INDUSTRY 4.0 WORKFORCE SUMMIT

A Live Webinar Series on Modernizing Engineering Education

Presented by ASEE
In Partnership with Automation Alley
Leveraging the Digital Domain for Workforce Development

How do We Scale-Up Industry-Education Collaboration?
Welcome

David Pistrui, Committee Chair

Sheryl Sorby, ASEE President
Thank You to Our Sponsors
Creating Lasting Value in the Age of AI and IoT

Intel
Irene Petrick, Ph.D.
Senior Director of Industrial Innovation

Arizona State University
Kyle Squires, Ph.D.
Dean, Ira A. Fulton Schools of Engineering
Creating Lasting Value in the Age of AI + IoT

Irene Petrick, Ph.D.
Senior Director of Industrial Innovation

ASEE Industry 4.0 Workforce Summit
October 9, 2020
500+ Voices from the Field

• **2018** – Co-evolution of workers and manufacturing operations in today’s factories

• **2019** – What strategies and tactics accelerate AI +IoT activities

• **2020/21** – The *Manufacturing 100* a longitudinal study

Reports available at [https://www.linkedin.com/in/irene-petrick-bb79521](https://www.linkedin.com/in/irene-petrick-bb79521)
Digital Transformation is a Holistic Problem

- 73% of participants identified the holistic complexity of advanced technologies as a significant barrier to digital transformation

- Systems of systems approach to attain sustainability

### TOP FACTORS DRIVING COMPLEXITY

- **60%** Operational Technology
- **55%** Legacy Systems
- **54%** People (e.g. operators, customers)
- **43%** Enterprise Systems
- **38%** Business Characteristics
- **36%** Site infrastructure (e.g. servers)
- **35%** Work processes and flows
- **33%** Physical environment characteristics (e.g., temperature, dust, weather, air quality, noise, toxins, lighting)
- **33%** Connectivity
- **14%** Company standards & guidelines
- **12%** Facility or site characteristics (e.g. building materials or equipment that would disrupt signals, physical security, utilities)
- **11%** Geographic or local differences especially related to regulations
- **10%** Physical layout of space especially free space
“The biggest challenge is getting knowledge from all of these new things for me. Every time there are new updates and new products, our plan needs to be updated too. There is no finish line.”

Sales Operations, 
End Manufacturer

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>TECHNICAL SKILL GAPS that prevent us from benefiting from our investment</td>
<td>36%</td>
</tr>
<tr>
<td>DATA SENSITIVITY from increasing concerns over data and IP privacy,</td>
<td>27%</td>
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<tr>
<td>ownership, and management</td>
<td></td>
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<tr>
<td>LACK OF INTEROPERABILITY between protocols, components, products, and</td>
<td>23%</td>
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<tr>
<td>systems</td>
<td></td>
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<tr>
<td>SECURITY THREATS both in terms of current and emerging vulnerabilities in</td>
<td>22%</td>
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<tr>
<td>the factory</td>
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<tr>
<td>HANDLING DATA GROWTH in amount and velocity as well as sense-making</td>
<td>18%</td>
</tr>
<tr>
<td>SCALABILITY ROADBLOCKS to accommodating growth without any business or</td>
<td>18%</td>
</tr>
<tr>
<td>performance loss</td>
<td></td>
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<tr>
<td>OUTPACING MARKETABILITY by our solutions getting too far ahead of</td>
<td>11%</td>
</tr>
<tr>
<td>customer and partner capabilities</td>
<td></td>
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<tr>
<td>MAINTAINABILITY CHALLENGES that make the advanced systems difficult to</td>
<td>10%</td>
</tr>
<tr>
<td>keep up and running</td>
<td></td>
</tr>
<tr>
<td>NOT TRUSTING advanced systems due to lack of transparency about smart</td>
<td>8%</td>
</tr>
<tr>
<td>actions and outputs</td>
<td></td>
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</tbody>
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### SKILLS TODAY
What adds the most value now

1. Basics of modern programming or software engineering
2. Manufacturing
3. Great communication skills
4. Innovation skills (e.g. brainstorming, design thinking)
5. Traditional IT skills
6. Data science
7. Systems thinking
8. Analytical and problem-solving skills
9. Hardware skills including development
10. Influencing skills
11. Business skills
12. Digital experience skills (e.g. user experience)
13. Ability to work on a multi-disciplinary team
14. Project or program management
15. AI and machine learning

### SKILLS FUTURE
What to grow or strengthen for the future

1. Deep understanding of modern programming or software engineering techniques
2. Digital dexterity, or the ability to leverage existing and emerging technologies for practical business outcomes
3. Data science
4. Connectivity
5. Cybersecurity
6. Manufacturing skills
7. Hardware skills including development
8. AI and machine learning
9. Collaboration and communication skills
10. Integration
11. Influencing and stakeholder management skills
12. Data management skills

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**MOST MENTIONED SKILLS**

- Workstation Safety Tracking for Factory
Problem Framing is a Critical Success Factor

82% What to Ask about Context
63% What is Most Important to Know about Impact on Processes or Tasks
  • What are data flows? Particularly what are data sources, what data is required for success, what are data related risks, and what is data quality.
  • What are end-to-end processes and steps including what drives variances and manufacturing sector-specific differences.
  • What is required for compliance.
56% What is Most Important to Know about Technology in Use
  • What systems (particularly legacy and smart systems) are in place; what are the technologists here familiar with (e.g., OS, languages, tools).
  • What infrastructure is in place particularly connectivity, data management, and cybersecurity capabilities. Also, what state is it in (e.g. is it up-to-date) and who supports it.

33% What is Most Important to Know about the Physical Environment of deployment
  • What are environmental factors and risks particularly environment extremes.
  • What is space availability and are there any structures that would disrupt signals (e.g. walls).
  • What site-specific variances.

89% What Makes Proposed Capability Mix the Right Solution Here
82% What is Capability Feasibility Here
  • What is technical feasibility here
  • What is financial viability here
  • What is business viability here
  • What is operational feasibility here
82% What Makes Smart Necessary
  • Is there a viable less complex alternative
  • Is it significantly better than do nothing alternative

80% What is Potential Opportunity to Improve
69% What Needs to Change
  • What pain point or problem to solve
68% What is Desired Outcome or Future State
  • What are use cases and priorities
  • How will success be measured

23% What to know about business (e.g strategic goals, business models)

21% What to know about customers and end users of capability (e.g. motivation to buy or use)

“What sets the successful apart is their ability to ask the right questions at the start of projects.”
COVID and Beyond: Changes We Anticipate

- Greater emphasis on automation & robotic solutions
  - On the factory floor
  - In warehouses

- Greater emphasis on agility and resilience
  - Compute agility from the edge to the cloud
  - Equipment repurposing and restaging
  - Supply chain flexibility and responsiveness

- Greater emphasis on the human in the loop
  - Effective remote work
  - Personal and environmental safety
  - Transform work as we know it
  - Greater emphasis on worker health

- Accelerated innovation
  - At the boundaries (e.g., materials, biomedical, robotics, material handling, remote monitoring)
  - From unexpected sources (e.g., experts, novices, crowdsourcing/opensourcing, new teams)
  - Around unexpected things (e.g., low margin, bottleneck parts)

"Like all the challenging times, any company that isn't strong enough and smart enough to cope with this change will be excluded from the market."

-- Plant Manager, End Manufacturer, Australia
“From a leadership perspective you have to continue to inspire the whole team … and you've got to get everybody on board. It's not an easy message to deliver but you got to inspire people to say – this is where our company is going, do you want to get on the bus or you not?”

DIRECTOR OF SALES,
INDEPENDENT SOFTWARE VENDOR
Five Takeaways for Educators

- Holistic complexity of digital transformation requires interdisciplinary savvy
- Digital skills create competitive advantage in industrial settings
- Problem framing is as important as problem solving
- New ways of innovating and collaborating will be needed
- Leadership skills must include convincing and engaging others
Adaptive Space: Transforming into Agile Organizations

Amazon Web Services
Michael Arena, Ph.D.
Vice President, Talent & Development

University of Detroit Mercy
Darrell Kleinke, Ph.D.
Professor of Mechanical Engineering
Transforming into Agile Organizations

www.adaptivespace.net
Average Company Lifespan on the S&P 500 Index

Projection of 15 years
Entrepreneurial Pockets

Operational System
Adaptive Space: positively disrupting

Bridge connections increase **Discovery** by 25% & **Diffusion** by 30%
Are Universities Going the Way of CDs and Cable TV

...Like the entertainment industry, colleges will need to embrace digital services in order to survive.
Why Higher Education Needs to Be Disrupted

1. Employers need skills, not degrees
2. Students want jobs, not theory
3. Students are paying more and more ... to get less and less
4. Universities prioritize research ... over teaching

~ HBR (2019) Chamorro-Premuzic and Frankiewicz
Session Recap, Research Overview, and Sneak Peak

Siemens
Dora Smith
Senior Director, Global Academic Programs

University of Detroit, Mercy
David Pistrui, Ph.D.
Committee & Program Chair
Recap

Creating Lasting Value in the Age of AI and IoT

Adaptive Space: Transforming into Agile Organizations
Sneak Peek

Accelerating Engineering Education Reform to Meet the Demands of the Talent Pipeline

Led by Ken Ball
Dean of the Volgenau School of Engineering
George Mason University

Same time, same place, 6 weeks from today!
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Communities of Practice

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Government | Society

Framework for driving academic reform

Learn | Make | Mindset | Virtual

https://engineeringunleashed.com
Summit Series Schedule

Friday, January 28th at 12 PM EST
Friday, March 12th at 12 PM EDT
Monday, April 19th (Engineering Dean’s Institute)
June 26-29 at ASEE Annual Conference
October 13-14, 2021 at the Omni Shoreham, Washington, DC
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The Future of Engineering Is Here.
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