

Monica: [00:00](#) My name is Monica Serrana. I do marketing for the William T. Spaeder Company and we are doing a podcast about advances and construction. Now when I say advances, I don't just mean technology. I mean things like tools, women in hard hats, all that kind of stuff. My co-host is Jonathan Marsh and sometimes we'll be hosting together, sometimes separate. Take it away, Jonathan!

Jonathan: [00:16](#) I'm Jonathan Marsh. I'm with Caisson, and we're a technologies and construction company that's doing a lot of work with the education of both UA members, MCA members, trying to bring technology to the trades and trying to bring technology to some of the mechanical contractors. I was a formerly the CTO of Spaeder, and I was so happy to get invited back, but that's why I got invited back and we're going to be talking today about some of the projects that I was working on before I left with Eli who has graciously come back to talk about what he's been doing over the summer as our mad scientist assistant. I think I was calling it.

Eli: [01:10](#) Yeah. Assistant to the mad scientist.

Jonathan: [01:13](#) I think I was calling you an Igor.

Eli: [01:15](#) Yeah.

Jonathan: [01:16](#) So you guys know in construction technology there is a common term for the person who's introducing new tech and that's the mad scientist and they seem to have that mindset, so me and a bunch of other semi mad scientists got together and said, do you know whenever we have interns we think they should be called Igors.

Monica: [01:34](#) Do they have little humps too?

Jonathan: [01:36](#) They do. Well, by the time they leave they have a little hump.

Eli: [01:39](#) I hope I don't have a little hump by the time I leave.

Jonathan: [01:41](#) It'll come out that way. But it's the radiation and the technology, it will mutate you.

Eli: [01:47](#) Okay.

Jonathan: [01:47](#) Sooner or later.

Eli: [01:48](#) All right.

- Monica: [01:49](#) In a good way. Superhero strength.
- Jonathan: [01:51](#) But like we said, this is Eli, he is the intern here at Spaeder this summer. He's working to advance certain of the tech integration projects. Basically.
- Eli: [02:00](#) Integrating technology into an industry that hasn't previously had technology.
- Jonathan: [02:07](#) You know, we do say that too. We say that construction doesn't have a lot of technology and that's true of I'd say the vast percentage of construction. But what were your thought when you first came on and saw what we were doing with technology?
- Eli: [02:20](#) I was pretty shocked cause you had laser scanners and Trimbles and now we're doing augmented reality and virtual reality stuff. I was like, I thought construction was just going down there and you know, welding stuff together. Not all of this in depth CAD behind the scenes and then integrating the CAD on the actual job site and stuff like that. So it's pretty sweet.
- Jonathan: [02:43](#) Yeah. I know Monica, you were a little bit surprised too when you came in and you're like, we're plumbers, right? Yeah, we're plumbers. Except we have quarter million dollars worth of tech going into most projects that we do.
- Monica: [03:00](#) Yeah, it was one of the things that really excited me when I working for spader was just the VDC department. I was like, oh my God, they have a HoloLens. Oh my God, they're going and doing virtual reality right on the site. This is like, what is this, the future? Um, okay, we're going to cut that out.
- Jonathan: [03:12](#) Uh, cutting that out.
- Monica: [03:16](#) But anyway, yeah, I was, it made me really excited to become a part of the Spaeder team.
- Jonathan: [03:21](#) Yeah. In Spaeder has been one of the more progressive companies and we're not progressive just because we're looking at new technologies. I think one of the reasons we're progressive is actually we have a lot of people that are in the field that are willing to put up with this and there's a certain amount of that like, yeah, I know you probably feeling a little bit of it now because I left you with sort of the bleeding edge of the technology we were trying to put in and I also left you with a bunch of foremen that must feel like pincushions at this point

because of every time I'd get a new technology, I was bringing it out to them and saying, this is new. Let's try this. Let's try this and about 50% of it was falling on its face. But the stuff that wasn't falling on its face was really giving us good returns. One of the advantages that Spaeder has in that the construction industry has in general is we're really, really centered on the amount of time we spend building. So anything that we can do to cut time instantly is a return, our ROIs are all about how many minutes we can take off a job. And in construction I would say it's a dollar a minute. So if you want to buy a piece of technology that's how many minutes you got to cut off a job.

- Monica: [04:30](#) Okay, this episode is going to be about augmented reality and mixed reality and construction and how things like that can help shave time off of a job as well as kind of what goes into it and how we are working to integrate that technology.
- Jonathan: [04:46](#) Well, you know, we started with this a while back actually when it first started coming out, what we looked at was virtual reality and we said, are we going to gain a lot from having an immersive experience with our guys? And so instantly we looked at "so what are we actually going to get out of this?" And I started thinking because I wanted the virtual reality tools... I have a tough time saying "tools" and not toys cause they're a lot closer to toys -- But we started looking what can you do, and what we realized is if you are immersed in these buildings, in these models that we're doing foremen who are used to looking at a screen, understand it, if there's valves that they can't get to, if there's pieces and parts -- one of the big things that we noticed is as we brought people into that virtual reality, they had no idea how big things were. They thought things were much smaller. All of these skids that we build and move out to job sites, they thought they were 75% of the size they were. They were looking at valves and they're like, oh I can reach that. We bring them into the immersive environment. No way they're going to reach that.
- Monica: [05:51](#) Then the immersive environment is on the job site or is this...?
- Jonathan: [05:55](#) The immersive environment was usually in this room.
- Monica: [05:57](#) Oh really?
- Jonathan: [05:57](#) We turned this room into what's called a play space, which means we defined an area of virtual reality so that you could sort of move around and you could look underneath and over top of things without worrying about bumping into something. But moving onto the job site represented some dangers. One

thing is you do not want to have people's eyes covered on a job site. A lot of it was focused on design. So when we first started messing with VR, we were focused on design, a little bit of routing and then on having these foremen who have never worked in sort of that visual environment identifying to us the things that we were doing wrong. We have a bunch of people that are drawing these virtual models that really come more from the engineering side than from the building side. So the building side, people being able to come in there and say, that's not actually how we build it. Super valuable to us. So at the end of the day when we got sort of down the road with virtual, we were really seeing value in the fact that the foreman could talk to us about what they're doing and that they could see what's going on and what we're designing and throw up red flags. This valve is too high, this pipe's not where it should go. You're totally missing a system. And those are the things that they saw right away moving into that because they're used to seeing it in real life.

- Monica: [07:11](#) Right.
- Jonathan: [07:11](#) And that's kind of where I started to leave things. And I think actually where you started to pick up where we moved from virtual reality, which is put on a headset where you can't see anything outside of that and just you're going to see the model to augment and mixed. And I just told you what augmented and mixed was. So...
- Eli: [07:27](#) Yes. So augmented reality is whenever you, usually it's with an iPad or a iPhone or just any kind of other tablet device and you kind of see a hologram. But there is nothing in a physical space. It's not interacting with the real world, it's just kind of projected on your screen. But mixed reality is whenever you're actually using the geometry of a table and putting something on the actual table. So it's interacting with the actual real world space.
- Jonathan: [08:01](#) Yeah. And you get that one of the things that Eli has been doing is he's been doing both at the same time.
- Monica: [08:06](#) Okay.
- Jonathan: [08:07](#) So you've been doing with the iPads the augmented reality where we're going to take our models and use the video on the iPad to sort of mix the model in with what we're seeing in that video feed to decide whether or not we're building correctly.

- Monica: [08:25](#) So basically I'd take the iPad and I'd put it over the model. Or is this already video that's on the iPad?
- Jonathan: [08:31](#) This is live video.
- Monica: [08:33](#) So I'm taking it live and then everything goes over the iPad. Kind of like you showed me when I first met you.
- Eli: [08:37](#) Yeah.
- Jonathan: [08:38](#) Yeah. We're using a product called Movilive and it's part of visual 3d, and they basically have a QR code, which is just a little scan code. You pull the QR Code, you set a little area that tells the model where to be in reality, then you're able to see it over top, you know, I kind of left that to you to get started. How's that been working?
- Eli: [09:00](#) So it's, it's kind of tricky sometimes. A lot of the times the issue with it is if the model is too big, it can actually upload it. And so for one of our job sites, it's a very, very large building. It's like seven floors plus another four on another side. And whenever I would try and upload the whole building with literally everything inside of it, it would immediately crash the software. So I had to actually scale it down to just the area that I want it to work with and then I can start actually uploading it and aligning the QR codes with the building itself. So you have to go from room to room basically. Yeah, that's the only downfall is because of that and another thing called "drift." So optimally you would just be able to put one QR code down, scan it, and then you would have the entire building align and then you could just walk around through the entire thing. But because of drift, so say I move 10 feet in real life, the augmented reality is only actually going to move nine feet or move 11 feet. So things are going to be off and then the more distance that you move, the more and more things are going to be off.
- Monica: [10:11](#) Is this just because realistically when you build something, things just aren't perfect? Like the model, is that the reason there's drift or is it because of something else?
- Eli: [10:19](#) It's because of camera. So the models that we have are actually pretty much exact to what are--
- Monica: [10:26](#) Yeah, that's what I'd imagined.

- Eli: [10:28](#) Yeah. They are pretty, pretty close. But it's because there's only one camera on an iPad, so it doesn't have two reference points to be able to say, hey, this is this, this is this.
- Monica: [10:39](#) So, if you're using like the HoloLens and do it on a mixed reality, then you don't get as much drift.
- Jonathan: [10:43](#) You get much less drift. In fact, the HoloLens, I would say that the, the Visuallive 3D is a great program. The mobile version of that is a great program. The hardware hasn't caught up with that software. And as the hardware catches up, I mean we have the HoloLens 2 coming out right around the corner. I have friends who are already trying it, and it does a much better job and it brings some other things in where it will measure to your eyes so it can do a better job of determining how you're going to see that hologram. But definitely anything that has two, three, four cameras, you know, you're able to triangulate, you're able to determine where you're at. So how the iPad works, and I don't know if you've figured this out, is it works a lot on patterns.
- Monica: [11:23](#) Ah.
- Jonathan: [11:24](#) So it's single camera's looking at the patterns and trying to build an environment out of that. So like this carpet's excellent. That wall has a pattern, but it's, it repeats a lot. So it might not be as good, but the more patterns, the less drift. And there's with a single camera, there's just always going to be drift. So I think one of the things that Eli's been working on, and you were telling me about somebody that some of the, some of the ways that you've been applying it is what can we use the augmented reality if we are having the drift and he's been using it to basically project data into the mechanical?
- Eli: [11:59](#) Yeah, so in every mechanical room I've put in a QR code and so the idea is for it is that whenever someone needs to come in and service or they're potentially going to have to service the equipment, they would go into the room, scan the QR code, and then since there is an overlay, you can just look, see, oh this is the machine, click on it. It'll give you the serial numbers, it'll give you the model numbers, it'll give you how many filters are in the machines, what kind of fans are in the machines, everything. That basically all of the data that we can pull and that we've been given for said machine, will be in that software so that then they don't have to go looking through submittals. They don't have to pull up paperwork. They don't even have to open up the machine. They can just click on it and say, all right, that's what's up right there.

- Monica: [12:44](#) Wait, so I have a question. Like all this information, can it be updated in real time? So like if I change something from the office, it goes into the system and then that's pretty amazing...
- Eli: [12:53](#) It's really cool. So if I was on the job site and I was like, "Hey, the serial number is wrong" - someone in the office could just go on to, right now I'm using it off of Google docs, but there's, I think there's three other cloud services that it supports. So they could just go in there, edit the excel spreadsheet or the Google spreadsheet, and then I just hit refresh and then it would auto refresh.
- Monica: [13:14](#) Does this, does LINQ support this?
- Jonathan: [13:15](#) LINQ supports this too.
- Monica: [13:17](#) Okay.
- Jonathan: [13:17](#) But one of the cool things about this is when we're doing service in particular, the reason the Hologram is valuable is you leave a building after you've done the initial build and you have no idea what they're doing while you're not there. And so to be able to come back there and look at the room again and say, I can see that you guys changed all of that piping there and you guys changed that... can help us diagnose what's wrong. So not only are we getting the information attached to that room, but we're getting a view into what that room looked like when it was created.
- Monica: [13:47](#) Wow.
- Jonathan: [13:47](#) Or when our models had it and what has the facilities staff done? Was there a second contractor? He came in, he changed some piping and now it's not working. So those are the things that we can do sort of with it to leverage that ability to see what the environment should look like.
- Monica: [14:03](#) Right. Solve problems faster. Hence save time. Hence save money.
- Eli: [14:07](#) Yup. The other nice thing about that software is that they, within the past like month, they actually updated it so that it has install tracking so that say at the end of the day or end of the week or however, whatever time increment you want, someone could go onto the job site, tag all of these parts that were installed on in said time period, and then on the Excel sheet it will automatically update and it'll give you a time stamp

and a date stamp of, hey, all of these pipes were installed this day. So if there's ever issues of saying, hey, you're behind, you can say go back on and look at this spreadsheet and be like, well the, you know, the HVAC wasn't put in yet so we can't put in the plumbing yet and the HVAC was 10 days behind, so it's not necessarily our fault.

- Jonathan: [14:52](#) Yeah, and seeing what's not in yet is super important.
- Eli: [14:53](#) Yeah.
- Jonathan: [14:54](#) It's status tracking school because, but we could really do it without the Hologram. We could just go in there and check statuses. The cool part is we can see what's not in there also. So we can see if we're going in too early, if someone's too late and we can get an idea of how far along this area is. And a lot of times the person in the field that's doing the status is not the person who understands what that space is going to look like, how much stuff is going to be there. They just want to be able to say that's in, we're marking that in. We're marketing that in. We're marking that in. You'd get that right.
- Monica: [15:28](#) Got it. At William T, how close are we to actually fully integrating this? I mean, where are we right now? I know that you're doing a lot of experiments and a lot of testing, but do you think that we'll be able to have like something functional in a couple of months or, we do we have it now or I mean you said you have the mechanical rooms.
- Eli: [15:48](#) I mean for the projects that I'm working on, if something needed to be addressed in those mechanical rooms, they could have that, they could pull that data right now. I'm going to be talking with some other people in Spaeder hopefully soon to see what they think about the technology and how different adaptations they think that we can pull from it and how to implement it and things like that. So it's just, it's a, it's a process that we're going to have to work through, but I think, yeah, potentially in a couple of months.
- Jonathan: [16:15](#) Yeah. You kind of have the MVP out now on those couple jobs. What was, what was the reaction from people that really aren't keyed into the model when they got to see what you were doing.
- Eli: [16:25](#) So I ran into a few people at the job site and they'd be like, Oh, who are you? I'd be like, Oh, I'm from, I'm from, you know, Wm. T. Spaeder. And they'd be like, oh, what are you doing? And I'd

show them then they'd be like, oh, that's super cool. Like, I didn't know we could do that. And you know, it's nice to see that we can have these features now.

Jonathan: [16:41](#) Yeah. And I think it is kind of cool that you're getting it out there and sort of getting those guys used to it. Because one of the big things that I've noticed throughout this is the job sites tend to be very uneven. You will go out to one job site and it will have the best technology and you'll go to the one next to it. And for whatever reason, that technology didn't make it on there. And I think being able to show off where we're at, what we're at and what they're likely to see, will make them ask for it in the future. So if they're standing there and they're like, this tool could be really cool, they know what it is and they can call us up and say, could you please deploy this on our job and get it so that we can kind of take advantage.

Eli: [17:19](#) And it's nice because they're the people that are potentially going to be using this technology. So if I introduce it to them early on, then it kind of puts that in the back of their head. Like whenever this comes out and be like, oh yeah, he did show me this a few months ago. And it also kind of gives, they can give me their, their 2 cents on it. So, oh, that's cool, but it's not gonna work for this reason, or oh, that's cool. It will work for these reasons.

Jonathan: [17:44](#) So what was the most frustrating thing in getting it to work, right. Other than the huge models.

Eli: [17:50](#) So with the program, for some reason, and I was talking with the company about it and they said that they were working on it and they thought that they addressed it in one of their more recent updates. But whenever you put the QR codes on the floor, they work perfectly fine. But I don't think it's good to have a QR code on a floor in an industrial building. It's just not smart. But whenever you put them on the wall, so say this is the wall and you put the QR Code on the wall, it will start you on the inside. So like if you put the QR code on the inside of the wall, like where you want to be inside the mechanical room, it'll start you outside the mechanical room.

Jonathan: [18:27](#) Flips you.

Eli: [18:27](#) Yeah, yeah. It flips you for whatever reason. And I don't, I don't know why, but I kind of found a simple work around where, where I just put the QR code on the outside in the model, but then I just put it on the inside so it flips you, but it flips you in the right way.

- Jonathan: [18:40](#) And that's good work ground. Yeah, that's a really good word around.
- Eli: [18:42](#) It's simple, but I think they're in the process of fixing the actual technology so you don't have to do work around.
- Jonathan: [18:48](#) I think you brought up something really cool that's sort of part of what's going on in construction technology is when you said that you can't put the QR code on the ground. You have a bunch of tech companies right now that are coming out with robots and everything else that really rely on a job site being clean and they're not. Yeah, they're not. They're horrible. I was looking at a robot that kind of went along the ground and was gonna go to mark out where things are and I'm like, there's no way that's happening. And that's where, that's where augmented reality can win because it doesn't have to be clean. It will put it right on top.
- Eli: [19:22](#) Yup.
- Jonathan: [19:24](#) But I think you're absolutely right. You know, when tech companies come in and they don't understand a job site, I think there's this underlying feel that you're going to be able to put it on the ground or wherever you want and you can't -- even putting it on the wall -- probably going to put it on the wall two or three times.
- Eli: [19:39](#) Yeah. I'm surprised the, the QR codes have still stayed on the walls. I figured something about the guy would've walked in there and be like, what's this? And just took it off the wall. But to my knowledge, all the ones that I've put up are still there, which is nice.
- Jonathan: [19:50](#) Yeah. How many jobs have you tried to deploy this on?
- Eli: [19:54](#) Just one right now. I've only gotten access to one job site.
- Jonathan: [19:58](#) Have you tried using the hollow lens on a job site yet?
- Eli: [20:00](#) No. But the only reason I haven't is because more employees are used to using the iPads. We have more iPads in use and the nice thing is they can just download the app and then log in whenever, while we only have one HoloLens. So we'd kind of have to distribute that around. And the HoloLens is also kind of awkward. Like you gotta get it fit on your head. Exactly right. You got to get it adjusted. Otherwise whenever you're looking the holograms and your view is just, it's a little bit off and it's

just, it doesn't quite feel right. While with an iPad you can just look around and it's a lot simpler.

- Jonathan: [20:36](#) Did you try out the HoloLens a good bit?
- Eli: [20:38](#) I have tried out the HoloLens a good bit.
- Jonathan: [20:40](#) So what do you think like safety wise, cause there's a lot of questions about that. What do you think safety wise for the HoloLens on a job site. I know that I put together some clips to put it on a hard hat, but then when I was wearing it I had some questions. What were your thoughts?
- Eli: [20:55](#) I mean, I haven't tried it with a hardhat, but um, I dunno because it obstructs your view a little bit and depending on, you know, depending on the model, you know, you might do that QR code thing where you're scanning the QR code and it puts you on the wrong side of the wall and you get a little bit disoriented for a little bit and then an accident can happen.
- Monica: [21:17](#) Don't do it on the fourth floor.
- Jonathan: [21:18](#) Don't do it on the fourth floor. Definitely. I know that one of the things that they're looking at for safety is making it stop projecting as you're moving. So you take a step and it stops for a second and then it re-projects.
- Monica: [21:28](#) Something that I did see online or there were hardhats with screens on them where like at least a data could be projected on the screen.
- Jonathan: [21:36](#) There's a couple of those. There was one called the Daquri.
- Monica: [21:39](#) Yeah.
- Jonathan: [21:39](#) Which was really cool. And the idea was to give people access to seeing sort of how the setup should go. And they even tried it with Google glass. Do you remember Google glass? But you got in trouble because it has a little camera there. Um, but they tried that with Google glass. Did you get to try that tech out?
- Eli: [21:56](#) I've never tried to Google glass. No.
- Jonathan: [21:57](#) Oh, if you ever get a chance to try them, they're like old tech now. They might come out with something that works. Cool. But that was pretty neat and did the same thing. The Daquri was really interesting because like you were saying with the

cameras... That one had cameras here and cameras here and cameras... It was trying to get a view of the entire environment in sort of the way that the HoloLens does with it. With the augmented, I think we kind of focused on Visuallive3D. There are a couple of other ones out there on the market and there's even a couple of free ones, but most of them are dealing with a smaller model. Autodesk put out one that allows you to do some limited stuff. Trimble put out an excellent one.

- Monica: [22:38](#) I saw a couple videos about that.
- Jonathan: [22:41](#) Yeah. And the, and they're the ones that are actually joining with Microsoft to produce the HoloLens 2. So when you see the HoloLens 2, it comes mounted to a hardhat from Trimble and with the, the Trimble on the side. I've always preferred the Visuallive 3D though. So that's the one I left you to.
- Eli: [22:56](#) Yeah, I was looking at some of the other ones that you had on HoloLens. And the issue with those ones was yes, they dealt with smaller models but they didn't lock them to a point. So with the QR codes, you can lock it to a point. So no matter how much you move around, as long as you kind of keep your eyes on that QR code, it'll stay locked to that point. But if I were to walk across the room with a lot of the other software, it would drag the model with it so it wouldn't lock to a point which wouldn't work on a job site.
- Speaker 3: [23:27](#) Yeah, in fact, on a job site that locking to coordinates is pretty much the backbone of a lot of this technology is trying to get what's called control, which means that we're lining up the model with what's in the real space around us. And everybody's trying something new. So we have the Trimble that gets us really close. If you ever look at scanning technology with the big 3D scanners, we had these giant spheres. The spheres actually were control points because the sphere is the same distance from all sides. So it was looking at a little point inside. If you have ever seen people move and it looks like that ping pong balls on.
- Monica: [24:00](#) Yeah, yeah. We do that a lot in film production. Motion capture.
- Jonathan: [24:02](#) Okay, we stole from you, we totally stole from you and we took and made them giant six inches long or you know, six inch spheres and put them up in a building and basically we are doing the same thing. We're locating exactly where that is.
- Monica: [24:13](#) Oh. OK.

- Jonathan: [24:13](#) With photos because a sphere looks the same from all sides.
- Eli: [24:19](#) I've heard Chuck say that after you use the tremble on one job that you could theoretically throw it off the roof because of how much money return you would get from it.
- Jonathan: [24:28](#) Yeah. In Trimble was, I think Trimble was one of the first major technologies to be adopted across construction just because of what you just said, because the return on investment with all of those things that we have to do on the deck, putting in penetrations, putting in hangers, all of that was so dramatic that we were making back our money and two or three floors and you had other \$23,000 to \$39,000 units that we're making that amount of money in return that fast. But one of the reasons we looked at augmented or we looked at mixed really was we were going out to job sites with 3D digital scanners and scanning areas, bringing it back into the computer, putting it back into the model, and we timed that. Okay, so we think there's a problem in the field. We want to make sure we got it right. We take out a scanner and someone will go out there and they'd spend two hours, say making a scan and then they bring it back to the office and they'd register it and let's say that's another two hours and there's some travel time there and then they put it into a model and other two hours and then somebody would look at it another two hours and so on and so forth. We said, how can we do this better? And what we looked at was we said, well, Hololive 3d we could go out there with QR code and cut all of that other stuff out. We won't scan it all instead of bringing the reality into the computer we'll bring the computer into the reality and I think that was the original promise of the product is to be able to do that and allow us to look up there and say, this is wrong. That is right. I know you are. You were working with some of the reporting functions for status. Did you work with any of their reporting functions for problems in the field and reporting issues.
- Eli: [25:56](#) The issue tracking? I've actually had issues with the issue tracking with..
- Jonathan: [26:10](#) You had issues with the issue tracking?
- Eli: [26:12](#) Yeah. So how it works is you take a picture of your issue and then you'll you know, circle it or you know, do little doodles and then you can type a description out. But every time I would draw on the picture, it wouldn't actually say it. So it just take a picture and then upload it to the cloud. It wouldn't give you any of the descriptions or any of the drawings that you did on that.

- Jonathan: [26:34](#) That's weird. Now I will tell you that there is a work around for that.
- Eli: [26:37](#) Okay.
- Jonathan: [26:38](#) This is one of the things that happens in construction technology a lot, so the people that are making some technology, they know about all the other technologies and so they count on them. Like if you took what you did and you pushed it back into Navis and you created an issue, it would now show the exact coordinate location and you'd have all your mark up. But it requires those other programs be there. In the same way when you're loading up this program, you're actually loading it out of another program. So that's one of the things within construction technology overall is it kind of builds on itself. So a lot of these people, that's what my group is looking at now is a lot of these people that can't even get into it, how do you get them enough tools that they can even get to some of this more cutting edge stuff and then use it because a lot of it is built on the shoulders of giants. You have this program that you use for publishing. And on top of it is this one. And on top of that is this one and this one. And if any one of those is missing from your organization, you're not able to make that technology function. It's actually called a software stack or a hardware stack or technology stack. But remove any piece from that stack and the pieces on top can fall right down.
- Monica: [27:52](#) Okay. This is gonna be a dumb question, but when you buy the software, does it tell you the other softwares that you need or does it just kind of hope that you have them?
- Jonathan: [28:00](#) Most of the time it will tell you what other software you need and most of the time beyond that, a lot of these higher end software, they have a customer success representative that's going to talk to you. Like I would imagine Visuallive 3D you can call up somebody.
- Eli: [28:09](#) The downfall is that they're all in mountain standard time, two hours away and I'm only part time. So by the time I'm getting like to the end of my day is when they open up.
- Jonathan: [28:26](#) It's the danger of not being in Silicon Valley where everything would be perfect because that's where they all live. They all kind of hang out there and then we have to wait until halfway through the day to figure out when they can the answer of questions. But they are doing a great job. Um, particularly the newer companies of telling you what you need and then holding your hand through the process to make sure that you're at least

getting that initial return on investment. Beyond that, you can do whatever you want, but getting that initial return on investment, if you're looking at one of the newer technologies, make sure you're talking to the person who is either in charge of it or in charge of what they're now calling customer success. Or you can get online and Hashtag construction dorks, and we will probably answer your question because there's like 90 of us that are tech dorks that sit on Twitter. It seems you don't just sit on Twitter, we actually have jobs, but, but we'll answer your questions if you ask us. You can go to LinkedIn, but if you go to Twitter, that's the best place --

- Monica: [29:20](#) More immediate response.
- Jonathan: [29:22](#) Oh, you'll get an immediate response from 10 people and hopefully we all say the same thing.
- Eli: [29:28](#) The nice thing is I probably contact Visuallive at least twice a week and they pretty much always answer my questions, which is super nice.
- Monica: [29:36](#) That's great. Yeah. Well I think it's great that like we were talking about before, that the construction industry is adopting these types of things just because the jobs are so expensive, there is so much money involved and construction is a very practical thing. It's happening everywhere in every state and every city versus just the entertainment industry, which is like what I came out of, which, yes, there's also millions of dollars in that too, but at the same time, other than making people happy or miserable, it's, uh, it's definitely, um, not as essential in some ways.
- Jonathan: [30:07](#) I got to say, there are so many parallels between entertainment industry and what we're doing. Like if you look at some of the software we use, it's the exact software you use.
- Monica: [30:16](#) Oh yeah. Well, let me look at Autodesk and Maya. It's like, I mean, that's all animation, but it's like, guess what we do CAD. We do all different types of modeling.
- Jonathan: [30:26](#) We do every type of modeling. It's like between the entertainment industry, the gaming industry and construction, we're using the same tools and construction's always out there. The first time I saw scanning in augmented reality was Google was playing some game with guns that was putting augmented reality in the room. And I'm like, man, if you can give that to me in construction, I can pay you lots of money cause I can make

lots of money on that. And I don't think there's that understanding, but you know, the tools are great. I love playing with all of the tools that you get.

- Monica: [30:57](#) Well and I also think it helps sometimes smaller companies to get an edge because they can save the time and save the money and don't need the same number of people in order to complete a job. Right?
- Jonathan: [31:06](#) Yeah. And the number of people's driving technology adoption.
- Monica: [31:10](#) Right.
- Jonathan: [31:10](#) We were looking at robots that are doing brick laying, and it's not that they want to save money on bricklaying, it's that they have to lay so many bricks to build all the buildings that want to be built this year. There's literally not enough people doing that, not close. So a lot of the drive for technology is simply that there are not enough people to build at the rate that we want to build. You know, and there's a lot of building projects where you're starting to see more and more robotics, more and more stations like that. And it's being driven by a lack of manpower. It's not like people are going out and targeting it. There's no one to put it together.
- Monica: [31:44](#) Like, how can we do it?
- Jonathan: [31:45](#) How can we get around this? And now we're starting to see workers taking on more technology so that they can get more done. And so that they can be augmented. If you've never seen, we'll, we'll maybe get one to, to check out here, but they actually have some good bionic suits now.
- Monica: [32:02](#) Wow.
- Jonathan: [32:02](#) And that's kind of cool. Allowing you to lift more and allow you to lift for longer, allow you to sit in without sitting down.
- Eli: [32:09](#) They have them. I think for shoulder lifting.
- Monica: [32:13](#) Okay. That's one of our next episodes, right?
- Jonathan: [32:15](#) Oh yeah. We have to get a hold of one.
- Monica: [32:17](#) We have to bring --

Jonathan: [32:18](#) To get ahold of something that we can use to show off sort of the strength.

Monica: [32:24](#) Like we need to put it on me and then have me pick up a car or something. Right?

Jonathan: [32:27](#) Yeah. The worst part is not called bionics. What the hell is it called?

Monica: [32:29](#) Exoskeletons.

Jonathan: [32:30](#) Thank you. We need exoskeletons here at Spaeder.

Monica: [32:34](#) Yeah.

Jonathan: [32:34](#) We're desperately asking for exoskeletons -- no.

Monica: [32:37](#) So if you see this podcast...

Jonathan: [32:40](#) And you have an exoskeleton.

Monica: [32:41](#) Yeah, just stop by. We're an Erie right now.

Jonathan: [32:44](#) No, but definitely the exoskeletons are something where we're saying we want to be able to do more. We want to be able to do it safer. So it's one of those things that is stepping it back from autonomous robots and saying, we want to just give our tradesmen extra abilities.

Monica: [33:02](#) Super human power.

Jonathan: [33:03](#) Super human.

Monica: [33:04](#) Yeah.

Eli: [33:04](#) It's really just preventing them from like the repetitive motion of...

Monica: [33:08](#) So will these also be able -- like will they be able to jump higher? Like, will they need lifts. They can just, you know, jump.

Jonathan: [33:14](#) I'm not seeing a jump higher. I've seen the ones where you pick up like way more weight.

Monica: [33:17](#) Wow.

Jonathan: [33:17](#) You know, I mean and and be able to move it around and in a safe way and certainly saving people's backs is super important.

Monica: [33:24](#) Oh, definitely. Less injuries on the job.

Jonathan: [33:27](#) Yeah.

Monica: [33:27](#) So anyway, on that note, that wraps up this podcast on Augmented and Mixed Reality for today. So stay tuned next time. We do have a short podcast coming out where Jonathan interviews Kevin Soohoo from LINQ.

Jonathan: [33:40](#) Kevin Soohoo from LINQ. LINQ's an AI for construction. It's kind of the Google of construction and allows you to get to all your documents just by asking your phone or asking your iPad. And it's really sort of changing the amount of information we can get out to those field guys and making it easier for them to get it all the stuff that's going on in the office.

Monica: [34:00](#) Rather than having to scroll through the pages and pages of submittals. They can just say, hey, bring me up this submittal and it.

Jonathan: [34:09](#) It pops it right up.

Eli: [34:10](#) Yup.

New Speaker: [34:10](#) We'll also be creating some videos using the HoloLens, some demonstrational things, hopefully on some of the job sites so we can kind of illustrate what we were talking about here, as well as how it interacts with the different technologies like LINQ and giving updates about this as we progress at Spaeder over the course of the summer.

New Speaker: [34:27](#) Oh yeah.

Monica: [34:28](#) And Yeah, I look forward to future podcasts with about this and any kind of advances in construction.

Jonathan: [34:33](#) This is a great to a great to be on the show.

Monica: [34:35](#) Yes. Thank you so much. And this thanks. Um, thank you for watching. Thank you, Eli. Thank you. Assistant to the mad scientist.

Eli: [34:42](#) Yup.

Monica: [34:42](#) Er. Resident Igor
Jonathan: [34:43](#) Resident Igor
Monica: [34:43](#) Okay. Ciao. That's a cut.