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Mike: From the Center for Occupational Research and Development, welcome to Preparing Technicians for the Future of Work. I'm your host Mike Lesiecki. In each podcast we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

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Our guest today is Lisa Masciantonio, and she's the Chief Workforce Officer at the Advanced Robotics for Manufacturing (ARM) Institute. Hello, Lisa, thanks for joining us today. Will you tell us a bit about your Institute and your role there?

Lisa: Absolutely. Hi, Mike. Thank you for having me. We are part of the Manufacturing USA Network. Our Institute's name is the Advanced Robotics for Manufacturing Institute. We are one of a number of institutes focused on reinvigorating the manufacturing environment in the United States. And we were the 14th Institute that was stood up in January of 2017. We were founded out of Carnegie Mellon University, and we are located in Pittsburgh, Pennsylvania, very close to the university.

Our mission is to focus on the robotics and automation processes in manufacturing. All of the institutes have different charters and different initiatives focused on key elements of emerging manufacturing capabilities that will help to strengthen the United States in the global market. Ours happens to be with robotics and automation. So, as you can imagine, we are pervasive across all of the other Institutes and the work that they're doing. My role as Chief Workforce Officer is something that we're really happy being one of the later Institute's, because they learned very quickly that, as fast as the technologies are changing, and manufacturing, you need to ensure and put as much emphasis that the workforce is keeping pace with those technological changes. And so, my role is to focus on elevating the way that people learn, the training programs, and the key workforce across the manufacturing sectors.

Mike: Well, you know, everything you just said, Lisa is totally aligned with our focus on preparing technicians for the future of the emerging technologies. As you look at the workforce out there, you're really tuned into these sorts of things. What gaps do you see in now this emerging technical workforce? And how do you know what those gaps are, those "skill gaps," Lisa?

Lisa: So Mike, as I stated earlier, the technological changes, as they're related to robotics and manufacturing, are moving very, very quickly. Robotics and automation technologies are changing on a day-to-day basis. And part of the problem in advanced manufacturing is, as the manufacturers become more reliant on the robotics and automation, the workforce's skills have not kept on pace. This creates a huge skills gap.

By a skills gap what I mean is that there's a mismatch. The skills that an employer needs are different from their employees' skills that they actually possess.

There's a study that we reference from the Manufacturing Institute showing that the current estimate of new jobs in manufacturing is nearly 500,000 unfilled manufacturing jobs. And there's an estimate: by 2025, that there will actually be over 3 million unfilled manufacturing jobs. We find those gaps across the entire spectrum of advanced manufacturing positions: anything from assembly, things in the warehouse, mechanical, electronic, the CNC machinist, the engineers, or the entry level production. And all of the material handlers.

At the ARM Institute, we've made a conscious effort over the last couple of years to really focus on where those large gaps are. And it seems to be at the robotic technician level. That's based on our research across our ecosystem, where they're showing that greatest gap at the robotic technician level.

You asked, "How do we know?" We've got nearly 300 member organizations who we use to help with our needs analysis and our gap analysis to inform our understanding and inform our roadmaps. We also use a lot of nationwide surveys. We do one-on-one interviews; many, many workshops; solution summits—to help guide all of our efforts. We also rely very heavily on research and statistics from the Department of Labor, Department of Education, and then certain studies from entities like Burning Glass, the RAND Corporation, the MIT Workforce of the Future study, as well as studies from Deloitte and McKinsey. So, we're very confident with the approach that we're taking based on the influencers that I just described.

Mike: Well, that's a tremendous wealth of information that you're bringing to this, Lisa. And I know the Institute, under your directorship, has created this new resource. I was just looking at it. It's called roboticscareer.org. Is it "career" or "careers," Lisa?

Lisa: roboticscareer.org

Mike: Right. Okay. I'll make sure we link that in the Show Notes, too. It's a tremendous resource. I know it was just released this month and in there, there are three types of career pathways that are highlighted. You just mentioned technicians. So, it's Technicians, Specialists, and Integrators. What distinguishes those three things? And while you're at it, tell us a little bit more about that really cool resource that you have.

Lisa: Oh, thanks, Mike, for asking. Yes. So, when we started to focus on where those skills gaps were, a lot of the employers were describing a situation that they've only got one job description for a robotic technician. And those positions are actually becoming a lot more specialized than the employers are able to keep up with. So, we've created, with our experts across our ecosystem, a competency framework, focused on the Industry 4.0 robotic career pathways, where you look at the competencies at the robotic technician level. Those are the fundamental skills. Things

like mechanical systems, maintenance and troubleshooting, electronics and controls, electrical systems, safety, robot programming, fluid power, PLC. Those are those competencies that somebody coming into the manufacturing floor would be experiencing at that foundation (early) level.

As they become more experienced, and they get more on-the-job training, they would become more specialized. They'd move into an advanced Industry 4.0 specialist role. Things that would be focused maybe on safety and risk assessments. Or the specific project management. Vision sensors. Those kinds of competencies that a few years and some experience on the job would help people to become more specialized.

Then a big gap in the manufacturing workforce is at the Robotic Integrator level. Most of the robotic integrator mindset, people think of hiring an integrator to come and install a new robot. But what we're learning that the manufacturers themselves are actually in need of very experienced people to focus on the internal workings of using that automated equipment or that robot. And they would be focused on really key, more applied technologies like augmented reality or virtual reality, simulations, offline programming—making sure that the systems are interoperable across the manufacturing floor. This is where you would focus on the system's process design, and the simulation and modeling capabilities.

Mixed with that competency framework, we also have a key mapping to all of those essential soft skills to make sure that the individual, as they move through these career pathways that make sense for them and their employer, they're focusing on those soft skills that would show if they've got technology aptitude. Or conflict resolution skills. Leadership skills. So that they and their employers can make the right decision for how they move up. Over time, we see that these workers are then able to move into what formerly we would have called like a journeyman position, that they would be gaining mastery of not just one skill, but a number of different skills. Our competency framework is not prescriptive. We intentionally built it with building blocks. So that people in the new robotics career pathways could focus on their innate skills and what their employers need and move along in a sensible way.

Through the roboticscareer.org site, what we've done is we've worked with a number of programs—we've got over 10,000 training programs represented across the country—so

that people can figure out which of the skills and the competencies they want to home in on. This site will help them to be able to find what that next move should be for them, and where they can find that training to enhance the competencies that I just described.

Mike: As I look at that site, Lisa, with all of its aspects and resources, one of the things struck me. And it says, "How can my organization become endorsed as a national robotics program by the Institute?" A lot of our listeners are at community colleges. They have robotics training programs. Could they achieve this endorsement? How does it work?

Lisa: Absolutely. So, the endorsement program is a way for us to highlight and show what best practices are out there in these training programs. And so, on the roboticscareer.org platform, an organization can go in and fill out the application. It's very robust. There is a very thorough set of metrics that we would be looking at before we would offer the endorsement.

After the organization fills out the application, whether they're invited to move forward in the assessment or not, they receive a "Strengths and Opportunity Report" based on the initial feedback that they give to us. And how we would recommend that they make improvements. And, if they meet certain thresholds for major findings and minor findings, we would recommend a several-hour audit where we would be looking at key elements to show that they've got best practices in their various training domains, let's say.

If they pass that—we now obviously are doing it as a virtual audit because of the pandemic—if they pass the threshold, they would receive a specific ARM Endorsement badge for them to use in their marketing collateral. They also, through the roboticscareer.org platform would have a specific designation, where they would come to the top of the search list and we would be able to show the audience those capabilities that that training program brings to bear.

Mike: Lisa, this certification that you're talking about, this endorsement seems that it could really be of value to a program—maybe a community college program in robotics. Is there a cost associated with it?

Lisa: Yes, Mike, there is. There's a cost for the initial application and it varies, depending on the robustness of the program. If there are 1, 2, 3, 4, 5 different programs

within the curricula that we will be reviewing, as well as an organization who moves on to the full audit. Again, there are some pricing variants. You can find that information on the roboticscareer.org platform.

Mike: I'll make sure I link to that in the Show Notes, specifically, Lisa. Thanks. It seems to me the key to something like this is acceptance by industry. And with the large number of industries that you have participating here, I'm going to guess that there'll be a real recognition in industry of the value of this sort of endorsement, right?

Lisa: Absolutely. It's on par with other audit methodologies out there that are showing the "best in breed." And because we're trying to create a community of practice, hopefully we can take those best capabilities that we find out there and share them that with other training institutes to help them raise the state of their educational performance as well.

Mike: Very good. I can't help asking this question. You talked about those skills that are needed. And you talked a little bit about those Integrators. I think that's a fascinating aspect as well. Because our education and training programs, we often talk about some of those fundamentals that you mentioned, the electromechanical systems, the wiring, the hydraulics, pneumatics, things like that. But I'm not sure we always think about integrating robots. And yet that strikes me as something that's really coming on as an industry need. What does exactly that mean? For example, does a technician need to know about certain network protocols? Do they need more IT Networking in their background to do this? What do you think about that?

Lisa: I would say the essence of the whole manufacturing process definitely has to include those capabilities. This gives them an opportunity to say, "Will it be my Robotic Integrator that has those skills? Or will I enhance my IT department perhaps? Or would I be able to make smarter automation decisions, because I now know all of the inner workings and how to make these capabilities interoperable inside of my manufacturing floor?" So, this is more of a guidebook to help them make smart decisions versus telling them that they've got to change all of their processes to fit into this model.

Mike: Good. Excellent. I have another question for you. I want you to take out your crystal ball. And maybe think about the background conversations you have at the ARM Institute, as you think about what's emerging out there—are robots going to be communicating by voice with their operators and technicians? Are there other interesting emerging technologies you might see out there? I'm just curious if you have any perspective on a maybe 3- to 5-year timeframe?

Lisa: Absolutely. That's actually a huge element across our ecosystem is: "What the future of manufacturing. . .what the future of robotics. . .what should we do now to help prepare our workforce for the future?" And again, we're very deliberate when we built the competency framework to show those independent building blocks and to not be prescriptive in the various pathways because we know it's going to be fast moving. And we want to permit these competencies to go out, and new ones to come in. We also want to be able to expand it either more towards the engineering competencies, or to a broader spectrum to include things like artificial intelligence and machine learning. And how do you include new skill sets, like data analytics, statistics? Those kinds of capabilities that would make a technician more qualified as the AI or machine learning capabilities come in.

If I was a betting person, I would say the AI machine learning would be the workforce of the future. And "How do we leverage the programs that are out there?" is going to be that "secret sauce," if you will, on getting those curricula up and running sooner rather than later so that we don't have yet another set of the manufacturing workforce fall behind, as we've seen over the last number of years with the technological changes.

Mike: Thanks for that comment, Lisa. I think, at least according to some recent other podcast interviews that we've done, boy, they agree with you totally! It's going to be AI and machine learning that drives this emerging area in the future. So, that's something we will really want to pay attention here and think about it. So, thanks for that comment.

As we wrap up today, Lisa, what would you say to—let's say, a young man or a young woman—workers who are currently employed who might be thinking about re-careering? What would you say to them about opportunities in the robotics field? Can you make suggestions? Can you

encourage them? What would you say to a young person or a re-careering adult?

Lisa: Absolutely. So, there are great opportunities for people who are looking at these kinds of new careers or for those people looking to change careers. We're taking a lot of steps right now with the individuals who were displaced because of the pandemic. In entities like service industries, where their jobs, sadly are not going to be coming back. And, if you look at some of the training programs, things that are focused on career upskilling let's say.

The platform has been really helpful over the last couple of months to find people training programs in their local area where they might be able to do something like a "boot camp." Or a project-based education, where they come out of it pretty quickly with a badge and a certification that they can at least get their foot in the door and start to move into those new career pathways. And, as I described with the skills gap and having over 500,000 open jobs, we want to be the enabler for the employers to fill those jobs as quickly as possible. And these individuals who are looking to be re-skilled and to move into these new exciting careers as fast as we possibly can. And so through the roboticscareer.org, people get access to those training programs all across the country. And based on those innate skills and their desires, and maybe even some of their background, they can find the quick training to get them a career pathway that will immediately be fulfilling for them.

I would also recommend that people moving into the robotics and automation fields, that it's going to offer them a faster career progression, however, the technologies will continue to change. And so, it's not just a one stop. It will be a lifelong learning journey with exciting opportunities to maybe move into AI and machine learning, and these careers of the future that we just described.

Mike: I like this message of a journey, Lisa. It's just not a, "Okay, I'm gonna get a job." But rather, you're looking for something that will evolve over time, and you're gonna evolve with it. I like that message! I think it's a good one!

Lisa: It really is. And the mindset of the way manufacturing used to be: that it was very rigorous and disciplined, and

once you had mastered a skill, you would stay in that position forever. And that's not the way that manufacturing works. By acquiring these skills, you would be able to move into many different sectors and to continue to evolve as fast as the technology is changing. And so, it's a great time to start focusing on robotics and automation, because it will be a lifelong learning journey, as well as lifelong evolution of your career.

Mike: Great. Lisa, today, you just painted this excellent picture for us that started with the real demand: the gap in demand. You mentioned the large number of openings now and in the future, really painting that demand.

And then showing that there's three opportunities. In a way your website talks about these three different career pathways, you can come into them at the beginning, or in the middle, or the larger, more developed part of the career. I think that's a great opportunity.

And I'm thinking about our listeners who are in the training and education space. They should see this as an opportunity to gain value for their own organizations by being associated with the ARM Institute. What do you call it? A certification? Or an endorsement? What's the right term to use there, Lisa?

Lisa: That's actually a great point, Mike. For training institutions, simply to have their information across the roboticscareer.org platform is completely free of cost. And they could be represented if they have a curricula or a training program that is focused on any of those competencies that we were talking about. So, that in itself is a huge value for them—to have that exposure and to be able to be part of that training solution across the country.

Now, if they wanted to have the stamp of the ARM Endorsement, there is also a way on the platform for them to apply for that endorsement. It would be, let's say the next level of evaluating what their competency training brings to bear with the robotic and automation world.

Mike: That sounds just great, Lisa. In the Show Notes I'm going to suggest that as an action to our colleagues out there who are in this education and training space—that they look carefully at both of those options: the listing on the program, and potentially encouraging their students to look themselves at the potential careers there. I think that's a

good thing. And I really appreciate the time you spent today and also the strategic direction your Institute is providing in this whole area. You've really made a strong effort here. We appreciate that very much!

Lisa: Thank you, Mike. I appreciate the invitation.

Mike: All right. Goodbye, then.

Lisa: All right. Thanks, Mike. Bye bye.

Mike: As we wrap up today, listeners, I'd like to ask you a favor. Right by the link to the show notes, on the website, you'll see something called a Feedback Survey. And that's just a couple of questions. Most people have been answering those questions in under three minutes. That will help us improve the podcast. Thanks very much!

Now today you heard Lisa Masciantonio from the ARM Institute. She talked to us about robotic skills. Now one way of framing those skills is to use what's known as a Competency Framework. (There's a link to that in the Show Notes.) And you can see that's organized around those three types of technicians that she referred to.

Your other action item is go to roboticscareer.org. And if you are involved in education or training, consider—at the minimum—listing your program in the database. It's free. You'll get a lot of visibility.

But in addition, you may find more value by having your program endorsed by the Advanced Robotics for Manufacturing Institute. The process is described at a link in the show notes. It's pretty straightforward.

And finally, if you're a student, or you're employed, but considering a career change, you can find programs relevant to you on roboticscareer.org.

This podcast is produced by John Chamberlain at CORD. Thank you, John, for all of your excellent work. And the project is led by Principal Investigator Ann-Claire Anderson. Thank you, Ann-Claire. You can find our podcasts at PreparingTechnicians.org (all one word), or on Apple Podcasts or Google Play. A rating and review is always appreciated. And thank you our listeners for Preparing Technicians for the Future of Work.

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