AUTODESK UNIVERSITY

PM502253
Future of Manufacturing: ASME's Research on the Roles, Workflows, and Skills to achieve Industry 4.0 business outcomes

Dr. Ashley Huderson, Director of Engineering Education and Outreach, American Society of Mechanical Engineers

Learning Objectives

- **Learning Objective 1:** Discover the industry trends driving digital transformations in manufacturing.
- **Learning Objective 2:** Hear how the drive for design for manufacturing, automation, and sustainability are challenged.
- **Learning Objective 3:** Gather research results that predict the manufacturing roles, workflows, and skills changes ahead.
- **Learning Objective 4:** Learn what industry, education, and government can do to advance manufacturing.

Description

Hear from ASME experts as they share the in-depth research results and insights that predict how new workflows will shape the future of work in manufacturing throughout the next five to ten years. A panel of industry and technology experts will discuss the overarching industry implications and business outcomes driving the advancement of manufacturing and how the roles of mechanical engineers, manufacturing engineers, and machinists will evolve—and we'll identify the new set of hard and soft skills required to succeed. Learn how new workflows are taking hold in the industry. And discover the workforce training, technology, and operations infrastructure that is required to achieve fundamental improvements in productivity, quality, and profitability. Finally, learn how industry, academia, and government can support the development of the skills and knowledge among students and professionals.

Speaker(s)

Dr. Ashley Huderson, Director of Engineering Education and Outreach, ASME

Dr. Huderson is a native of New Orleans, LA, and completed her undergraduate training at Spelman College (2006), a certificate in Health Policy (2012) and doctoral work at Meharry Medical College (2013). Her post-doctoral work included a fellowship at Georgetown University Lombardi Cancer Center's Office of Health Disparities and Minority Research (2015) and a 2015-2017 American Association for the Advancement of Science, Science and Technology Policy (AAAS S&T) Fellow in the Engineering Education and Centers' division (EEC) at the National Science Foundation. During her two years at Georgetown University her interest in exposing and helping minority students navigate their STEM careers flourished as she accepted her first adjunct position, affording her the opportunity to teach and advise undergraduate and graduate level students. It was during this time that she decided to turn her sights completely to diversity and inclusion issues within STEM education and embark on a career that would allow her to make a meaningful contribution on diversifying the scientific workforce and empowering those interested in STEM, regardless of their background. Currently Dr. Huderson serves as the Director of Engineering Education and Outreach at the American Society of Mechanical Engineers, where she leads the Engineering Education and Outreach department in designing, planning, organizing, overseeing and implementing educational programs and projects that define ASME's role and impact in K-12 STEM Education, Engineering Education and Scholarships. She has published over 12 peer reviewed articles, including two book chapters on Urban STEM education and counter spaces for minority women in STEM. She has also been the recipient of several awards and honors including the 2019 McD #35

Alum of the Year award, 2020 BEYA Modern-Day Technology Leader award, and the 2020 UNCF WIAC Grace Walker Phillips Leadership Award.

Alexander Stern, PDMS Platform and Cross-Industry Strategy Lead, Autodesk GmbH

Peter Deppe, Co-Founder & CEO, KUHMUTE

From supporting rights for student-athletes vs the NCAA, to challenging the status quo within Urban Mobility in a land built for cars, Peters' goal is to change the world for the better in his own unique ways.

He's a Kettering University graduate who founded KUHMUTE together with fellow KU grad Scott Spitler in 2018 during the early rise of Micromobility. This was mostly due to the new form of dockless escooters that roamed the world, and caused havoc for cities. Together, Peter and Scott, understood there should be an EV charging network experience, but agnostic to any form factor smaller than a car—for both shared and owned.

KUHMUTE is a world-class locking & charging manufacturer that supports mobility services all over North America, fulfilling the need as the only Universal Charging Network for Micromobility.

Bryce Heventhal, Senior Manager Technical Marketing, Autodesk

Demonstrating practical workflows for the future of product development is my passion. I manage a team of designers, engineers, and manufacturers to ensure we create stories in the voice of the customer. My current role allows me to balance go to market strategy with product development workflows. I'm a CAD, CAE, and CAM enthusiast. I have 10 years of experience in the product development process. I am passionate about new developments that automate any stage of the process.

James Warrick, Managing Partner, Beacon Technology Partners LLC

AUTODESK UNIVERSITY

Future of Manufacturing

Fact sheet

To help industry and academia develop an advanced Industry 4.0 manufacturing workforce, the American Society of Mechanical Engineers (ASME) and Autodesk conducted a research study to identify the future workflows and skills needed for mechanical engineering, manufacturing engineering, and CNC machinist roles over the next decade.

Below are key findings from the resulting Future of Manufacturing white paper report.

Essential changes to three roles in Industry 4.0

Mechanical engineers

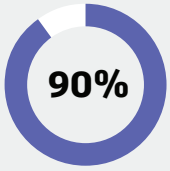
- Mechanical engineers will continue to improve upon engineering designs and become more involved in manufacturing implementations and processing production data results to improve designs for manufacturability.
- 60% of industry believe interdisciplinary engineering knowledge will increase for mechanical engineers over the next 5-10 years. This was consistent across small, medium and large manufacturers.
- Continued emphasis on "soft" skills like problem solving and communication skills to complement their growing focus in software tool functionality, data analytics, programming, and "smart" and sustainable design techniques.

Manufacturing engineers

- The manufacturing engineer position will become even more interdisciplinary as it blends skills with both mechanical engineers and CNC machinists.
- Within industry, 72% of respondents believe human-robotic interaction will increase and 74% believe automation will increase for this role.
- Similar to mechanical engineers, future manufacturing engineers will continue to need enhanced communication skills and will be expected to incorporate additive manufacturing and utilize AI/ML, digital twin and data analytics to improve throughput and efficiencies.

CNC machinists

- CNC machinists' roles will evolve dramatically, from a CNC operator to an engineering technician who programs CNC machines, and over time, they will take on other manufacturing engineering functions.
- The factory environments in which future CNC machinists will work will become more complex through the use of cobotics, 3D printers, AI/ML and multi axis machines, and will require greater mental dexterity (such as programming) and productive collaboration with engineering teams.
- According to industry professionals, becoming increasingly fluent in CAD/CAM software and programming will enable machinists to increase their use of technologies, including five-axis machines (65%), additive/hybrid manufacturing (66%), and robotics/cobotics interaction (65%).

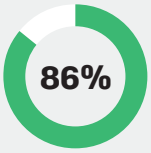


Across all three roles, 90% of all survey respondents stated that teaching deeper Design for Manufacturing knowledge was the most impactful way for academia to develop the future manufacturing workforce.

Additional findings

Communication is paramount

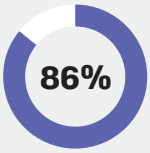
The research suggests an increased focus on exchanging data between groups of people through cloud collaboration. Digital transformation of roles will shape communication across roles as workflows change.



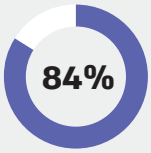
of total respondents strongly or somewhat agreed that there is a need for a collaborative design process between all three disciplines

Certifications show specialization

Academia expects to promote supplementing degrees with certifications. Degrees will likely serve as the foundation, while certifications will showcase specialized skills.



of academics embrace less reliance on degrees and welcome more specialized certifications developed in partnership with industry



of all survey respondents believe employers and academia should partner on new types of certification programs based on employer needs

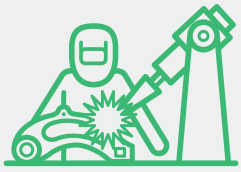
Academia embraces emerging tech

Academia embraces new tech like GD, AI/ML, AR/VR.

For mechanical engineers in the next 5-10 years, **80%** of academics believe GD application will be an important skillset and **67%** believe AI or ML will be an important product design skill

CNC machining is changing rapidly

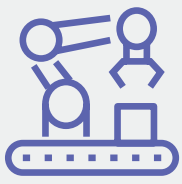
CNC machinist role will change the most over the next decade.



For CNC machinists over the next 5-10 years, **65%** of industry believe use of robotics will increase and **62%** believe use of programming skills to program smart products will increase

Mechanical engineers need interdisciplinary skill sets

No more "throwing it over the wall." Mechanical engineers need to have applied knowledge throughout the manufacturing process.



For mechanical engineers over the next 5-10 years, **79%** of industry believe electrical and software engineering will increase and **77%** believe system engineering skills will increase

AUTODESK UNIVERSITY

About the study

Autodesk and ASME conducted research over three phases, including a literature review, in-depth phone interviews with 30 thought leaders, and a survey with 324 respondents from the US, Canada, and UK. Respondents were chosen from industry based on their involvement in manufacturing physical, discrete or mechanical products and from academia based on their instruction of mechanical or manufacturing engineering or CNC machining.

Resources

For Industry 4.0 to succeed, manufacturing education must transform

https://autode.sk/Future-of-Manufacturing-news

Future of Manufacturing white paper

http://autode.sk/ASME-download-report

Transforming Manufacturing Education e-book

https://autode.sk/Transforming-Manufacturing-Education-e-book

Research inspired ALP workshop sign-up page

https://autode.sk/Request-a-Fusion-360-workshop

Future of Work campaign landing page

https://autode.sk/Transforming-Manufacturing-Education

Folloze board

https://bit.ly/3BjwWfI

Educator Resource Center for CAM

https://autode.sk/Manufacturing-Resources

Educator Resource Center for CAD

https://autode.sk/Mechanical-Engineering-Resources

Media contacts

Drew Esposito: drew.esposito@autodesk.com

Emily McNab: emily.mcnab@autodesk.com

Campaign contact

Christina Batelli: christina.batelli@autodesk.com