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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 Jake Hall, better known as the "Manufacturing Millennial." Jake's got a passion for manufacturing automation and the skill trades. Welcome, Jake. Tell us a little bit about your background and what you're doing today.

Jake: Yeah! Hey, thanks so much for having me on, Mike. It's great to be here. Oh man, my background. Where do I start? Well, my passion for manufacturing has always been part of my childhood. Growing up, I entered my first manufacturing automation facility when I was 16 years old: sweeping the shop floors. And cleaning off CNC and mill machines. So, my passion has always been there to build things. So, growing up, I was a huge proponent of loving Lego, and K'Nex, and Lincoln Logs, and pulling out my dad's Erector Set. I said, you know, I want to go into this field where I can continue

to work with my hands. So, I chose engineering as a passion.

I went and got my Mechanical Engineering and Manufacturing Engineering degrees, and a minor in Biomedical Engineering. And right after college, I went into the industry of Automation Distribution. So, I sold PLCs, HMIs, worked with a lot of manufacturers, and then users- and systems-integration companies. And did that for seven, eight years.

And during that time, I began to really realize, Mike, that there is a massive mis-underrepresentation of kids my age in the manufacturing industry. And, you know, the first few years, it didn't seem that far off, because I went to go work with a lot of my college graduates. So, I knew a lot of kids already growing up that were my age.

But I was attending a conference probably around 2018-2019. It was a professional manufacturing conference. And, as I was sitting in that room, looking across, I'm seeing all the other professionals sitting there. I was probably one of maybe three or four out of the 500 in that room that were under the age of 40. And I said this just doesn't seem right. For an industry that I viewed as exciting, and innovative, new technology. It's so weird not having this representation across generations. So, I came back home, and I looked online and said, "Why are there not young kids in manufacturing?" And then I began to realize, "Holy cow! There really are NOT a lot of younger generations in manufacturing!" There's this thing called the "silver tsunami" coming up. We're having a lot of people retiring in the next 10 years. And I said, "You know, I'm a millennial, and I love manufacturing." And that's how this brand of the "manufacturing millennial" came to be.

And over that time, I've grown online to be a content creator, social influencer, advocating manufacturing skilled trades and automation to our younger generations, and the companies who need to attract them. So, that's what I do a lot of times on my "side job." My day job still is I work for a Systems Integration company, where we help manufacturers with digital transformation, automation, and Industry 4.0, integration. But the passion for me is, "How do we get younger kids excited about what this industry has to offer?" And really dispel the myth that manufacturing is just this dark, dirty, dangerous, dull environment, as I

like to call it. And it's actually this industry full of innovation, and technology, and automation.

Mike: You know, you added the fourth "D" there: "dull." You usually think of it as dark-dirty-dangerous, but you added the "dull" there! Thank you, Jake!

It's interesting that passion for doing things with your hands. For making things. So many of our listeners are involved with community and technical colleges where students are attracted to that side of things: doing, making things. So, I appreciate that! Your background is an interesting one.

Certainly, you're in touch with what's going on in industry today. If you had to put on a crystal ball, and say, Hmmm...I'm peering to see what emerging technologies are likely to transform the things you've talked about: the automation and things like that. What do you see coming? In just sort of a broad sense?

Jake: Yeah, great question. I think what we're going to be seeing transforming in our industry—the manufacturing industry—is, as we move just from a product-based industry to a digital industry. Where, you know, as we move from the Industry 3.0 revolution into the Industry 4.0 revolution, a lot of end-user manufacturers don't just care about the products that they're producing, but they care about the data in which they're being produced. I would say having more accessibility to machine information is going to be a massive transformative step. That's what I would say is one of them.

The other one, I would say, is the integration of AI (artificial intelligence) into existing systems. Let me give you an example of that. Right now, in the United States, there's about 550,000 welders that we would say work in the manufacturing industry. Well, the average age of those welders, Mike, is right around 55 to 56 years old, where we're going to see almost half of them retiring in the next 10 years. That's a massive number! And we just don't have the future workforce right now entering our industry to 1) be able to keep up with all the knowledge and experience that's leaving the industry, but also just the physical hands to do that job. So, what's happening? Well, we're seeing more integration of robotics that is designed to be more flexible when it comes to welding.

And I'll give you an example. Right now, I'm in Michigan. And one of the largest hubs of automotive or robotics welding in the world is across from me in Detroit. Well, that works great for robotic welding, when we're doing the same part over and over and over and over again, day in and day out, and there's no variability. But for a lot of the manufacturers here in the US, which are small- to medium-sized manufacturers (under 500 employees), they're NOT running the same part over and over again. So, they never viewed robots as a solution to help mitigate the lack of skilled workforce that's out there. But what we're seeing is artificial intelligence is filling that gap.

So, there's a really cool company, I'll just say this as an example, down in Ohio called Path Robotics, where they're using welding robots, but they're using vision camera and AI to look at a part. And then. the algorithm the AI builds in this vision will automatically be able to determine where and what to weld on those parts.

So, now we can still leverage robotic welding, but in a flexible way that's a lot more economical for small to medium builders, because it has a lot of high variability. And a lot of times these small- to medium-sized manufacturers don't have welders on site. They don't have skilled robotic engineers and programmers on site. But if AI can alleviate that gap, where that skill is, and allow small-to medium-sized businesses and manufacturers here in the US still be competitive, that's going to help transform our industry forward and keep a lot of manufacturing here domestic.

Mike: Sure. You mentioned "skills." You know, our project, "Preparing Technicians for the Future of Work" does focus on those technical skills that they need. So, as you see this transformation that you mentioned, this digital transformation, the integration of automation and robotics, the incorporation of AI—what does it mean for the technician? They're no longer just figuring out how to join these parts, welding them, but rather, they're doing something different. So, what is their skill set? Because that's what we're working on in our project: how to prepare these people for what they need. What does it mean, "skills?"

Jake: Well, I think the classification of skilled trades is growing. When I looked at skilled trades 20 years ago, it was a machinist. It was a plumber. It was an electrician. It was a masonry. People who had very specific skills for specific projects or processes. But what I think, we're introducing a lot more skilled trades around mechatronics. And program. And design. But also, on top of that we are seeing now skilled workers being more flexible in what they're able to do. And that's just mainly because we just don't have the resources out there.

So, we're seeing now the call for manufacturers on these younger professionals coming up where they can't just be an electrician. They need to be a mechatronics engineer who knows how to wire a machine, but also knows how to address and problem-solve a PLC inside of a panel to get a machine fault to clear. So, when I look at where do our educators need to help manufacturers in building these new skill sets, I think it's the idea of taking traditional skilled processes, and how they're being digitally transformed.

And going back to that "welding" is a great example, right? We still need people to understand the processes of how welding works. We still need people to understand all the science and skills behind what makes a good weld. But I think on top of that, you might now need that same person who understands that, but understands the technical side. Maybe they're not the one that's doing 100 parts. They're having the robot do 100 parts. But they still need to leverage the skills to make sure what that robot's doing is correct. And I think the big value of that, Mike, is the fact we're removing that boring, dirty task from a worker and we're creating more value for them. Where now, they're not just doing the same boring, repetitive task weld over and over again. We're creating more value to them because they're learning a lot more skills. They're growing the ability to be more flexible and dynamic with their own skill sets. And I think that's what's just going to be the future of what we're seeing as skilled trades—at least, here in America.

Mike: That story about the transformation of welding, in that particular sense, is a good one. Our colleagues are educators at community and technical colleges. You know how it is in a classroom, right, Jake? You're often faced with explaining to the students, "Why are they learning this

stuff?" "Why do they have to worry about data?" They just want to get out there and do things. What should we tell them? Is there another story that maybe I could take into a classroom and say, "Look. This is why you have to understand this digital transformation. This is what's happening." Have you seen other industries that have been transformed by this? Other manufacturing examples?

Jake: Yeah, other than manufacturing, one of the biggest industries that we're seeing right now is warehouse and the E-commerce and distribution industries—just massively growing. And I think that's one reason why we're seeing a hard time getting jobs and workers here in manufacturing. It's because now, all of a sudden, you have places like Amazon (that are also heavily automating) buying a ton of robots, buying a ton of control systems, and all that stuff. Before the distribution center was miles and miles of just conveyor systems, with a lot of manual loading and unloading. Well now it's miles and miles of conveyor systems, with hundreds of robots and vision systems doing a lot of these tasks. Well, now you need engineers, which at one point in time would be classified as a "factory."

And I hate the term "factory" now. And I always correct people: We're not in a factory anymore! Factory is where my grandpa used to work back in the 1940s and 50s, when he worked at a printing press. And he came home every day covered in grease.

And I think what we're seeing now is all the industries are saying digital information and data is "king" in a lot of areas. And I don't want to take away from... There will always be industries that will not be that clean and glamorous view of what manufacturing is.

I drive to Chicago every month. Coming out of West Michigan, I always pass through Gary, Indiana. And Gary is one of the world's largest producing—along with, you know, Ohio, and the Rust Belt, and Pittsburgh and all that is— steel industry to foundry. There's nothing clean about what a foundry is. But it's still... It's the backbone of manufacturing and production here in America. And I think what we can do with jobs like that is: even though it's a very dark, dirty environment, how can we create more value and purpose? Well, if we can remove an operator from a dangerous, high-heat, repetitive task, let's say by

introducing a mobile flexible robot... And I'm just gonna say like a "Spot," for example. Now a Spot— you've probably seen on TV or on YouTube. It's the yellow dancing robot from Boston Dynamics.

Well, when you're walking around a foundry, there's a lot of processes out there that you have to look at and monitor: gauges, temperature meters, pressure valves, all that stuff. Well, instead of having an operator always walking up and down the stairs or walking across a high temperature area, what if you had that exact same person sitting behind the desk controlling a robot to drive around that facility instead? First, the operator's a lot safer. There's gonna be a lot less likelihood of injuries occurring. We're still doing that same process, but we're taking a job that would have been viewed as a very dark, dirty, dangerous job. And we're now making it a valuable digital job—still doing the same task. And that's what's gonna allow those manufacturers to attract that younger generation and want to be a part of it.

You know, there's a really cool study out there. I forgot the exact title of it. But it was a study done and asked, "Where Gen Z's (which are the age between 4 years old and 22 years old)...," and they said, "Where do Gen Z's... Where does this next generation want to go work?" Well, on the very top of the list, it was science, technology, engineering, and math—a STEM-based field. Behind that medical-based field. And there was a bunch of other industries. And on the way, way, way, way, way bottom of the list, second from the bottom (at 3.4%) was manufacturing.

Mike: Wow.

Jake: And for me, I always view it as, "Why is manufacturing not viewed as a STEM industry, right?" You look out there, and there's so much cool technology in the industry. How do we change that perception of manufacturing, but say "No, it IS this industry full of a lot of cool technology. And it's full of a lot of cool skilled trades that ARE technical.

Mike: I'm just thinking, as you mentioned, getting the skilled workforce is a big challenge right now, of course, for manufacturers. I mean, it's probably one of their number one challenges. But sometimes a manufacturer is also faced with upskilling their current workforce, right? As things

are changing. As you bringing in automation, or other technologies, how do you upskill a current workforce? What have you seen people do? Have they embarked on large-scale internal upskilling? Do they forge partnerships with training and education providers? Do they contract with vendors for internal training? Do they do all those things? What have you seen to bring up the existing workforce as things change?

Jake: Yeah, one of the big successes... I know here, out in west Michigan, as I know several manufacturers that work with a local community college to send them back to school to get trained on certain things. Now, that can be either PLC programming, that could be getting a Fanuc Robots Certification, that could be creating an IT-OT introductory class (so they better understand digital processes on their factory floor). So, what that does is that creates a massive value to keep existing employees and keep a high retention rate in our industry. That's a big success out there that I've seen: manufacturing companies working with local education systems to make that happen. I've also seen a lot of examples where they'll send them directly to specific vendor training. But I see more and more a lot of companies working with local colleges, or skilled trades, or Manufacturing Extension Partnerships—which is the MEP, which is part of the NIST (a federal-founded organization). And I think that's where we see recreating value with existing employees.

Mike: Okay, good. Jake, as we're wrapping up today, here's a question for you. How does one keep up? Okay? It's a funny question, right? But imagine now you're, let's say, you're working at one of these technical and community colleges. You're a faculty member. You know that you have to keep your courses (your program) current with industry. Because that's where the value is, right? So how do you keep up yourself? I mean, you're busy. A lot of stuff going on. You must deal with this in your own world. What should these people do? Should they subscribe to your own YouTube channel? I'm saying that tongue in cheek. (It's probably a good idea!) Should they go to some of those big manufacturing shows that you talked about? Or maybe they ask their local industry members to form a tight knit Advisory Committee that'll look hard at their programs to

see if it's correct. What do you think? What have you seen work to keep up?

Jake: Well, I named all three! That went right to my head right away! The first one is, I think, going and being a part of manufacturing-automation trade shows and conferences is important. Because there you can network with a lot of people in the industry about that. I was in Detroit a couple of weeks ago for their big Automate Show. And in there, there was a whole dedicated section for secondary education for skilled trades in manufacturing. Probably 30 booths there that were highlighting all the colleges and skilled trade centers that are having programs to continue to reskill and tool their existing workforce. So, I mean, great example there!

The other one is find people who are passionate about this industry. Who are always highlighting new technology. Who are creating and interviewing conversations. And like for me! I would say, "Hey, if you're listening to this podcast right now, go on LinkedIn, look up 'Jake Hall,' and you'll probably find me as one of the first searches: the 'Manufacturing Millennial.'" And I highlight content every day talking about what new technology, what thought leadership's happening in the automation industry, and around manufacturing, and around skilled trades.

And the great part about that is that it, a lot of times, will create really interesting conversations in the Comments. And I can't tell you how many times I've heard from people who say, "Oh, yeah, I met this person who made a comment around one of your videos, around one of your posts, and then we started talking. And then we were able to form some sort of a partnership from that." I think that's huge and massive.

The other thing absolutely, as you mentioned before: getting involved with local education STEM programs. Either by creating your own committee, getting involved with a local Manufacturing Extension Partnership program, or one of the other federally funded manufacturing organizations that are out there.

But I think the biggest thing is... Well, I always say this to manufacturers who say, "Jake, I can't find anyone to work with me." Or "I can't find anyone with the right skills I need to hire." And then my first comment, I always

go back to them and say, "When was the last time you went to your local community college and said, 'I am not finding these skill sets and I need local educators to put these skills into curriculum'?" And 90% of the time, they say, "I never thought of that!" And I said, "So, you're complaining that young kids graduating are not having the right skills. Yet, you're not willing to then go and talk to the people who create skills for young professionals about it?!"

A large majority of manufacturers—they're hiring their talent locally. So, if you're not locally engaging in your skilled trade centers, and your community colleges (that are pumping out Associate degrees), or your local engineering schools, or working with your local high schools even (to get involved with their STEM-based programs), you know, you're not helping yourself out! And you know what? A young kid who's going through high school, and sees that a local manufacturer is investing in them, and wants to give them skills—when they graduate, where do you think they're going to want to go to work? It's one of those things where I would say, "invest in your local community, because that's where you're gonna get your future employees!"

Mike: And that's the value proposition that you're portraying to the industry folks! And I think it's a good one. It makes sense, Jake.

Today, I just love that your comments that started with talking about all the data that's now flowing. How the manufacturing industries are being transformed by the data flow. The integration of AI that's filling a skill gap in a way. Very interesting thing.

I got a question though. I was thinking about this, as you're talking. You mentioned, you don't like to call it a "factory" anymore. What should we call it? What do you call these places, Jake? Can you name them in some way?

Jake: Yeah. I just view "factory" as this terminology that's built with this dark, dirty, dangerous environment. I mean, you could be at a manufacturing facility. And I think manufacturing has a lot more room for viewing things as a "technically leading industry." And I just always view "factory" as where my grandfather used to work. And working in a "manufacturing innovation center," or something along

those lines feels like we need to change what manufacturing is perceived as.

Mike: That's a great wrap up comment, Jake. We really appreciate your time today. I'm gonna put a link to your LinkedIn page, and some of your other resources, where you do talk about this emerging content and emerging technologies. And I think people would really appreciate that. Jake, we appreciate your time today and talking about the future of work.

Jake: Thank you so much for having me on.

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Mike: All right. Listeners, today you heard Jake talk about the drivers for some of the emerging technologies in manufacturing. And also, we discussed, "I just want to keep up with these things."

Well, that's your task for today. In the Show Notes there's a link to content that Jake has provided that will help you prepare for the emerging technologies associated with the future of work.

Today, I want to also acknowledge John Chamberlain, our Audio Engineer, who does a great job of producing these podcasts. Thank you, John. And Ann-Claire Anderson, Principal Investigator of our project. And thank you, our listeners—for Preparing Technicians for the Future of Work!

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