

Transcript - How can Electronics Evolve Manufacturing Q&A

01:27:31 [Professor Nik Watson - NW]

So hi Sarah, how are you?

01:27:38 [Dr Sarah Connolly - SC]

Hi Nick, yeah I'm great thanks how are you?

01:27:40 [NW]

Good, what have you learned this morning?

01:27:42 [SC]

Oh, it's been incredibly insightful, working with the foundation industries so slightly further upstream from some of this advanced manufacturing. It's really great to see kind of the high tech and early-stage research that hopefully I'll be able to pull back upstream into my industries. So really good to hear some great stories coming through and about inspirational uses of digital.

01:28:05 [NW]

Yeah, yeah, I think I think you're right, it's interesting. I before getting rolled, connect to family, did everything in food and drink and it just suddenly kind of blinkers on the challenges there. The technologies that we use and I think, and I think a lot of innovation is taking ideas from different sectors and you were talking about seeing the start mark about the automotive, the maritime and I think I. I think it's yeah, absolutely right. There's probably solutions there that we're just not aware of in our own world sometimes.

01:28:36 [SC]

Yeah, absolutely.

01:28:38 [NW]

Cool, so do you have a plan for this Q&A? You got lots of difficult questions or you gonna? What do you want to do?

01:28:44 [SC]

Yeah, no. I've I've got a few that I've pulled out from the talks that have come in and but if there are any kind of themes that are coming through in the Q&A, please do keep them coming in and I'll try and build them into and the half hour that we've got left.

So really, I'd like to start with probably one of the tougher questions, and but it's been picked up upon in a number of the talks, so really, that's what do you think are the biggest barriers to adoption or buying that you get? And from the industry that you're working with in terms of taking on some of these digital systems, and so I'd like to start with Mark because really, you're doing something quite

transformational. And how did you find working with the end customers and working with others in the industry? How is this idea being taken on?

01:29:36 [Professor Mark Gillan - MG]

So I think so. I mean, obviously we come from a high performance sport background and my sort of original sort of entrance into simulation was at in in Formula One and is very much that is ingrained in the sort of culture of development within high performance sport, just being able to go at that pace, you have to sort of embrace the digital environment, one of the aspects that we see there was a as a business, particularly the marine side, is clearly from a certification perspective, maybe used to a more traditional process of development. And that's something that we're working with, the on the certification side with those involved just to bring them along that journey. And it's no different to any of the other transportation, whether it be aerospace or automotive. Maybe some of those are further along the journey with this on the certification side, but certainly within sort of Artemis on our consortium, it's a, you know it's fully engaged and no issue at all for going on, going on with the journey that we are on.

01:30:49 [SC]

That's really great to hear, and so Alexandra and moving on to you next. And what have you found in terms of engaging with some of the suppliers and the customers that you're working with as part of this program, and have you found any barriers to uptake, and especially maybe working with smaller businesses that are used to having a single and supplier that they use regularly that might be local to them and how have you found the uptake and any other barriers that you may have faced.

01:31:25 [Dr Alessandra Caggiano - AC]

Well our cloud manufacturing architecture is particularly suitable for small customers small suppliers. So because in this way they can access different resources that they do not have inside their system, so it is particularly, so this kind of users. Of course, there can be some barriers to the adoption of these new systems. Of course they have to share some information. For example, if you have to have to upload the cat files you have to be sure that you can trust in this platform, so you have to share, this can be a barrier so if something is related to the security of the data and of your personal, company data and all those sensitive information that will be shared through the platform. So this is 1 aspect that must be considered because when you want to involve more users than they have to be sure that what they share will be kept private for example.

And in this sense, for example the platform first processes this data, uh, in private way, and then after finding the manufacturing solution then this data is shared with the supplier that is selected by the customer so you can have a filter before sharing this data with other suppliers for them.

01:33:09 [Dr Alessandro Simeone - AS]

Yes, if I can add one more consideration, especially with reference to the industrial network that is here in China, where in the city where I work, which is basically a network giant network or small very small manufacturers, mainly stone cutting, marble cutting or toys or apparel. Well, here there are two problems. First is the communication. How do you effectively communicate that industry 4.0 technologies cloud manufacturing or Internet of Things will actually bring advantages right, here, the

business model is me boss, you do, and it's difficult to effectively communicate on the other side, there is the objective problem of the skills, so you need someone who is able to run cloud, cloud system or is able to really configure, so a professional figure which interface is the, let's say the engineers on one side and the developers of the cloud systems and on the other side the businessmen and the workers, right? So skills and communications are, I think, that you interesting barriers to solve, especially in a top down context like the one where I am, where I'm working currently.

01:34:35 [SC]

Great, thank you, so Carmen you mentioned in your talk that extreme environments and placing sensors is a really big challenge and also the challenge of getting the workforce to engage with some of these sensors and digital techniques and a question has come in through the chat and that trust has always been a big issue and surrounding data and it sounds similar to the Big Brother Effect that you mentioned and so did you have any thoughts on how an manufacturer's trust in the electronics and digital manufacturing can be increased.

01:35:13 [Dr Carmen Torres - CT]

It's a, It's a good question because it's a complex one. If we think that sensors can be bought, you know you buy a sensor OK of an off the shelf one, however, the solution that is going to make you work in your manufacturing situation that needs to be bespoke and it needs to be designed and implemented so therefore you need skills which is connected to what the previous speaker was talking about with people who can really do that. Now. In my experience, working with both large and small companies, that resistance could be because they don't know, they don't know how that works. They've never done it themselves so it's oh why are you selling me, where are you going to implement here in my factory. So I think that having a champion in the company who can be that agent of change, that communicates within the company, that move is the right move. I think that's a powerful step.

The company wanted it from within rather than a sales pitch, right? You go and sell and sell a sensor on on the on the thing the hang the hang from that. So definitely having a champion within the company and I think it's great that this is an early career event, an early research, a career event, because these people who are listening to us today are going to go and work in those factories and those manufacturing companies and they are going to be that agent of change that we need for digital manufacturing to really breakthrough at the end of the day is of people, people talk to people you don't talk to a robot you don't talk to a piece of code right? It's about people, so it's you guys, people in the audience who are going to definitely be the ambassadors and create that absorptive capacity that we need for the entire smart manufacturing concept, that to be truly implemented in the in the UK manufacturing sector.

01:37:33 [SC]

Well, that's a perfect segue onto my next question, and so I'll come to you first, and Nick. So what are your thoughts about the requirements at a site level for both the skills and kind of the hardware needs in the future, so a bit of an interesting question this one. Do you think that individual businesses will have the digital skills embedded in their workforce to enable this transition or do you see more of a servitization model where these skills are held maybe in universities or in consultancies and that they reach out to businesses to kind of do the upgrades and the installation and let them run with things.

01:38:26 [Dr Nick Polydorides - NP]

I'm like I'm not truly a pessimist and I'll tell you my own side of story. I think the more we try to come together you know, I see a bigger gap between us and them and I'm, you know, I'm a computational science is the myself. I work with people that do experiments. I work with people that build instruments and so on, so. Uh, I think it, you have to start from a low level. You know the from the education side of things you can't, I don't think you can do it in a in a top down situation. As we speak I am part of three sizable projects and you know, I do one bit. They do some other bit and there isn't that much of a communication, and I don't think that is, you know, specific to us in terms of obviously we have meetings that we talk about, but we're not like working as part of the same company. Where a company would have been working better together because you know, we can do with doing what we know individually without having you know to try and understand the details of what the others are doing. I think that's a that's an issue, and unless you have the education, you won't be able to break it.

Uh, and if I'm allowed also one comment on the previous question, I've also took part in a couple of online workshops with these foundation industries and it looks like, especially in the UK the bigger the company is, the more conservative tends to be, so they're not like, it's do you have it ready? But if I had it ready, wouldn't I have a company and sell it to you? And obviously if I want to sell it to you, that would be a different price, right? So there is this gap and I think part of that blame is also to the universities because the amount of innovation that doesn't get translated, to a small company to something that can evolve. It's just phenomenal. I mean after the paper you know, drop down. Let's go to the other project and this isn't the culture in other countries I'm afraid. So this is something that we have to look at. And how do we fund this you know, happening systematically just so that you know, I'm not saying all of these companies will grow up to be Googles or, you know, be the big guys or Freud etc. Unless you give some of that a chance to approach to get into the into the game.

01:41:03 [SC]

You've preempted my next question, Nick W, did you have any thoughts on that, just before we move on.

01:41:11 [NW]

So I I guess the skills one is really interesting question and every time I go to a digital manufacturing road mapping or whatever it is, the biggest priority is always skills and everyone highlights it is the biggest priority, but no one really knows what to do about it, I think I think it's difficult because from a university level, university is a slow machine. Anything to change in the universities we're talking years and years and years, and if you look at digital revolution, if we look at industry foreign industry, saying what is really obvious is its rapid change compared to what's happened in the past it. It's exciting, really fast, and I don't think universities are quite have the ability to change quickly enough to do kind of, to actually to actually do something about it. So I think it needs to be something done at a kind of national level where it starts at skill schools and degree level apprentices, different types of apprenticeships through the universities, bur it needs a really, really big initiative and everyone I feel kind of doesn't try to tackle it well enough because they just go and focus on the technical sides or the bits they can, they do have a bit of an idea how to solve, I think I have a bit on this as well from the adoption side, is the kind of business models as well. I think technologies as a service and sensors as a service, things like that when you're providing the benefit of technology is something that is going to need to be explored more.

01:42:33 [SC]

Great, thank you, so my next question really, is looking at that knowledge transfer and that transferability and of some of the research that's going on, and so I didn't know if, Mark if you wanted to start us off there, and what do you think the transferability of some of your and simulations are, you touched on it a little bit in your presentation.

01:42:59 [MG]

Yeah, so I mean I have a real passion on not just sustainability but productivity, obviously worked at Innovate UK as well and understand sort of productivity mapped across the UK and how it's a very picture. And I see this as a really good way of diffusing knowledge from businesses who are very good at going from idea to product quickly, in an efficient manner to let other businesses cross-refer and understand how to utilize these skills, learn from it and to transfer that knowledge into the multi sectors. So I mean obviously we're working in the marine but it could equally be any form of transportation.

I mean and as you well know, we use that that that process on the ventilatory Challenge previously had in it with, with the help of the F1 teams and project pickling. So that was taking early stage in some cases early stage ventilator designs and getting them NHRA ready in 3 1/2 weeks, that was a process that typically would take three years, so it's that level of diffusion across multiple sectors and across even within sectors across businesses which really know how to implement it versus those who are learning the early stages, I think then we can really move the dial on the productivity issue.

01:44:29 [SC]

Great thanks Mark and Carmen just picking up on some of Nick's comments and about that tech transfer from academia into industry, obviously both projects that you talked about are very industrially focused and working with some of the big players and how have you found that tech transfer activity and what do you think you could apply to other players in the industry as well.

01:44:54 [CT]

My personal experience is that companies come to universities in this case, which is which where I am based, primarily looking for talent. They bring a project, and they say, well, you know, what can you do with that. But while they have one eye on what technology we can develop, they also they also have an eye on people and who they can, who they can then approach at the end of that project or during the project. In this case, which is brilliant I personally love when my researchers get snatched away by industry, because at the end of the day is 1 to a three-year long interview and as I said earlier in my previous answer, these people are the agents of change who are going to make things happen and the exposure. It's always about exposure. It's getting our researchers particularly the early career ones, exposed to companies don't wait through the Year 3 or year 4 the PhD or Year 2 or 3 of the of the post doc to expose them to industry do it from the beginning because is that mutual understanding that is required from industry to us, the pressures that we are we are under in in the academic world but also for the researchers to understand that the way I run these though and university is not necessarily the same ways down in industry. And when they get exposed to industry, they can pick the best of both worlds and move on.

Finally, what I really need to say, and I know this is it is controversial. There is a need for a true compromise and a true commitment from the funding bodies UK I EPSRC for funding a doctoral program, CDTs that have to do with manufacturing because in the last round of CDT competition, the manufacturing CTD's were absolutely decimated. We lost very important manufacturing themed CDTs so therefore we are losing the possibility of training the researchers who are going to end up in in manufacturing.

We would like in digital manufacturing, because that's the way the way forward. So, everybody needs to pull their weight here. Not only the early career researchers, not only us and academics infusing those young graduates in engineering to do research in digital manufacturing and digital technologies, electronic devices as we are speaking today, but also UKRI and EPSRC putting their money where their mouth is and not to allow what happened two years ago when the manufacturing CDTs suffered such a such a loss with so many centers not being renewed.

01:48:03 [SC]

Absolutely no. Can't agree more, especially with this cross-sectional research and spanning those sector boundaries and some of the CDT's were good in facilitating that. So yes, we're looking at an audit for what we need across the foundation industries, but I know other industries are looking at the best way forward to and mix.

Nick, did you want to come in on this?

01:48:25 [NP]

I mean, I'm not, you know, I'm not usually I'm not defending new EPSRC and UKRI. I don't think it's just something that, it's a genuine question like it applies to manufacturing. It also applies to select communications in many respects you know is that talent needed in the UK.

I mean, do we have the capability? I mean we run the biggest MSC in telecoms, I would think probably in the UK but 99% of our students will get a job in in another country. They come from that other country, so you know that's what I'm saying, there has to be an argument so that EPSRC can ask money from whoever writes the cheques, that you know if we're going to do this, we need so many people to be trained to support this and that.

I'm not saying we shouldn't but unless there is a demand from the country or you know, the industry itself. We don't get enough ammunition.

01:49:29 [SC]

Yep, no, we need that that talent pipeline, but also the attraction from the sectors. So getting these data scientists specially to come and work in manufacturing to work in the steel industry is getting that balance right and also looking at what we do need in the UK in terms of skills. And making sure that we do retain them and Mark, I think your hand came up next for this.

01:49:54 [MG]

Yeah, so it was just sort of something Nick said. I mean we have open vacancies now in exactly these areas that we're talking about. So, if you've got interested parties, I'm open to a direct email and so I, I

agree in it there must be pipeline in the UK for these roles, but certainly from our side and we see it very much as a growing need and business.

We have open vacancies now and with the current situation of visa positions, you know keen to get homegrown UK talent.

01:50:48 [SC]

Great, thanks Mark, maybe one for the network plus is to take up some signposting activities to capture all these opportunities and Nick Watson.

01:50:59 [NW]

Thanks, Sarah, nothing like a good debate just before lunch, I think there is a need for these manufacturing foreground, I mean one of the reasons is especially relevant to what we're talking about today, the electronics. We did some work somewhere with the high value manufactured couple and we're looking at where, where are the providers of all these digital technologies actually?

Most of these don't come from the UK. We're importing these technologies, we just don't have them, and I think if we can develop the people to design them, then we can develop the companies to build them. Then we can have that as a real strength in the UK I've got nothing wrong with importing great international collaborations, but I also feel it's something we want to have and it's a great opportunity as part of make smart noise over initiatives. But it needs it needs to CDT, it needs things, like the outreach going on in primary and secondary education, it needs to be integrated into undergraduate and postgraduate degrees and it means that in that kind of innovation culture as well.

So, it is not just one thing we can do. There's lots of things we need to do to connect them all together for this to happen and don't understand there's not a solution in 2-3 years. It's going to take time.

01:52:06 [SC]

Absolutely, and so just coming back a little bit to the data science and technologies themselves and a couple of our speakers picked up on and some of the challenges in terms of the validation of the data when using big data and digital twins and some of the certification, that's needed, would anyone like to pick up on some of the challenges that they face in in the transition to using digital models instead of physical experimentation, Mark I thought you might be in on this one.

01:52:39 [MG]

Yeah, so it was actually raised a couple of times in the discussions on the importance of the human in the loop still and I mean to give you an example having sort of previously been sort of at a race team, one of the drivers would come in and say that there's a problem with the engine, and you know an F1 car has got thousands and thousands of channels that they you know we have 75 engineers looking across it. Couldn't see an issue 2 laps later. The engine failed. It was on the acoustic piece on the engine that the driver had been attuned to, and it is that sort of highlights the real importance of this holistic view.

You know the human is a fantastic holistic sensor well-tuned to the to the complex system, and it's how we work. And as we progress and get better and better with our sensors and the digital twin, how we learn to know how good the human is, uh, as that holistic sensor and embedding them in the process.

And it was just sort of obviously just sort of highlighting that we should not you know, I think removing human from the complete process would be a mistake. Even at this stage in the in the matter. What the industry, I've yet to see it because, you know, a human who has got good understanding of that system is very, very impressive.

01:54:06 [SC]

Great thanks Mark. Nick P didn't know whether you wanted to come on and this one you talked about kind of the size of data and weighing up that that risk and I didn't know if there was anything you wanted to discuss.

01:54:22 [NP]

Yeah, so and relevant to the to the digital twin thing. Obviously, I'm not in that area, but I am curious enough to read some of the publications that come out. Obviously the best results come from the real thing. So the digital is always going to be second. But it's practicality is if there's just so many things that you need to test, you wouldn't build that, it's just time consuming, you know the company will go bust before it gets a chance to test these things, so it's kind of the least bad thing to do is just try the simulation. Now in that simulation however, you need to put in the things that you don't really know, right, because it's like making it contrived experiment. It will give you the things you expect to see, but they will be wrong, right? So that that kind of spirit must be building the simulation, so if there's things that you know in reality might be different, that kind of stuff must be reflected in the simulation. I've also known for this of this company Axelos that was spun out of MIT that they are doing this sort of stuff for oil and renewables, they're doing well, so obviously this is something that works in practice because they get their money from real contracts, so it's watch this space.

01:55:55 [SC]

Great one want to leave that on there. Lots of exciting things coming out in in the pipeline and so I think our hand over back to Nick Watson and just to wrap up this session. Thanks to all our panelists and that was a really good session.