

Reigniting the Educational Infrastructure

How data-driven education, virtual reality, and sociology can assist the skilled workers crisis

Matthew Jaster, Senior Editor

For Related Articles Search

workforce development

at geartechnology.com



Students learn about NASA technologies during the Smartforce Student Summit at IMTS 2022. Photo courtesy of IMTS.

For an industry that prides itself on cutting-edge technologies, manufacturing doesn't always practice what it preaches in terms of education and training initiatives.

"Manufacturing is one of the most technology-rich industries, right? They love talking about the Industrial Internet of Things (IIoT), automation, robotics, additive manufacturing, etc., yet you go to the training aspect and it's much more archaic than that," said Jeannine Kunz, chief workforce development officer at SME. "We do ourselves a disservice with these technology advancements when we don't take advantage of them."

The story of finding—and keeping—skilled workers in manufacturing has been told for decades. It's always the "next-generation," that's going to swoop-in and create a manufacturing renaissance both here and abroad. Yet, the conversation remains largely unchanged since as far back as the 1980s.

"This conversation is a bit like the movie *Groundhog Day* in the sense that we keep having the same discussion over and over again about addressing the needs of the skilled workforce," said Chad Schron, senior director for Tooling U-SME. "Unfortunately, there's such a pressing need to get parts out the door that many organizations can't justify taking the time needed to learn the skillsets to remain competitive."

Leadership has the best intentions when it comes to training and education, but the reality is that many shop floors are understaffed, underpaid, and have a difficult time developing in-house talent. Companies have looked at early education recruitment, mentorships/internships, technical schools, job fairs, trade shows, the list goes on and on, but the crisis remains as prevalent as ever.

"Everyone says the lack of skilled workers is still the number one challenge across manufacturing, but it doesn't get treated like the number one challenge," Schron added.

Those involved in manufacturing, however, saw optimistic signs during The Smartforce Student Summit at IMTS 2018 where broken attendance records followed a growing national conversation around STEM education. As the Smartforce Student Summit reconvened in September 2022, signs continue pointing toward advanced education and training strategies.

"Our content is answering the biggest needs of our manufacturing customers. They are looking to bring in new hires that can utilize some of these skills and enhance productivity on the shop floor," Schron said. "We're hearing these great stories from different age groups about how e-learning, hands-on training and virtual reality (VR) can benefit everybody."

Expanding the Toolbox

The average job shop can ill-afford to shutdown a portion of the workspace for training today. After COVID hit, it's clearly an "all-hands-on-deck" situation where product is moving out the door at an accelerated rate for many manufacturers. How can you justify sending three of your best machine operators away for training for a week or two? Organizations like Tooling-U SME, THORS, and Tulip are taking a closer look at adapting training resources for today's manufacturing challenges.

Classroom work, for example, is being supplemented by hands-on training workshops. Online learning tools are expanding to give today's trainees scheduling flexibility. Remote VR sessions are replacing machine tool

demonstrations to offer cost, safety, and time benefits. These resources are supporting the fact that the old way of conducting business—Monday thru Friday, 9:00 am to 5:00 pm—is no longer a viable option in today’s business climate.

“I think the greatest challenges to finding and retaining manufacturing employees include reaching students who are ready to transition from school to employment and finding potential employees who are trained on the latest manufacturing technologies,” said Christine Walker, general manager, THORS eLearning Solutions.

THORS (The Helpful Online Resources Site) was envisioned by Senthil Kumar. The story goes that Kumar had many questions that his managers had very little time to answer at the beginning of his manufacturing career. His quest for more knowledge led him to create an online resource that captured decades of manufacturing and engineering experience on a single platform. Today, THORS has grown into THORS eLearning Solutions, offering a growing library of online courses and productivity tools and looks at education and training from different perspectives.

“Training today includes interactive elements like animations, AR/VR, which allow people to train even if they can’t make it into the shop. Training can be continuous no matter where the employee is located,” Walker said.

THORS eLearning is providing a variety of educational options to engage the next generation of skilled workers. This includes interactive, cloud-based learning solutions, industry-specific content that mirrors real manufacturing methods and courses developed by combining industry knowledge with theoretical insights presented with graphics, animations, and interactives.

The idea is to replace textbooks, enhance lectures and provide learning tools that appeal to the “YouTube generation,”



Tooling-U-SME’s booth at IMTS 2022 featured virtual reality demonstrations as part of the company’s Virtual Labs. Photo courtesy of Tooling-U-SME.

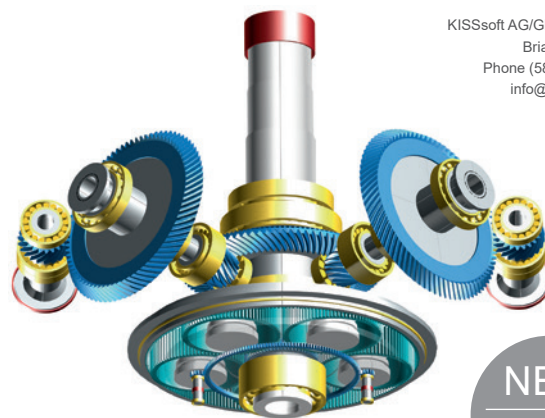
COMPACT. CONSISTENT. COMPETITIVE.

kapp-niles.com



KAPP NILES

precision for motion



KISSsoft AG/Gleason Sales
Brian P. Stringer
Phone (585) 494-2470
info@kisssoft.com

NEW
Release
2022

KISSsoft Features

- Influence of flank waviness on transmission error
- Tooth root fatigue strength from time series
- Bearing contact stress with modified raceways
- Bearing inner geometry from Schaeffler and Timken
- Optimized bolt module interface

Trial version requests via www.kisssoft.com

A Gleason Company **KISSsoft**

according to Darren Spotz, account executive at THORS. Spotz spoke with college educators and learned that most engineering courses are information driven. This traditional lecturing structure fails to engage student interest and motivation.

THORS meets these challenges by providing a baseline comprehension of the terminology as well as a focused understanding of the various manufacturing processes before a lecture takes place. Self-paced online assignments allow students to dive deeper into the content outside of the classroom giving more time for hands-on lab activities and exercises. This ‘Show versus Tell’ method allows students to gain a better understanding of manufacturing procedures using videos and animations. Spotz said—in many cases—these interactive assignments can give the students a better understanding of the manufacturing process than they would standing in front of the machine.

“The future skilled workforce may know how to use technology, but they may not know the fundamentals of how that technology came to be. The foundational understanding of why materials behave as they do, or what processes can lead to what results, or how to recognize defects to troubleshoot an issue are not typical topics taught in school,” said Leslee Sambor, head of custom course development, THORS eLearning Solutions. “We need to assist these students with a background in manufacturing topics so that they can be better prepared to be problem solvers in a world where manufacturing meets technology.”

More importantly, many of these resources are creating learning tools that appeal to a wide range of potential employees.

“Our training is enjoyable, we present the fundamentals of manufacturing with colorful graphics and dynamic interactives, that make it fun to learn. Manufacturing is presented in a way that is exciting and engaging because our own staff is passionate about creating learning materials that are visually appealing and relatable. We believe that when you enjoy what you are learning, you have better learning retention,” Sambor added.

The State of Talent in Manufacturing

Perhaps one of the greatest mistakes in manufacturing education in the past was not paying close enough attention to the opinions of the workers on the shop floor.

Madilynn Angel, head of marketing, Tulip Interfaces, discussed skilled worker challenges in her presentation, “Why Upskilling and Digital Augmentation are Key to Winning the War for Talent,” during IMTS 2022.

Angel described how a technology tradeshow like IMTS boast lots of vendors and showcases the latest and greatest in machine technology, but rarely focuses on the women and men on the frontlines that are thinking about the usability and design of these technologies.

“The frontline workers, historically, have been the most underserved by innovation and technology,” Angel said. “Operators need to be more a priority from a performance, training, and support point of view.”

Angel said this could be achieved by digitally training workers quicker, accepting feedback and making their general workflow higher quality. “Other industries, have already adopted

SMT

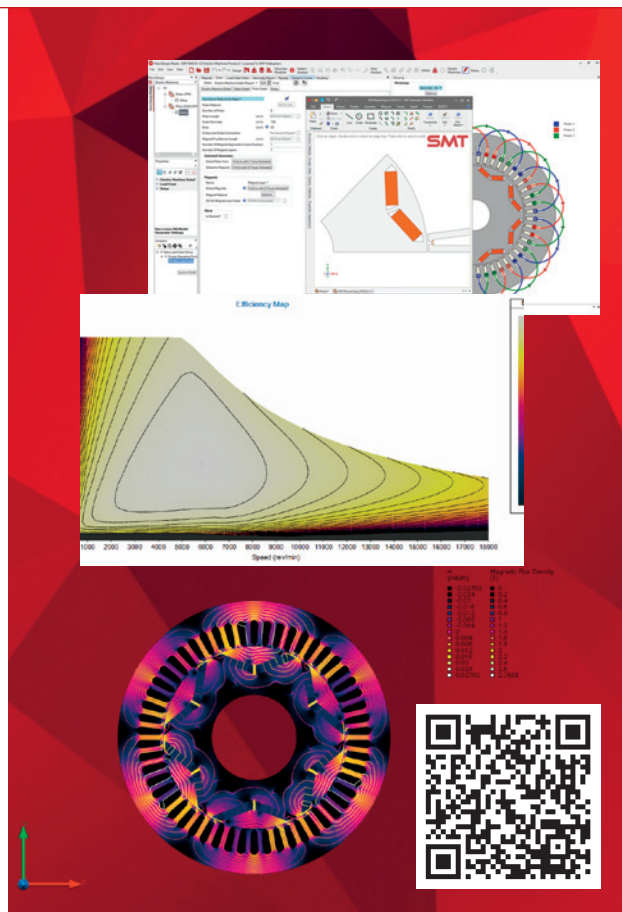
Electric Powertrain, Transmission & Electric Machine Design, Analysis & Optimisation

MASTA enables engineers to design robust, efficient, light weight and quiet transmissions and electric machines.

Run and generate reports on a wide variety of component and system level analyses including durability, NVH, efficiency & more.

Visit smartmt.com/masta to learn more or scan the QR code to request an evaluation.

MASTA¹²



this approach and it's making it more difficult for manufacturing to stay competitive from a talent perspective."

There's a need to fill many important positions in the job market, but these are not exclusively manufacturing and engineering careers.

"The war for talent is still prevalent in manufacturing. A competitive labor market, coupled with a wave of generational turnover is increasing pressure on manufacturers to retain workers more effectively. To be able to do that, manufacturers need to understand what workers are looking for and how to build a system that can service them," Angel said.

It's no surprise Angel's background in sociology comes into play when discussing the human elements of training and education. She described a workforce that is competing on a much larger stage in 2022 than in the past.

No matter what field we're talking about—big tech, healthcare, manufacturing, etc.—Angel still expects 25 percent of a company's workforce to leave for a new opportunity within a year.

"40 percent of manufacturing workers left their jobs for other opportunities in 2021. A 60 percent higher rate than other industries. This is particularly challenging for an industry that is trying to ramp up as well as respond to increase business and consumer demands," Angel said.

Many job descriptions in manufacturing, for example, require an average of four years of experience. "After four years of school, they won't consider certain applicants unless they've had an additional four years of field experience. So, you're looking at eight years in some cases to meet the basic requirements for these manufacturing positions."



Smartforce Student Summit, IMTS 2022. Photo courtesy of IMTS.

Angel said this problem will continue to grow if thought leaders can't come up with new ways of retaining manufacturing workers and developing a talent pipeline.

"Engineers are naturally inclined to solve problems, they like building things, they're excited about technology and they're invested in the manufacturing and engineering fields," she said. I believe the focus needs to be on the individuals and less on the companies trying to attract them."

Tulip was started by a team of engineers out of the MIT Media Lab. The platform is based on over ten years of research

RESIDUAL STRESS MEASUREMENT

State-of-the-art facilities
and superior service.

No compromises.

www.protoxrd.com

1-734-946-0974
info@protoxrd.com

PROTO
X-RAY DIFFRACTION





Meta Quest 2 headsets were used at the Tooling-U-SME booth to showcase how VR can provide training and educational benefits. Photo courtesy of Tooling-U-SME.

in frontline operations, led by experts on the Internet of Things (IoT), machine vision, human-computer interaction, augmented reality, and machine learning. The company understands that automation has done so much for frontline operations, but the most complex tasks still need to be run by people.

Ready Player One: Manufacturing Edition

In addition to digital resources, VR is not just for gaming or traveling the world from the comforts of your living room anymore. It's a multigenerational tool being used to serve training and education platforms. Tooling U-SME showcased its new Virtual Labs during IMTS 2022. This innovative, immersive virtual reality training curriculum bridges the gap between *learning and doing* to enhance productivity, increase safety, lower costs, and engage a younger workforce.

Using a Meta Quest 2 headset or through their desktop or laptop computer, trainees tap into applied learning through virtual reality. By providing realistic, immersive experiences for learners to work with simulated equipment, Tooling U-SME Virtual Labs accelerate competency for real-world manufacturing situations.

"We're always looking at new ways to create and deliver content," said Schron. "Equally important is the way this content is delivered. It used to be lectures, VHS tapes, DVDs, e-Learning and now VR is the next step in engaging the manufacturing workforce. VR has been around forever, but now we're able to leverage this technology much more cost-effectively."

Gone are the days of \$20,000 VR headsets that worked only half the time and forced participants to be plugged into a computer station with cords restricting movement. Today, anyone can purchase a VR headset for a couple hundred dollars and roam freely across rooms with minimal restrictions.

"We don't think it's going to replace our e-learning or instruction-led training, but it's just another tool in the toolkit for us to deliver new content," Schron added.

During beta-testing of the VR tools, Schron found that the stereotype that VR headsets are for the younger generation is highly misleading.

"I can't tell you how many older people love this technology. We have this great photo from IMTS where there's a 10-year-old kid using the VR headset right next to an 85-year-old guy using one and they're both engaged in the technology. It's really a great educational tool for all generations," Schron said.

Schron added that everything is technology-driven today. Machine operators are utilizing 5- and 7-axis machines, but

they don't know how to use the latest controls. The kids coming out of college know the software and technology but might not be as comfortable standing in front of the machine tool.

"We're hearing these great stories from across generations about how VR training can become a part of their educational development," Schron added.

Another key component is the safety benefits.

"When we think about schools, they don't get access to a lot of manufacturing equipment because it's so expensive and there's also a variety of safety issues," Kunz said. "It's a lot cheaper to break a tool in the virtual world or in a classroom than on the shop floor."

Virtual reality gives students the ability to get as close to the machine shop as possible without worrying about costs, time or safety issues that might occur.

"Additionally, workers can practice different skills and gain exposure to new technologies without having to shut down a portion of the manufacturing floor for training purposes. These are kind of the added benefits of creating a virtual training environment," Schron said.

At the end of the day, VR is about establishing the competencies and knowledge a new worker will need to be successful on the shop floor.

Based on the concept of Learn-Practice-Perform, the Virtual Labs are an efficient way to safely build knowledge that contributes to confidence and proficiency by learning new



Students learn more about the ARTEMIS project during IMTS 2022. Courtesy of IMTS.

information through standard instruction, practicing skills in a safe, virtual environment, and performing tasks and applying knowledge on the job or in the classroom.

“Welding is a great example of this. First, you must know a lot to be a great welder, then you need the skills and muscle memory to do the welding required for the job. You’re not going to learn to be a welder by taking e-learning classes. VR allows you to learn about welding, practice welding techniques in a virtual environment and then demonstrate those skills in a real-world application,” Schron said.

Embracing the Art of Engineering & Manufacturing

The future of training and education in manufacturing starts and ends with the trainees.

“The next generation of workers grew up with technology as no other generation has. They are accustomed to visual learning, understanding digital media, coding, and all things internet-related, and they are used to turning to technology for problem-solving,” Walker said. “The leap from their childhood experience with screens to technology in the workplace is virtually seamless.”

As we embrace this new technology, it’s important to understand that these resources must continue to evolve. Sambor is excited by the notion of a blended approach utilizing online, e-learning, visual elements and AR/VR tools to change the curriculum. The human element, however, is still the most important aspect of workforce training.

The manufacturing industry needs to much more transparent, “a guidance counselor of sorts.” It’s important for a CEO to share their story and life advice. This allows the people of an organization to become more accessible and tangible so that manufacturing isn’t always about materials and products.

“Building and fostering a culture of being a great place to work is one very important thing but going beyond that to help those employees feel a sense of pride and accomplishment in how they contribute to their communities and the overall state of the economy is important,” Sambor added. “Showing valuable employees that their personal growth and worth mean something to your organization speaks volumes.”



Spiral Bevel Gears

- Spiral & straight bevel gear manufacturing.
- Commercial to aircraft quality gearing.
- Spur, helical, splined shafts, internal & external, shaved & ground gears.
- Spiral bevel grinding.
- Midwest Transmissions & Reducers.
- ISO compliant.



Midwest Gear & Tool, Inc.
15700 Common Rd., Roseville, MI 48066
Tel: 586.779.1300 mwgear@midwestgear.net



PRECISE. POWERFUL. PRODUCTIVE.

kapp-niles.com



KAPP NILES

precision for motion