

Preparing Technicians for the **FUTURE OF WORK**



Marilyn Barger, Ph.D., P.E.
Executive Director & P.I.

FLATE (Florida Advanced Technological Education Center of Excellence)

barger@fl-ate.org – www.fl-ate.org – www.madeinflorida.org



Project Team

- Ann-Claire Anderson, Principal Investigator
- Hope Cotner, Co-Principal Investigator
- Mike Lesiecki, Co-Principal Investigator
- Richard Gilbert, Co-Principal Investigator
- Marilyn Barger, Special Advisor



Preparing Technicians for the **FUTURE OF WORK**



- Nature of work changing at unprecedented speeds
- Technology advancements in machine learning, AI, IoT, and robotics eliminating some jobs, creating others
- Technicians sit at the center of much of this disruption
- Education must keep up
- Our students' career paths will evolve erratically and fast



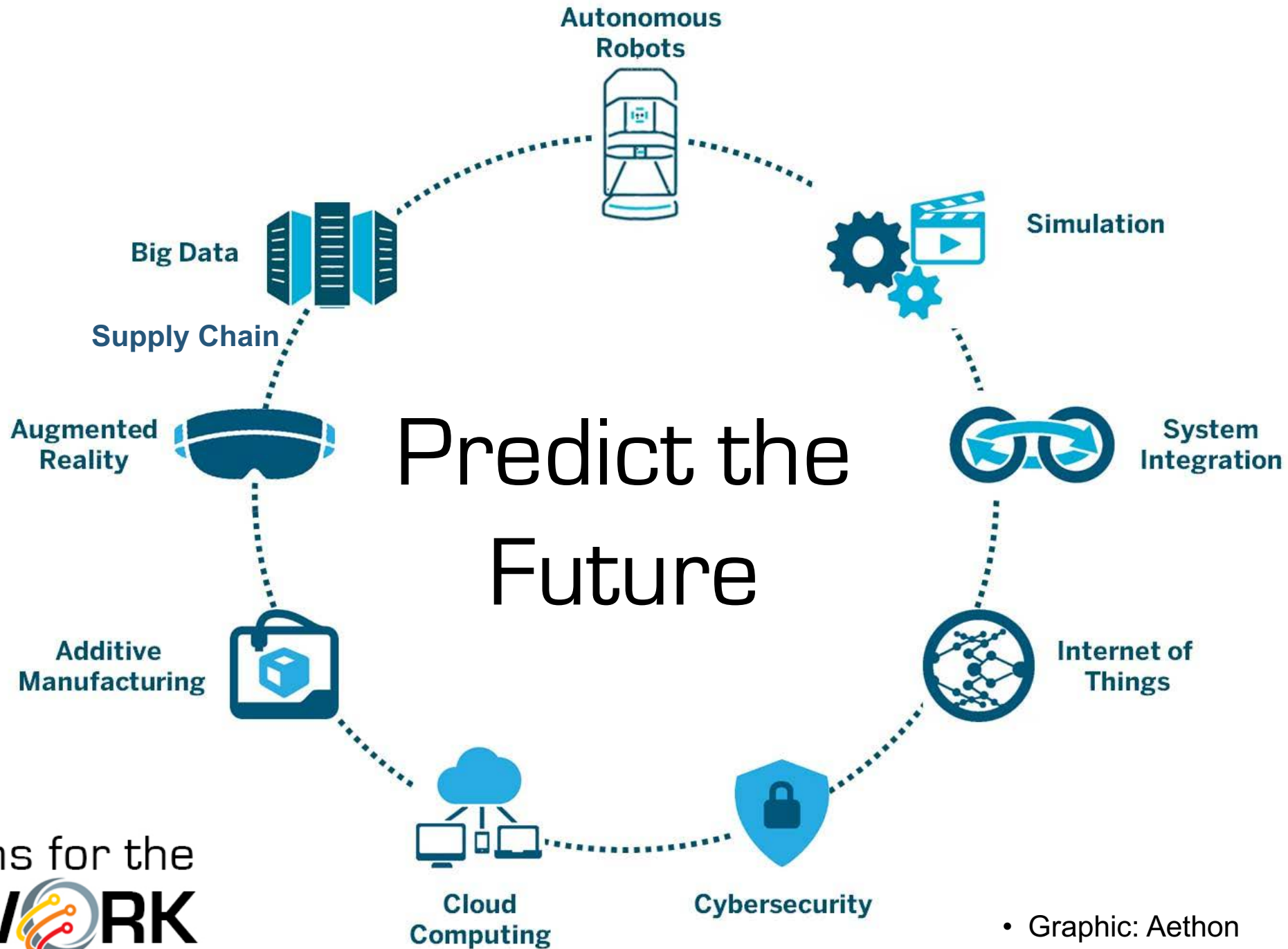
Industry 4.0 Technologies



- The Internet of Things
- Automation
- Augmented Reality/Simulation
- Simulation
- Supply Chain/Customization
- System Integration
- Cybersecurity
- Big Data
- Additive Manufacturing
- Cloud Computing



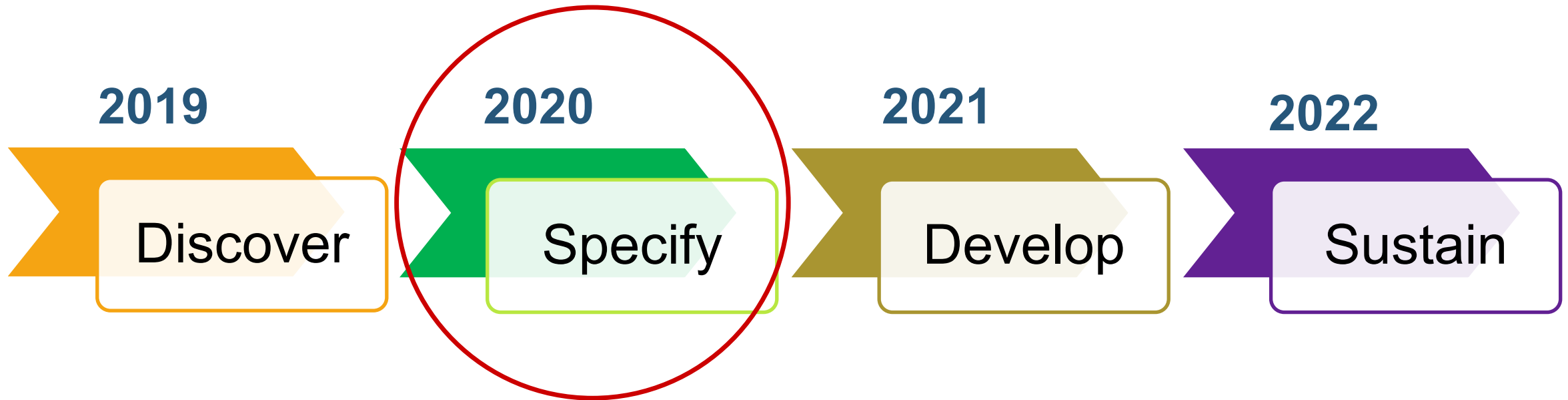
Our Job?



Preparing Technicians for the
FUTURE OF WORK

• Graphic: Aethon

Project Phases



Preparing Technicians for the
FUTURE OF WORK



www.preparingtechnicians.org

An Initiative of the Advanced Technological Education Program

The National Science Foundation's 10 Big Ideas Include a New Research Agenda



- **“The Future of Work at the Human-Technology Frontier”**
 - Study the intersection of future workers, future work, and future technology
 - Enable creation of technologies that can collaborate with humans to enrich lives and workplaces





The Elephant in the Room: Fear of Job Loss

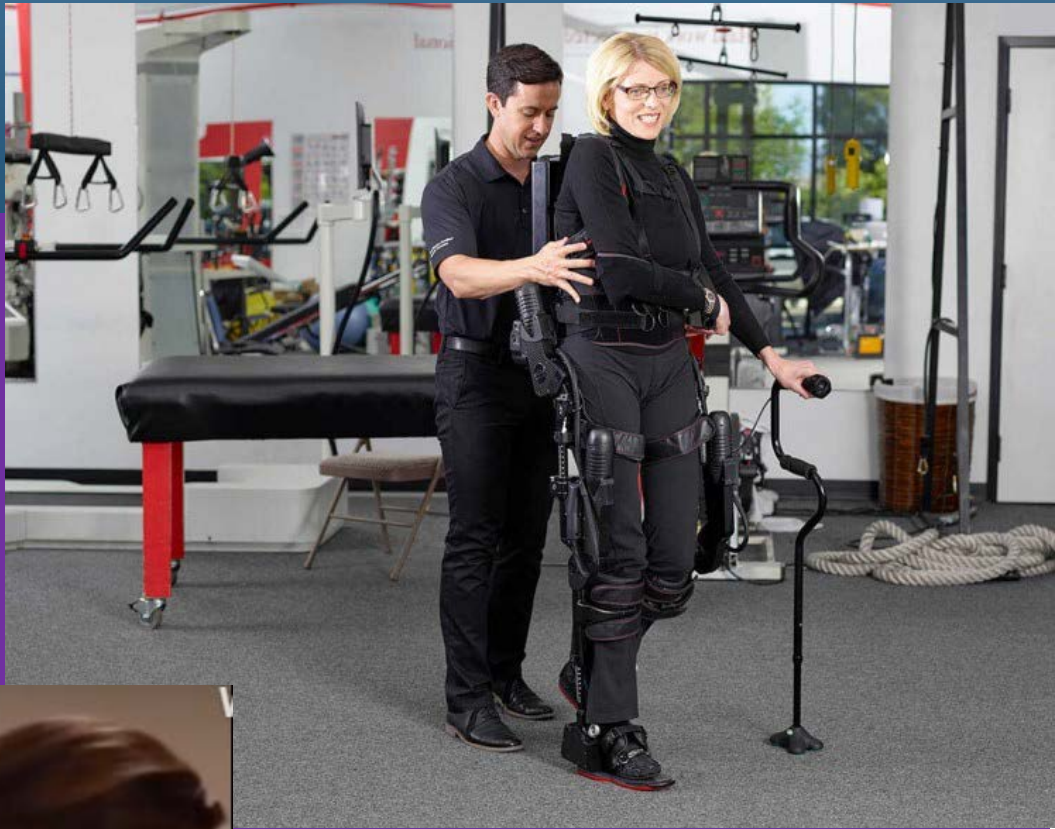
- Technology eliminates job categories, not work
- Technology is transformational
- One size does not fit all



Technology Transforms: Powered Exoskeletons for Industrial Applications



Technology Transforms: Medical Diagnostics & Treatment



Technology Transforms: Material Handling



One
Size
Does
Not
Fit
All



**Humanoid
Robots**



**Stationary
Robots**



**Aerial and
Underwater
Robots**



**Non-humanoid
Land Robots**

Adoption
among
companies
by 2022

23%

37%

19%

33%

First
movers

**(35%)
Financial
Services
and Investors**

**(53%)
Automotive,
Aerospace,
Supply Chain**

**(52%)
Oil and Gas**

**(42%)
Automotive,
Aerospace,
Supply Chain**

On the card, please write



ONE word about the Future of Work

A rectangular card with a white background and blue horizontal lines, resembling a piece of lined paper. The word "Future?" is written in a large, black, cursive script across the center of the card. A red horizontal line is visible at the top of the card, just below the main heading.

The STEM Technician's Role?



Smart machines are getting smarter and production, assembly, monitoring, and maintenance in a wide variety of industrial settings is becoming more efficient.

What does this mean for role of the technician?

Are there new foundational skills for future STEM technicians?



Preparing Technicians project goals



Enable the NSF-ATE community (2-year colleges) to *collaborate regionally with industry partners,* within and across disciplines, on the transformation of associate degree programs to prepare US technicians for the Future of Work.

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Gathering Information from Many Sources



- Industry Advisors
- NSF Advanced Technological Education Leadership Caucus
- Industry/education focus groups
- Recent business news and research on the Future of Work
- Existing competency models
- Industry site visits
- Interviews of working technicians and supervisors



Observations about the Future of Work



1. More robots and cobots with more functionality--which means they're more complicated and more connected--are being installed everywhere.
2. Most technicians need to know something about digital communication protocols between equipment.
3. More connected and automated robots and machines mean more challenging troubleshooting situations.



Observations about the Future of Work



4. Across all the operators and technicians, strong fundamentals in math, science and technology are key to understanding the new equipment and processes.
5. Employability skills (or the human skills) are still extremely important—maybe even more so today than they have been in the past.





New Foundational, Cross-cutting Knowledge and Skills



What we hear about the Future of Work

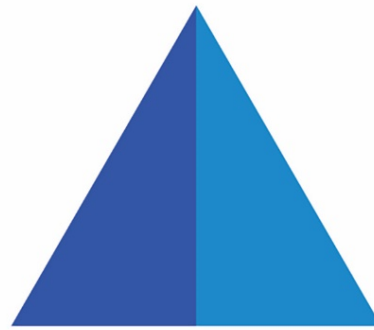


Specific knowledge and skill areas that will help “future proof” STEM Technicians

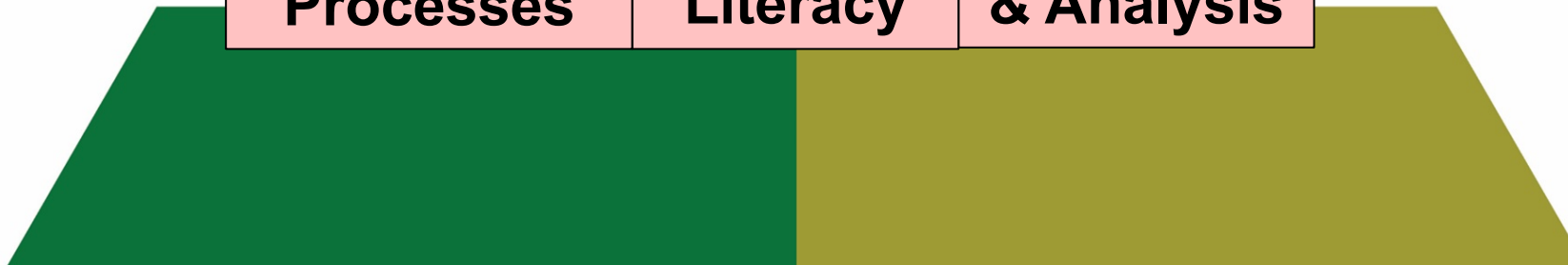
- Skill Area 1: **Data Knowledge and Analysis**
- Skill Area 2: **Advanced Digital Literacy**
- Skill Area 3: **Business Knowledge and Processes**



Foundational Skills for STEM Technicians



Business Knowledge & Processes	Advanced Digital Literacy	Data Knowledge & Analysis
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Skill Area 1: Data Knowledge and Analysis



Manipulate, interpret, compare, contrast, merge, and “operate” on data to resolve issues/problems and use Excel and other common software proficiently to accomplish tasks



Data Jobs in the Future...



“Increasingly **complex data** science algorithms will continue to be subsumed in packages and technologies that make them orders of magnitude **easier to deploy**...

Much of the work that data scientists are doing today will ultimately be **transferred to less highly trained workers** who have sufficient coding and statistics exposure to effectively use robust packages and technologies and build machine learning models.”

• Wulin, *Forbes*, May 21, 2019

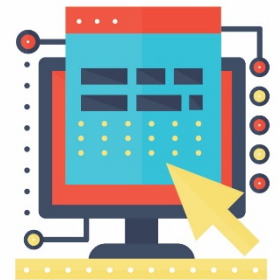


Skill Area 2: Advanced Digital Literacy



Understand and use at a higher than introductory:

- Digital communications / interfaces
- Networking
- Cloud interface
- Cybersecurity
- Machine learning
- Smart sensors
- Human-machine interfaces



Skill Area 3: Business Knowledge and Processes



Understand:

- Processes of an enterprise
- Value chain
- Business practices
- Work performance skills
- Ethics surrounding use of new technologies
- OEE



Continuing Activities

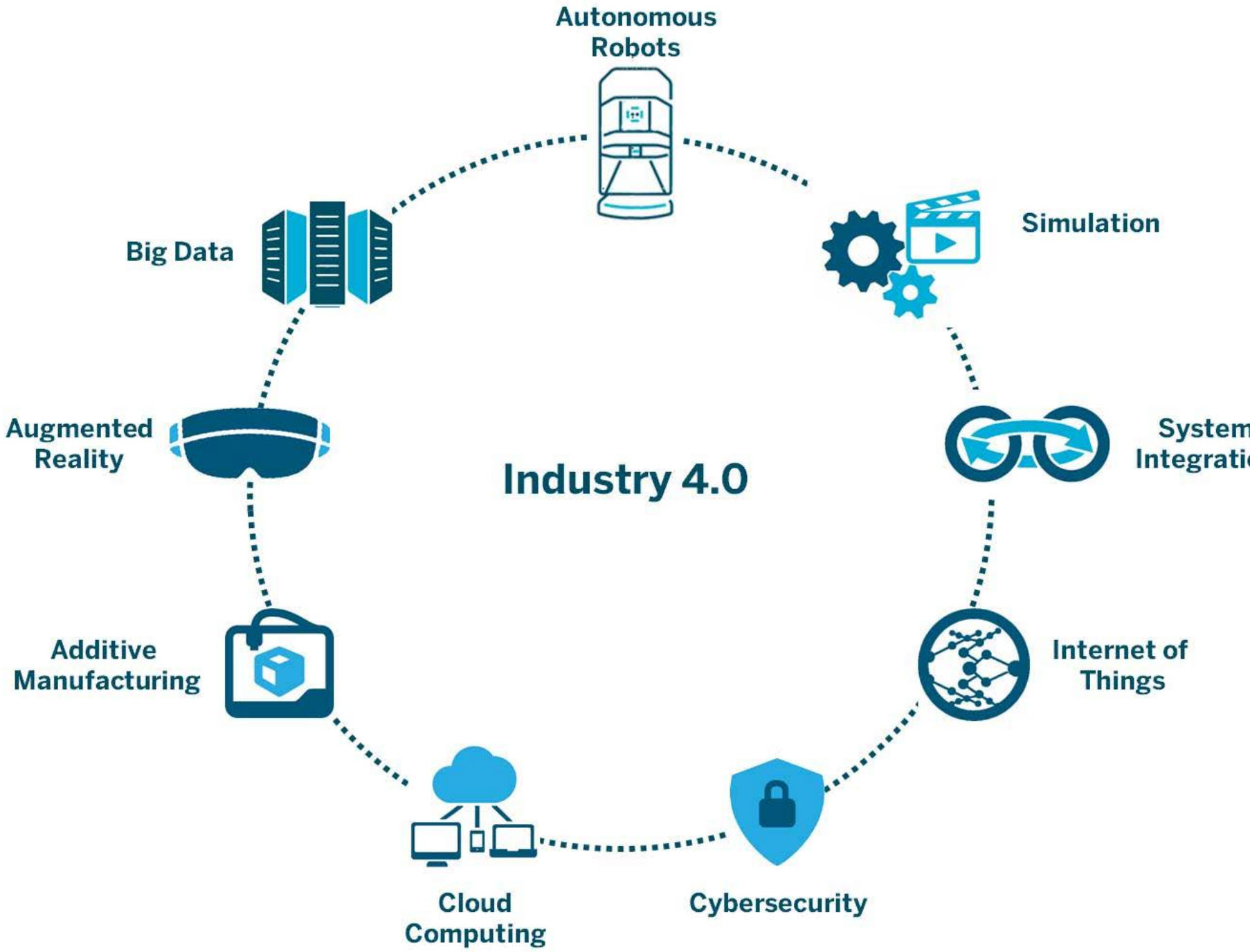
New Activities



- Industry site visits
 - Interviews (technicians, technician supervisors, middle management, executives and HR staff)
 - Special interest groups
 - Dissemination activities
- Subject matter expert review of priority topics
 - Regional convenings / networks (industry, ATE, other committed parties)
 - Identification of curriculum modifications
 - Professional development



Where are you with I4.0?



PODCAST SERIES



EPISODE 1: Preparing Technicians for the Future of Work — The Challenges

Michael Lesiecki, host
January 2019 | 00:15:02
[Episode 1 Transcript](#)

For many of today's technicians the Future of Work is already in focus. They are cross-disciplinary workers, immersed in diverse platforms and interrelated systems that once belonged to single industry sectors.

[More](#)



EPISODE 2: Who Owns the Skills Gap?

Al Carlson, University of Florida, Innovation Station, guest
February 2019 | 00:14:46
[Episode 2 Transcript and Show Notes](#)

Over the last ten years, the skills gap has increasingly been the subject of business roundtables, government agency forums and think tank research. Employers report struggling to find new workers with...

[More](#)



EPISODE 3: One of the Key Things to Measure — OEE

Mariano Carreras, SMC International Training, guest
March 2019 | 00:19:17
[Episode 3 Transcript](#)

A gap may exist between industry practice and what our students learn and practice in our education environment if they don't learn about Overall Equipment Effectiveness.

[More](#)



EPISODE 4: Design Thinking for Gender Equity

Alexa Frank and Rachael Munkacsi, Deloitte, and Hope Cotner, COD, guests
April 2019 | 00:28:52
[Episode 4 Transcript and Show Notes](#)

Gender equity is a critical issue for both education and industry as we face the future of work. In this episode, we discuss how strategies for encouraging equitable representation of women in high-tech...

[More](#)



EPISODE 5: Taking a Journey to the Future

Brynt Parmeter and Emily McGrath, NextFlex and Tate, FlexFactor participant, guests
May 2019 | 00:23:01
[Episode 5 Transcript and Show Notes](#)

How can industry inspire students to envision themselves working in advanced manufacturing? And how can colleges attract and recruit students into existing high-tech career pathways programs? One approach,

[More](#)





Exploring the Human-Technology Frontier



Leadership 4.0: People Development in the Fourth Industrial Revolution

Thomas Lichtenberger, President and CEO, Festo Didactic
May 21, 2019

When thinking about manufacturing in America, what comes to mind? Big data processing, cloud-based systems, advanced robotics, and artificial intelligence? If not, they should. The significance of these technologies cannot be overstated. Take AI for example. When used for predictive maintenance AI's greatest value to manufacturing comes from predictive maintenance, yielding \$0.5 trillion to \$0.7 trillion across the world's businesses.¹ So this Fourth Industrial Revolution, also known as Industry 4.0, has ushered in an unprecedented technological revolution, and with it, paradigm shifts that affect us all. The complexities and infinite possibilities of Industry 4.0 can be wondrous, and overwhelming. For many automation companies, it's presenting a management challenge in terms of ensuring individuals, teams, and the organizational structure as a whole can adjust accordingly when new technology and software is introduced.

[More](#)

Recent Blog Posts

Leadership 4.0: People Development in the Fourth Industrial Revolution

Thomas Lichtenberger, President and CEO, Festo Didactic • May 21, 2019

Whose Responsibility is Information Security, Anyway? And How Do We Address This in Our Future Education Programs?

Dawn Montemayer • April 5, 2019

Browse by Topic

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Imagine the Possibilities



Regional Convenings



Regional Networks



A Regional Network



- Is a partner of the Preparing Technicians for the Future of Work national project
- Collaborates regionally with industry partners, within and across disciplines
- Benefits regional industry, college programs, and students





Regional Network Vision

- Grows from this regional convening
- Brings multi-disciplinary, multi-sector stakeholders together
- Supports the skilled technical workforce within regional economies
- Expands and accelerates effective practices





Potential Regional Network Activities

- Surveying regional industries
- Building/expanding partnerships
- Creating cross disciplinary competency frameworks
- Developing, adopting, refining, and implementing regional recommendations
- Coaching National Science Foundation ATE grant applicants



Benefits of Participation

- Project resources and tools
- Education programs that anticipate future technology and industry needs
- Access to cross-sector collaborations and collaborators



Thank You



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