technology decisions. That's because technology can be a buzz word at this point and so we

want to ground the conversation and how to actually approach and think about technology. I've gotten some requests from people in the past just asking, "Can you tell us about technology?" That's a broad approach to doing that. We figured that just figuring out how to start talking about it and then start thinking about it and then going from there is a good way to help people narrow down just that idea of, let's talk about technology and then think about what we want and what do we want to accomplish.

We encourage agencies to talk about what their needs are, what they want to do. That is also the basis of our technical assistance activities such as our state summits and our strike teams. We also are aware that sadly, many agencies are pretty resource-strapped and so instead of just getting all of the technology, we need to make pretty important decisions about what to choose and the impacts that that will have on the various goals that the agencies have. One thing that we want to play around with is collaborating agencies. Especially with our state summits we're going to see how we can bridge different products that places have and then also how groups of agencies that on their own don't necessarily have a lot of resources could then leverage some of these larger-impacts technologies.

My colleague, Alex King actually came up with this in one of the projects we were working on with the National Center for Mobility Management. This is a great - obviously, not scientific approach - but it's a good way to visualize the different ideas that you have percolating within your agency. The ideas at this point you've already come up with a way to address a problem or a goal that you have, and so then you can start to flesh those ideas out and then understand where they fall on these two different spectrums. If it will take a lot of investment or it'll be harder to execute but it will result in a lot of change, you have your top-right systemic change idea. Or it could be a no-brainer, it's easy to do and it will make a big impact or you won't have to put many resources towards it but

you also won't make a bigger change. These are just ways to visualize what you're going to pursue and then how to choose the different resources or how to pursue the different tools that you can use based on the resources that you have.

Again, going back to that idea of technology as a large concept, really being overwhelming, we're going to work a lot with different agencies on being deliberate and being really focused on what they want to do, and then how to go about it. That's why this really made sense as the best starting topic for us. Then the technology world for transportation is evolving very quickly. There's a lot of new jargon coming out that has I think tripped people up a lot in the past. You have to learn this new vendor-speak that's coming out and then just keep testing different ideas before going all-in on a really expensive investment and then also determine that return on the investment.

Kevin is going to go into more detail about that for us. But I just wanted to introduce that as the general idea and philosophy that we're working off of. It's not just technology because of technology but because we want to help agencies to find the right tools that will help them push their agencies forward and to better serve the goals that they want to do. With that, going to hand control of the PowerPoint off to Sheryl and Kevin and we'll go from there.

Sheryl: Let me introduce you, Kevin before you start so everybody knows who you are and where you're coming from.

Kevin is in Portland, Oregon. Since 2000 he's been dedicated to assisting public agencies and non-profits in assuring that their technology investments serve their organizational missions. For seven years, from 2010 to 2017, he led Technology Innovation at Ride Connection, a Portland area industry leader in providing mobility options to older adults and people with disabilities. Now Kevin is in Portland, Oregon. Since 2000 he's been dedicated to

assisting public agencies and non-profits in assuring that their technology investments serve their organizational missions. For seven years, from 2010 to 2017, he led Technology Innovation at Ride Connection, a Portland area industry leader in providing mobility options to older adults and people with disabilities. Now he consults through Full Path Transit Technology focusing on the intersection of technology, mobility, human services and healthcare. Kevin as well serves as the technologist for the National Center for Mobility Management.

Kevin: Great. Thank you so much. You can hear me?

Sheryl: Yes.

Kevin: Great, okay. Well, that's a good start. Well, hi, everybody, I hope you're all well in this really wild times we're in. The topic here is a framework for making technology decisions. I'm doing this webinar as a rough sketch and an introduction to a white paper I'll be doing for N-CATT. But this is going to be pretty breezy and pretty fast. But I want to lay some things out, give people some high points and then give some time too for questions and answers.

Let's take a look at this. A framework for making technology decisions, the first step really is defining a problem represented here by a broken light bulb. From that problem you come up with a solution, some different options, and some different types of light bulbs that you can get. You could see that each one of them has each own set of costs and benefits. You need to do an analysis of what is the best solution of all the possible solutions out there, select the one that's the best for you based on your analysis.

Then you move forward to procuring. You look at the different vendors that provide that specific option of the solution that you've chosen. Do a cost-benefit analysis of those vendors, select the one that is the best. Then you go ahead and implement. You screw in

your light bulb and then you're good. That's pretty much it. I really want to move through this quickly so that we could have time for questions. But not really, actually, I'm kidding, there's more to it. I think that model has value and that's really what a lot of our procurement processes are built around is that specific approach. I wish that we could have a world where we are dealing with screwing in light bulbs and things of that modular and clean and forthright.

But that's really not what we have. What we have is something more like we're actually as transportation providers; it's more like we're actually responsible for managing the entire electrical grid. Transportation is complex. Services are complex. We are juggling drivers, vehicles, and routes. There are so many parts and pieces in the list that we're really not able to get the nice, clean, pick your light bulb off-the-shelf situation. How do we start to think about that? I just want to list off what some of the key barriers are to applying technology successfully in transit. I'm going to go through these in the subsequent slides but these are half a dozen of the high points.

One is mis-identifying what the problem is. Then underestimating the cost and over-estimating benefits. Not applying systems thinking and risk management tools, just dealing with too much complexity then applying consumer-centered thinking to that complexity, and finally, an absence of standards for solving problems. Let's go back to this piece here and just take a look at defining the problem. Defining the problem is really vital. I'll start off with this choice quote here from Russel.

Ackoff where he says that, "We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem."

I think one thing that I've seen in my work with agencies is sometimes there's just a presumption that technology is the solution right off the bat. I talk to agencies like, "Well, we need tablets. We don't have tablets. We need an app. We don't have an app." We never want to start off thinking that our problem is that we don't have technology X. We want to make sure we're digging down to what is it that we really want to be needed, we want to be doing. Is it about informing our customers? Is it about the efficiency of managing changes throughout the day where dispatch can more easily communicate with the driver? Or we can know where a vehicle is so that we can make last minute changes?

We want to get down to that, not to the challenge of, "Oh, we don't have GPS." Well, having GPS itself is not a problem. We want to make sure we're thinking about what the simplest solutions are to that problem and using risk management as a lens for defining problems. Later on, towards the end, I'll have a matrix for talking about risk management. Now, moving on to developing a solution, let's just reiterate we don't want to be thinking of technology itself as either a problem or even as a solution. I think Andrew earlier spoke about, what are we even talking about when we're using the term "technology?"

The working definition for my talk and I think for a lot of people here is just that thing that is technology because it's digital, and it's cool, it's new, and it's fresh. We don't often think about technology as things like buses, even though really the bus, or the Sedan, or the Callaway is really the key technology in transit. It's the thing that makes transit what it is, all these other things; the apps, the GPS, none of that is the core technology of our industry. The core technology is the vehicle. For that, we always want to be having any of the technology that I think is really what I'm talking about during my talk here are really it's a set of amenities that support and make technology either more efficient or more usable for the rider.

In that, we always want to have the service and the service design lead. Again, it's not about getting shiny objects; it's about making sure the core technology of the vehicle is made as effective as possible. Because we're working with this thing that is referred to as "the thing doesn't quite work yet," we want to always be thinking about iterating and learning as we go. We want to be very cautious about technology to try to solve institutional problems. We want to lean towards the simplest solutions as I'll show in these next couple of slides.

On the topic of institutional change, I want to take something that's apropos to our moment right here. This is a couple of lead paragraphs from a New York Times article from late last month about this, "Fail safe system to track contagions in China." In China, they created an infectious disease reporting system, so you just imagine a large database of a network system which could be world-class and immune from meddling because the system was going to instantly notify government health officials in the central government in Beijing. But they didn't work because the hospitals deferred to local health officials before entering reports into it which allowed for withholding information which kept Beijing in the dark and delaying the response.

I added that emphasis and I want to point this out because here we have a failure of technology which has had an amazing global implication that we're living in right now. It was because in part at least, the presumption was the technology was going to solve the problem. One of the problems was the institutional difficulty of local governments communicating effectively with the national government. They said, "We're just going to apply some technology that'll take care of that," then they took their eyes off the problem because they thought they had automated the solution. That is clearly - we're all paying for that. But there are versions of this and

you may be able to think of them in your own organizations where it just doesn't work.

You want to be very cautious about that and you don't want to let automation cause - One of the ways we call this is "skill decay," where because this system is automated, you think, okay, it's taken care of. I don't have to think about that anymore. I can put my attention elsewhere. That is something you really want to be questioning as you explore how technology can help you. The other thing I want to talk about is managing complexity. The metaphor that I was to apply, which I'm going to dig as much life out of as I can here is, "Keep your retaining walls four feet or lower if possible." On the left you'll see something that is higher than four feet and should have been engineered in its design. You can see here that where the wall is getting pushed out from pressure from the earth, pushing the wall out.

On the right, we've got a four-foot wall that didn't require engineering. It is doing great. It's a brand-new wall. These are both taken within about two minutes' walk from my house. I've got lots of examples in my neighborhood where engineering should have been used and where it wasn't needed because they kept their solution a little simpler. I'll even point out here - because I feel like there are a lot of metaphors I could drag out here - if you look in the background of the picture on the right, you can see where there's a little change in color on the garage back there. That's where you can see the height of their old wall and where the earth used to be. It used to be they needed a five and a half foot wall. But when they rebuilt this, they actually removed about a foot and a half of soil so they could have a four foot wall.

It is an understanding of landscape architecture that any retaining wall that is four feet or higher needs to be engineered. You either need rebar, or anchoring or something. You can't just stack up a bunch of blocks and assume that it's going to hold for the long-term,

but four feet and under? It's fine. You basically can stack up a bunch of blocks. It's interesting to me that when they rebuilt this, rather than engineering it, they chose to actually go through the extra effort of removing soil so they could have a simpler solution. I think this carries out to a lot of the things that we can do in transit; it is thought about the complexity of our projects. Carrying the metaphor forward, in our industry, when you build your walls four feet or higher, what we need is a thing called "systems engineering." That is a complex approach where you really dig into all your requirements and you put a lot of focus on design, and you put a lot of focus on testing so that you know that the thing you're building will actually be successful. It's the right way to go. If you can avoid it, that's much better.

There's no clear four feet guideline in our industry so it's something that you need to be asking yourself continually as you think about making investments. Are we going into something that's going to need a lot of attention and you need to bring an engineering framework into it? I think there are some things that you can do that don't require it. Any time that you can simplify your requirements so that you need either no engineering or less engineering, you really want to consider that. One thing I've often heard is that, "Well, we don't really have to worry about that because the vendor has worked out all the complexities and all the engineering is already built into their solution. We don't really have to go through that process."

My response is, "Well, maybe." I say that because a lot of software - and I'm thinking particularly of things that are really where you're automating the workflows, the internal business processes of an organization where you have this huge Goldberg machine where you want this piece of technology that's going to do everything from client intake to taking requests, assigning those requests to drivers and vehicles, handling the reporting - that's a very complex workflow.

There's a lot of software out there that seeks to support to automate those workflows. But every organization is different and you really want to dig into how does the software assume that your organization works? Does your organization really work that way? Because it's not that the vendor has gone out and done a survey of all the transportation agencies out there and made their software work with every single one, rather, the way it usually happens, is that they work with one customer, they designed something that works for that customer. They move to a second customer. Then they make adjustments for that second customer and so on, and so forth.

You may be different from them. Maybe they made adjustments for your type of operations but that doesn't mean that it's going to work for you. There are a lot of details you want to look at when you're managing that kind of complexity. Going on to procurement and implementation, as you go forward, if you're doing something complex, you want to think about starting simple. In the software development world, we have the idea of the minimum viable product or MVP, not the most valuable player but the minimum viable product. In that minimum viable product's process, you start with the thing that is most important, and then you work outwards so that you get a chance to test out the most important things. Then you start adding other functionality incrementally.

But in order to do that, you have to know what's most important. This is speaking just to implementation, you can also want to apply this to figure out what your solution is in the earlier stages but ranking and ranking ruthlessly is very important when you're implementing. So starting with something small and then building out once you have a foothold is a much better approach. Again, iterating and learning as you go. The other thing you want to be thinking about in implementation is whether the complexity that you're considering is something that you can manage going

forward. I think that's actually the main limit around the technology isn't really what we can implement; it's what we can maintain. That's something to think about, is actually working But in order to do that, you have to know what's most important. This is speaking just to implementation, you can also want to apply this to figure out what your solution is in the earlier stages but ranking and ranking ruthlessly is very important when you're implementing. So starting with something small and then building out once you have a foothold is a much better approach. Again, iterating and learning as you go. The other thing you want to be thinking about in implementation is whether the complexity that you're considering is something that you can manage going forward. I think that's actually the main limit around the technology isn't really what we can implement; it's what we can maintain. That's something to think about, is actually working backwards from what resources are you going to have once everything's in place and whether you're going to have the energy to really maintain it over time.

In that vein, I want to offer a risk management matrix here. The rows are about the impact of a particular risk. The columns are the likelihood that that risk will occur. You could see I've color-coded them so that the high likelihood and the high-impact risks are red along with a couple of next to it. The low likelihood, low-impact risks are green. Then we've got this yellow area in between. Going back to that maintenance topic, a high-impact, the high-likelihood occurrence is that you could have staff turnover and that eventually; you're going to have some major software upgrade. Because that's both high-impact and high-likelihood, that is something you really want to be paying attention to and making sure you have plans for. As well as things that are maybe less impactful but are also - they're going to happen like a minor software upgrade.

You want to plan for things that maybe aren't going to be so terrible but they're more likely to happen such as the internet access going

offline at your office. It could take you offline for a while. You want to have a plan for that. Then at the other extreme is - I threw in a hodgepodge of different types of risks, not just technology ones - but for example, let's say you've got a bus barn and you've got motorized doors on that and it fails. That's not likely and the impact is low because you've got a manual - you can just manually lift it with a chain or what-have-you and that's fine. Then you just call a vendor when it happens. You don't necessarily need to have a robust plan for that.

Then you've got this gray area in the middle, like a high-impact event that is low-likelihood like a global pandemic. That wasn't really likely but it ended up happening and so we want some level of planning for that, and so on and so forth. I think this ranking and sorting of risks both when you're planning what your solution is going to be and when you're thinking about implementation and maintenance, this is a really great model to use to help sort through things and figure out what's important, what you need to attend to, and what stuff you can let lie.

This is responses to our initial list of what core problems are or core barriers to implementing is we have; digging down to core problems is really the solution to the earlier problem of misidentifying problems. You really want to take care and analyze costs and benefits and not put on the rose-colored glasses when you're thinking about solutions. We really have a challenge in the industry in that again, we're not screwing in light bulbs. We are managing grids. Although we dearly want plug-and-play solutions, oftentimes, those are not available for our industry either because our niche is small or because the problem really is just plain complex.

We want to be applying systems thinking whenever we can. That's where systems engineering comes into play. I don't really get to talk about this in any depth because of the introductory nature of this presentation. But it's something that you really want to be

thinking in terms of our technology solutions as systems that interlock rather than lights we screw in. They're in between Lego-like metaphor we can use but often we're building our own Legos. We need to be thinking about those cases and minimizing it when we can so that we are engineering solutions when we need to but we're not just going off and doing that without really realizing what comes with it, keeping our retaining walls, four feet or lower if we can.

Finally, one thing that I found or - not finally, next to final, is the idea of cultivating leadership and trade-off based thinking. I've interviewed a number of transit leaders around the country, particularly here in Oregon. Where I've found technology being most successful is where it's also accompanied by leaders who are willing to make tough calls. That goes back to narrowing solutions so that it may be forcing agencies to merge. In the case of one person I talked to at a state level, so that the technology solution would be viable. Another is just deciding to have a service design that maybe is a difficult challenge in one sense but then it allows a whole bunch of - I'll say one thing for example is making a decision to simplify or change a fare scheme that takes a lot of initial energy to make the change, people are resistant to it.

But then if you simplify your fare scheme, that may make e-fare a lot easier. That's something that was done here in Portland. We had this really complex and baroque fare scheme. When we went to e-fare it went to one fare for - the whole zone system was eliminated basically so that we can have e-fare. But that takes leadership. You have to decide that. You have to lead change and create a vision. You can't just think that technology would just solve it. You have to be thinking in terms of tradeoffs rather than consumer-based thinking where it's like, "Oh, the technology, I'll just buy this thing and then that will be my solution. The technology will take care of it." That's not a recipe for success, in my opinion.

Finally, and we really don't get a chance to go in super deeply on this but use standards to support the development of more standards in the industry. There's a few of them out there that we're leaning heavily on, the general transit feed specification is the oldest and most mature one in transit. That's being expanded to other things and the model of the GTFS has been employed by other parallel agencies or parallel industries like bike share. It's been extended into a flexible transit through GTFS Flex so that now we can better describe demand-responsive transit and put demand-responsive transit into trip planners. All those things are really helping us.

There are a lot of standards we don't have and we still need it. One question you always want to be asking vendors is what's your standards compliance? How can we use more of them in your solution so that we can get more modularity and more of that plug-and-play effect at least incrementally? I think that covers it. I've got my last piece or so. I think if we take some of these extra considerations into account then I think we really can - I don't know if we can actually get to rainbows and unicorns. We may not really get to that. But we could be lowering our risk and increasing our success by quite a lot. With that, I'll say thank you and we can move on to Q&A. Anything else that you wanted to talk about, Sheryl?

Sheryl: Okay, well, I have a few questions. Why don't we start with those, Andrew, if you could keep up on the chat box and monitor that? It seems to me that there are a lot of areas of technology where there's not a lot of knowledge on the part of the folks in the transit system who may have a problem that they need to solve. Then you combine that lack of knowledge with just a lot of choices in terms of vendors and maybe a range in terms of technology. How does someone approach that? It seems like it becomes an overwhelming situation, a situation where a translation of some kind is needed as well.

Kevin: Yes, I think the answer's going to really depend on the type of organization that is seeking the solution. I work a lot with small transit agencies and often, very small transit agencies, highly-rural and small urban where there is no IT Department. I think in those cases, the four-foot rule is very important that you really don't want to be setting up agencies for failure. Can everyone still hear me? I saw the screen share went off. Okay, great. In those cases, I think probably what they should start off with are things that they can really understand and control. Things like spreadsheets are a respectable form of technology. There's nothing to be ashamed of with spreadsheets. They have scalability problems, right?

When you get to a certain level they're not really viable anymore. Of course, if you design it poorly, you can get yourself into trouble. But you can go a long way with them. You can set up an online version of a spreadsheet like Google sheets and suddenly you have the ability to do some coordination with that spreadsheet. That's one level. It just works with what you have. I think another level is if you want to actually come up with something that is more robust and allows you to scale up what you're doing; you really should get some help. There's a lot of ways you can get help. Ideally, if you're a small transit agency, it would be great to have resources either at the regional level, or at the state level or through an organization like N-CATT, or NCMM, or RTAP or the others that can provide some technical assistance to help you both understand your problem and understand what's available to respond to that problem in the marketplace.

I think there are also resources often within communities. There's the company that does something similar that maybe works with computers or works in logistics or what have you and maybe you can tap those people to help find some solutions around GPS, or cameras, or what-have-you. But going it alone I think is a tough problem to try to go into these specialized tools without support. Then going up in organization sizes, you move to organizations that

actually have one or more people who are IT staff then you want to lean on them, support them and make sure that they have the resources they need to be able to do the research and do the evaluation and really listen to them on what's the level of resources that we need to be successful with a particular technology. I think that's a quick hit. I don't know if I've answered your question in the way you want it.

Sheryl: I think a good solution for figuring out what good technological solutions and options are to bring in a consultant to be that bridge.

Kevin: Yes, if you can. I have to admit that that's exactly what I do. [Laughs] With that potential conflict of interest stated, yes, I do think that's what's helpful. It doesn't have to be someone like me, to get an outside point-of-view, can be very helpful because it's very difficult to get perspective in your own problem very often when you're in the midst of it. Sometimes it can just be helpful if you can find the right key volunteer that's a little bit of a techie who can look into what you're doing with a beginner's mind. That's another route to go. I think the larger you go, the more important it's going to be to have somebody who's got the expertise and can really focus and breakdown the problems into its parts and pieces. At a smaller level, I think if it's a matter of highly-rural organization that has just got a few vehicles, there's probably the threshold for what that level of effort to bring in is going to be lower also. But yes, I think bringing in outside support can be essential.

Sheryl: Do you see - and Andrew, you can jump in on this as well - more of a reluctance to adapt technology and not know how to approach it? Or folks who see this shiny new thing and say, "Oh, we've got to have that," without really analyzing whether that shiny new thing is going to do anything of value?

Kevin: Andrew, did you want to jump in?

Andrew: Yes. From my experience, the orgs that I've interacted with, pretty much you have both. There are a lot where a lot of times I've gotten emails or calls just saying, "Can you help us figure out technology? We need technology." All right, well, we're going to break this down a little bit. So you have that side of it, then similarly saying, "We heard about this new thing. How do we get it?" Again, I have to walk people back a little bit and say, "Does this fit into what you want to do?" There's been a lot of re-setting the conversation like that.

But at the same time I've had plenty of interactions where it's been very focused on, "This is what we have done. It has worked and so we will continue doing this." I would never necessarily push something on anyone just for the sake of doing it, but every once in a while we will work with them because they want to do something. Then once it comes to pointing out what needs to be done then that's where we need the resistance to trying something different or anything like that.

It's not like I've ever parachuted into somewhere and said, "You, need some technology." But more of just, "Based on our conversation, I think this is the direction we should go in." Then that creates its own friction based on how things have been done and would be done. So that's my experience in a large nutshell.

Sheryl: How do transit systems reduce their risks when they're investing in a technology that costs quite a bit whether that's electric vehicles or putting in a new scheduling and dispatch system, whatever it is that I feel like they have to get it right because the cost is so high?

Andrew: From my perspective, my experience and the work that I've done are more on the customer-facing side. In that case, there are ways to do low-cost tests of it.

Sheryl: Can you explain a little bit about that?

Andrew: Yes. When I started at CTAA, I was indoctrinated with the human-centered design approach. There's a heavy emphasis on these low-fi prototyping activities. It can be as simple as you have paper versions of cell phone applications. You don't even develop the app until you've walked people through and see how they interact with that design. You can see if the interface and the user experience that you envisioned yourself actually work the way you thought it would and it works for the customers. In this case, it would be the passengers.

One of the grantees that I was working with through National Center for Mobility Management, they found a way to make a new system work on the old system that they had so that way they could work out all the kinks and make sure that this new concept would work for them and for their dispatchers especially because that was the bigger concern. This way they could know what they needed in the new software before they actually got it developed and launched in their system, this scrappy approach to figuring out what's needed before you implement that new thing. That's my perspective as far as the more engineering type things such as actual buses and computer systems; I'm going to defer to Kevin on that one.

Kevin: Yes, I think I would support everything Andrew said that I can't speak to the electrification of buses, that's really not my area of expertise. But I think for digital technology for the tablets and so on, I think one is going out and talking to other agencies that are doing similar things and seeing how their experience has been being very useful. Having some things you can't really press rewind on easily so you really do have to apply to engineer - not necessarily hire an actual engineer but apply an engineering mode of thinking to it and really go through your requirements as

thoroughly as you can and come up with what is your concept of operations which is a term of us which means basically how is this operation going to work? What is the concept behind it, draw it out, whiteboard it out?

I think it takes a lot to get it right the first time; you need to put a lot of energy in it the front end. Probably significantly more than you would like to. I think really the risk reducer there is a lot of engagement, a lot of thinking things through. Some of it you can do on your own, some of it it's really a lot easier if you call in somebody from the outside can have perspective having worked with other agencies, just going to have the beginner's mind with you could ask questions with you that you're just not going to be able to think of. That's an overview of it. On your question about whether agencies are more towards avoidance of technology versus seeking it out, I think my experience on that is determined by the prior experience of the leadership.

Those who have experienced a technology failure and seen it happen are much more likely to have a realistic viewpoint going forward. Those whose experience of technology is mainly framed by an experience of working with consumer created technology like mobile devices and such, they're going to have the idea that that experience is going to map on to an enterprise grade or industry level technology solution. That's where I think is where people who have the rose-colored glasses are going, "Oh yes, we just need to get this thing," and not realizing the level of effort that it actually takes.

Sheryl: Right. Kevin, could you give us an example or two of the four-foot rule in your practice in a transit technology example?

Kevin: Sure. I'll give you some. One is actually one I'm working on for a high lead agency is the idea of rather than setting an agency up with a dedicated scheduling and dispatch system, actually

setting them up with a really carefully designed Google sheets solution that will allow them to do what they need to do without needing to have highly-dedicated software. There are some risks there but there are some real benefits also. Another one is I think - and this is going back to the idea of thinking and trade-offs - one way is thinking about how your service is going to interact with your technology and thinking about trade-offs. Something that some agencies do is interlining of services. That's often where sometimes we run into challenges because we have vehicles that are switching between fixed routes then maybe at another part of the day they're switching over to doing pair transit or some other demand-responsive service.

Then they're going back to the fixed route and maybe there are different solutions for fixed route versus demand response, that's the way it is in most agencies. We've got different platforms for that. There's the challenge of, well how do we get all these vehicles? They're all set-up both to manage the fixed-route technology and the demand-responsive technology. There are some challenges in getting all the apps to work on the tablets and so on and so forth. One way to simplify things is to segment your fleet so you have one type of technology that runs on some vehicles. Then you have a different type of thing that runs on different vehicles. I've been struck by how much simpler it made some solutions for agencies that do segment out their vehicles by service-type, how much easier it was to implement things because the switching of modes didn't need to happen.

That's an example of at least a trade-off. That's not going to work for every agencies. Some agencies just plain need that. That's how their fleets work. There's no way that you can assign one vehicle to only one mode. But for those that can, you may be able to say, "Oh, okay, well then that makes our fixed route deployment and our demand responses deployments a lot easier." Does that make sense? Is that a good example for you?

Sheryl: That does make sense. For a rural agency or tribal agency that's really not done much in the way of technology adoption, what kinds of technologies do you think they might consider as a first bite of the apple given the kinds of issues they deal with?

Kevin: Well, I would start off with what are their pain points? Is the pain point that they've got six different funders and each has a different reporting requirement and they need to figure out how to make that sane? Is their pain point communication with drivers? I wish I could give a one-off solution but I would start with where's the pain that they're experiencing and really look through that and go, "Why is that painful?" And go really incrementally with like, "Okay, this is painful because of X, Y and Z." Then from there you say, "Okay, is that something that can be readily solved - is there a solution in the marketplace that says, "Oh yes that could be solved with GPS" for example, so now you know where the vehicle is. That's great.

That might be - but I'm really hesitant to say, "This is the thing that is going to be the brass ring for solutions." Because it goes back to the fail-proof solution from China, right? Are you trying to solve an institutional problem? Is that where the pain is? Maybe what needs to be done, maybe really its additional training or maybe it's addressing something else going on in the organization at a cultural level that's preventing things from working well. I wish I could give a single one and I'm hesitant to do it.

Sheryl: You or Andrew have any advice for choosing vendors whether that's things to avoid, flashpoints that should alert you that something is wrong or a method for choosing when you're dealing with technologies that you don't know much about or you're really relying on the vendor to help create that path to the solution?

Kevin: Probably the biggest risk I'm seeing right now is there really isn't a strong technology resource in the industry to support agency leaders at the small level. If you're a level of a metropolitan area and you've got IT departments they're able to be effective resources to their decision-makers. When you get down to the small, rural providers that don't have IT departments, the lack of technical assistance resources is a really big problem. When you have agencies that are experiencing real pain and real problems and they want a solution, generally, they're talking directly to vendors. They're going to a conference. There are vendors at that conference. You talk to two or three of them. They tell you their version of what they can do. They're not telling you the cost.

They're selling you on the benefits but they're not able to give you a realistic picture of what the costs are because that's not their job. Their job is sales. I think that's the biggest risk is talking directly to vendors and almost exclusively the vendors and moving forward with the decision from there. You really want to be talking to other agencies. You want to be able to get an outside perspective if it's a significant investment of time and energy where you get a viewpoint of somebody who is on your side as an agency and whose interests aren't with the vendors themselves.

Sheryl: Well, Kevin and Andrew, thank you very much for speaking today. I think this is really helpful for those in the field. Kevin, we look forward to your white paper. We will certainly blast that out when we get it. I hope that everyone out there stays well and is doing their social distancing as much as possible. Thank you to all the transit heroes out there as well.

[End]