



# 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

**SIEMENS**

*Ingenuity for life*

**ENGINEERING  
UNLEASHED**   
POWERED BY KEEN



**Kelly Engineering**



Volgenau School  
of Engineering

The Future of Engineering Is Here.

# 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

intel®

ASEE

# 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>

*77 Inches of Customer Obsession*



150+ hours of interviews  
7000 data sets  
500++ participants  
400+ companies



# 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."*

## Biggest Challenges in Digital Transformation

Sales Operations,  
End Manufacturer

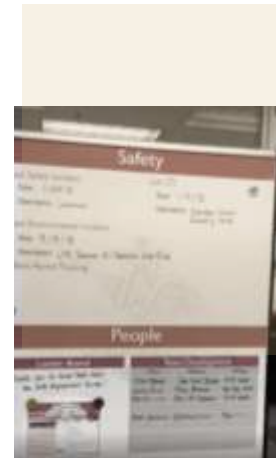
- 36% TECHNICAL SKILL GAPS** that prevent us from benefiting from our investment
- 27% DATA SENSITIVITY** from increasing concerns over data and IP privacy, ownership, and management
- 23% LACK OF INTEROPERABILITY** between protocols, components, products, and systems
- 22% SECURITY THREATS** both in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

# In the Future, Top Five Needed Skills are DIGITAL

MOST MENTIONED SKILLS

SKILLS TODAY What adds the most value now	SKILLS FUTURE What to grow or strengthen for the future
<ol style="list-style-type: none"> <li>1. Basics of modern programming or software engineering</li> <li>2. <b>Manufacturing</b></li> <li>3. Great communication skills</li> <li>4. Innovation skills (e.g. brainstorming, design thinking)</li> <li>5. Traditional IT skills</li> <li>6. Data science</li> <li>7. Systems thinking</li> <li>8. Analytical and problem-solving skills</li> <li>9. Hardware skills including development</li> <li>10. Influencing skills</li> <li>11. Business skills</li> <li>12. Digital experience skills (e.g. user experience)</li> <li>13. Ability to work on a multi-disciplinary team</li> <li>14. Project or program management</li> <li>15. AI and machine learning</li> </ol>	<ol style="list-style-type: none"> <li>1. Deep understanding of modern programming or software engineering techniques</li> <li>2. Digital dexterity, or the ability to leverage existing and emerging technologies for practical business outcomes</li> <li>3. Data science</li> <li>4. Connectivity</li> <li>5. Cybersecurity</li> <li>6. <b>Manufacturing skills</b></li> <li>7. Hardware skills including development</li> <li>8. AI and machine learning</li> <li>9. Collaboration and communication skills</li> <li>10. Integration</li> <li>11. Influencing and stakeholder management skills</li> <li>12. Data management skills</li> </ol>

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)



Image shared by participant representing the complexity of context impacting projects

*“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.**

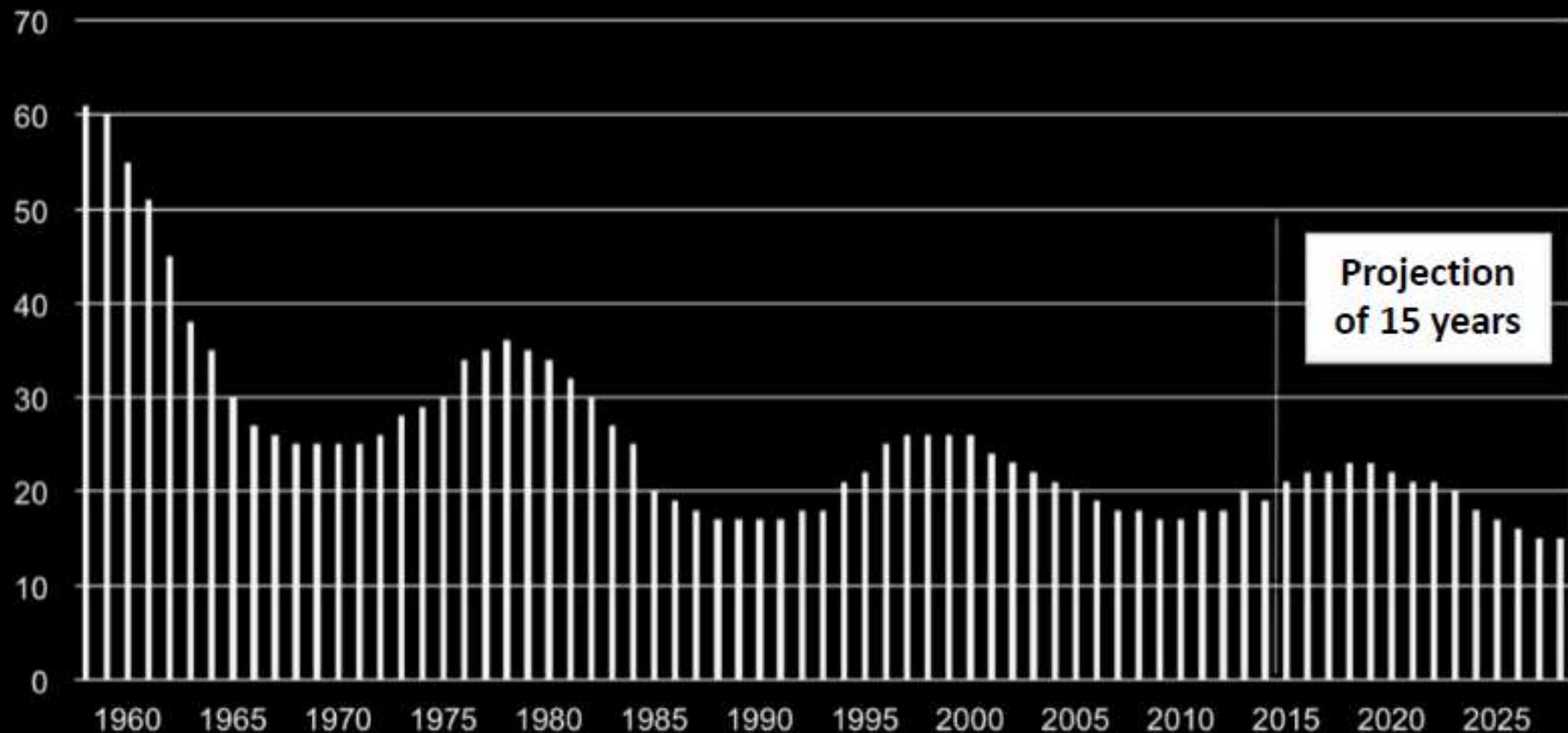
Professor of Mechanical Engineering



# Transforming into Agile Organizations

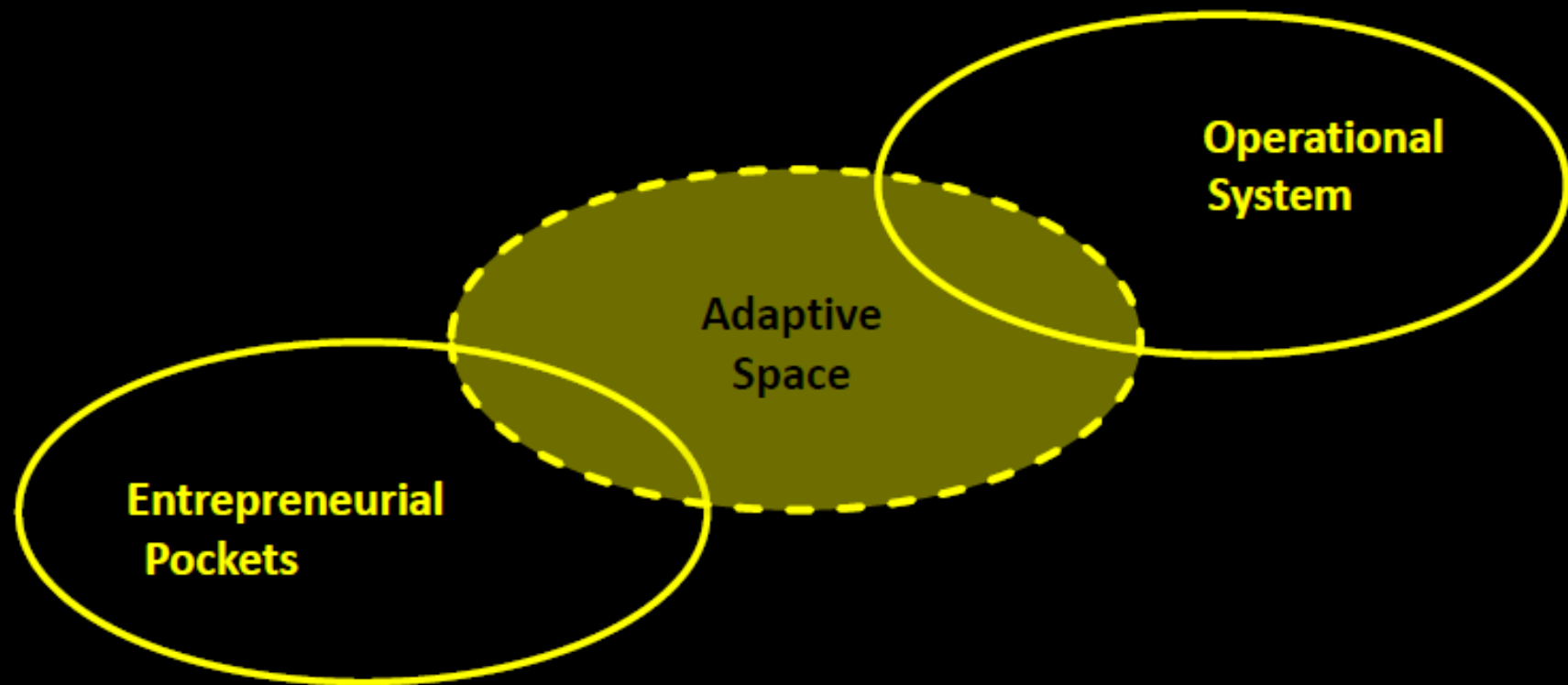


## Average Company Lifespan on the S&P 500 Index



**Entrepreneurial  
Pockets**

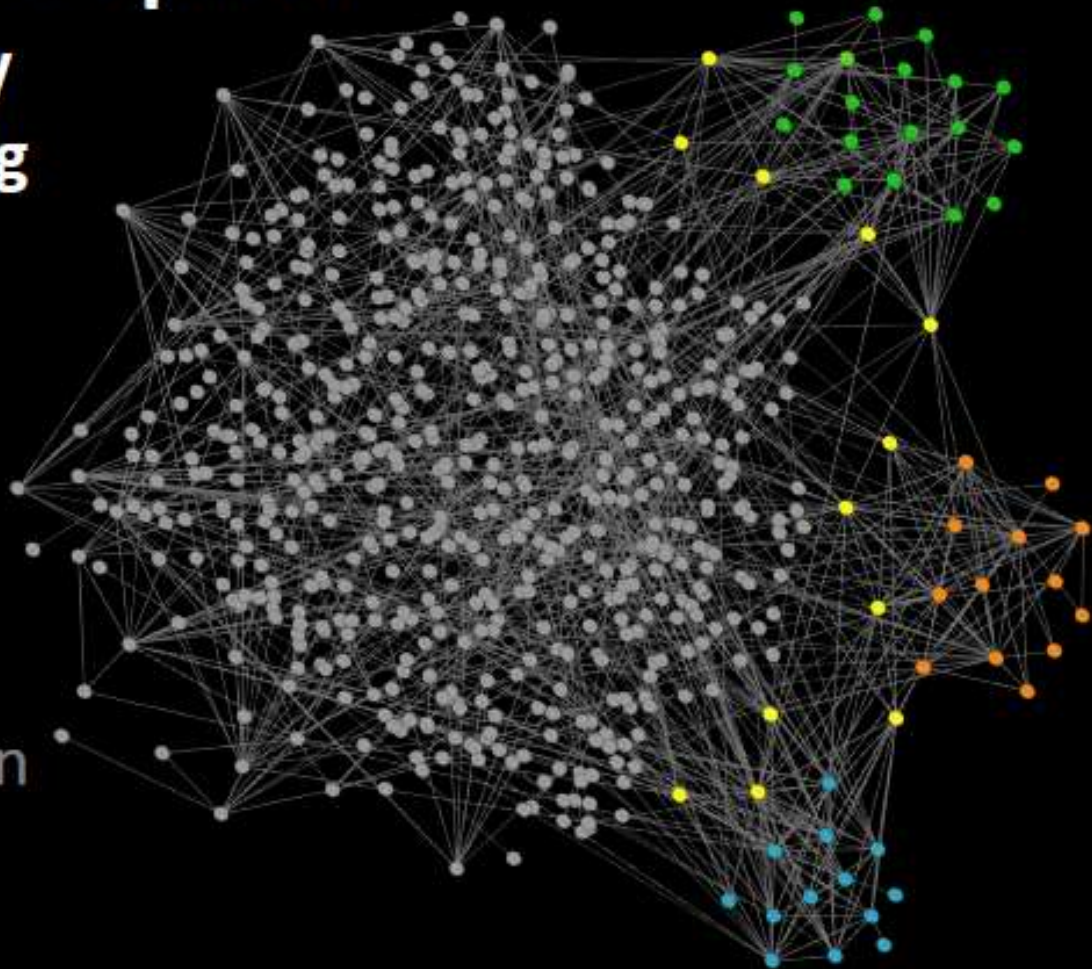
**Operational  
System**




# Adaptive Space:

positively  
disrupting

Tight core  
improves  
Execution



Cohesive teams  
increases speed  
& Development  
by up to **20%**

 Bridge  
connections  
increase  
Discovery by  
**25%** &  
Diffusion by  
**30%**



# *The Atlantic*

*“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



# 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





Empowering Engineering Education to Meet the Needs of Students

# Voice of the Customer (Student) Research



# 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!**

*Coming this October...*



## **Communities of Practice**

**Industry | Education  
Government | Society**

*Framework for driving academic reform*

**Learn | Make | Mindset | Virtual**

<https://engineeringunleashed.com>

# Summit Series Schedule

Friday, January 28<sup>th</sup> at 12 PM EST

Friday, March 12<sup>th</sup> at 12 PM EDT

Monday, April 19<sup>th</sup> (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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