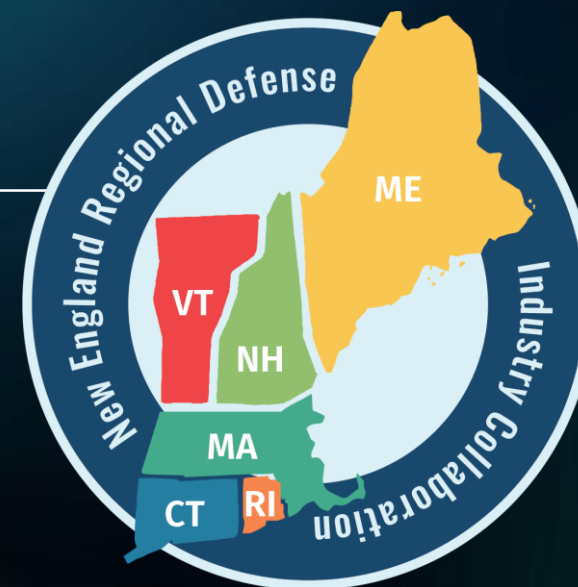


Navigating a Course to Success through Strong Collaboration

New England Regional Defense
Industry Collaboration

June 21, 2023



Agenda

- Welcome and Introductions
- General Dynamics Mission Systems – Dr. Laura Hooks
- Workforce Overview
- Break
- Workforce Break-out session and Report outs
- Lunch
- Navigating Supply Challenges Break-out session and Report outs
- Regional & Defense Industry Highlights



Welcome and Introductions

David Beurle, NERDIC Project Manager

Christine Nolan, Center for Advanced Manufacturing at MassTech



Once in a Generation Opportunity



The Modern American Industrial Policy

Key Federal Objectives

- CHIPS: **\$54.2B** to incentivize domestic semiconductor production, R&D
- +Science: \$200B (authorized) to support Science, Technology, Innovation, and STEM
- CHIPS + Science Act reflects a once in a generation opportunity to
 - Revitalize US Manufacturing
 - Secure critical supply chains
 - Reinvigorate the US STEM engine



The Biden-Harris Plan to Revitalize American Manufacturing and Secure Critical Supply Chains in 2022

FEBRUARY 24, 2022 • STATEMENTS AND RELEASES

Release of Historic Industrial Base Reports by Seven Federal Agencies Caps Off a Year of Action Fortifying America's Supply Chains

One year ago, President Biden signed Executive Order 14017 directing an all-of-government approach to assessing vulnerabilities in – and strengthening the resilience of – the United States' critical supply chains. Within six months of taking office, the Administration completed a comprehensive review of the supply chains for four critical products, identified solutions to secure those supply chains against a wide range of risks and vulnerabilities, and established a first-of-its-kind Supply Chain Disruptions Task Force (SCDTF) to address the challenges arising from a pandemic-affected economic recovery.

IMMEDIATE RELEASE Department of Defense Teaches New Technology Vision for an Era of Competition

FEB. 3, 2022



The Department of Defense announced today a new technology vision established by Under Secretary of Defense for Research and Engineering Heidi Shyu. This technology vision, anchored by the USD(R&E)'s three strategic pillars of mission focus, foundation building and succeeding through teamwork, will be used to develop a National Defense Science and Technology strategy based on an updated National Defense Strategy.

"To maintain the United States military's technological advantage, the Department will champion research, science, technology, engineering, and innovation," said Shyu. "The demands of the present era call for new operational concepts, increasingly joint operations, and quickly fielding emerging science and technology opportunities."

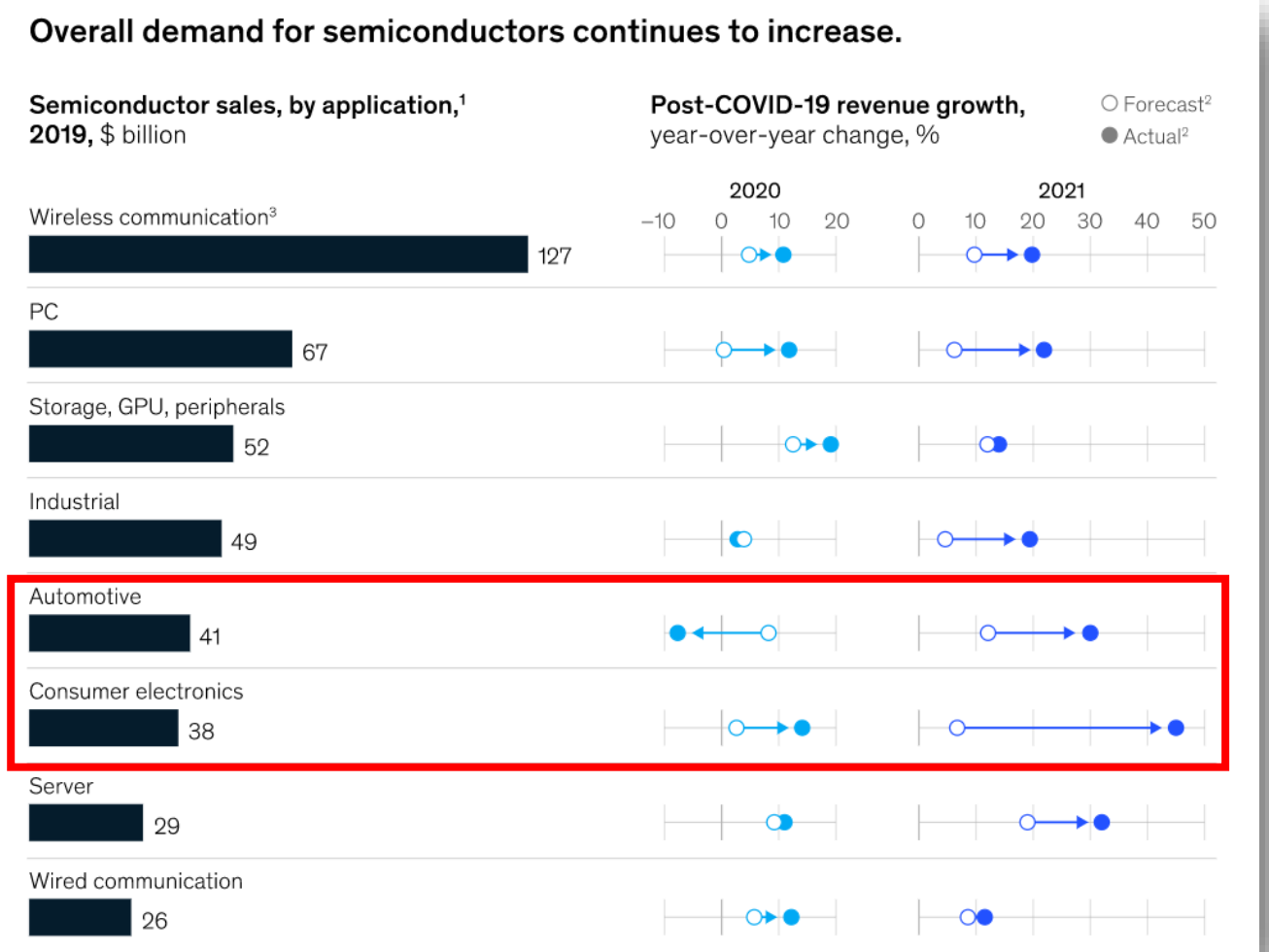
In addition to building a strong ecosystem to deliver future technologies to the military, the memo lists three groups of fourteen technology areas that are critical to the department. The Memorandum with the full list of Critical Technology Areas can be found on www.cto.mil.

Global Supply Chain Trends

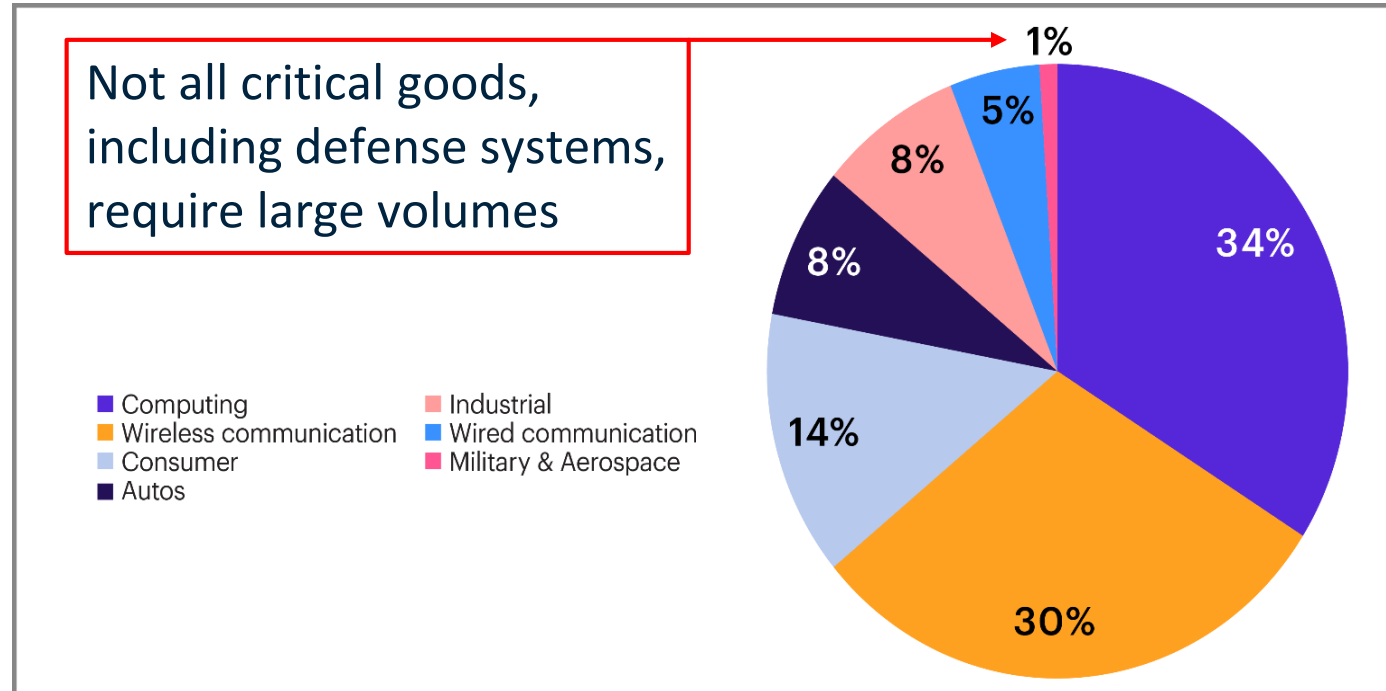
- COVID-19 caused significant distribution disruptions
 - Delaying the movement of materials and semi-finished goods throughout the value chain
- Demand for semiconductors across many sectors has increased
- Combination of these supply and demand factors are leading to unprecedented delays



— NOV 20, 2022
 Yes, There Are Still GM Vehicle Production And Delivery Delays
 They may last well into 2024, as well.



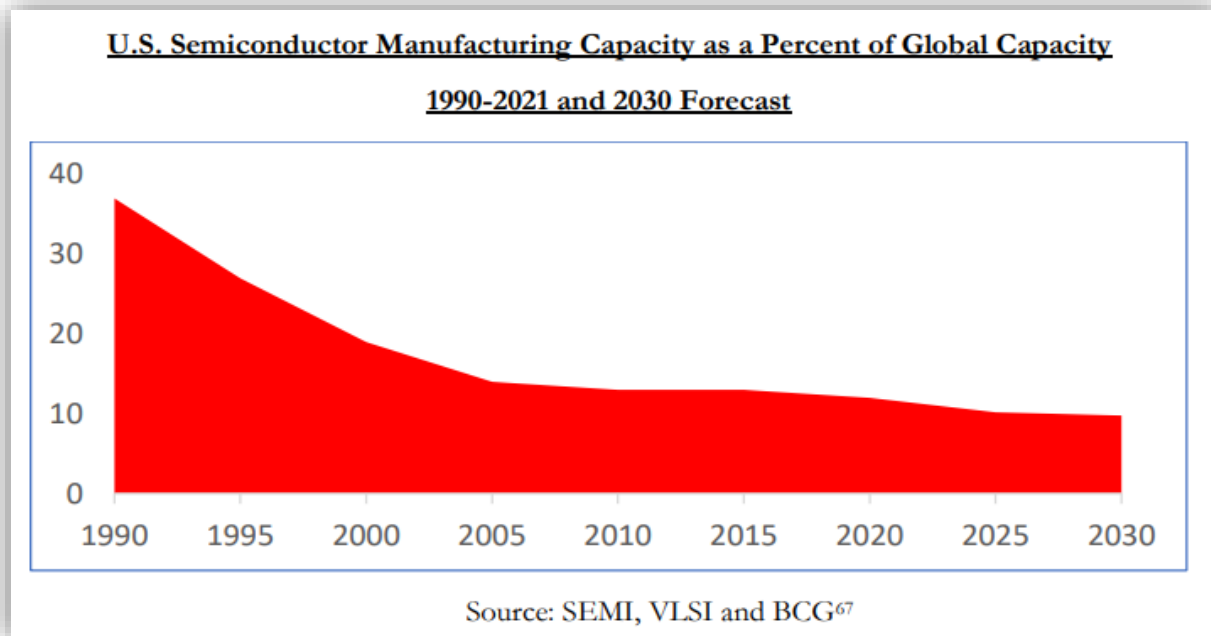
Domestic manufacturing, including semiconductors, is a matter of national security



America's CHIPS and Science Act isn't only about smartphones or about science. Control over the world's most advanced semiconductors will shape the balance of military power, too.

-Chris Miller, associate professor Fletcher School at Tufts University and author of Chip War: The Fight for the World's Most Critical Technology

Decades in the Making



Key Trends of Global Semiconductor Value Chain

- US-based activities largely focused on R&D
- US relies on Taiwan for leading edge logic chips, accounting for ~80% of production
- US, including the Northeast, has strong position (~40%) in semiconductor production equipment used to make chips; however, most of it is exported outside the US

Ecosystem in Action: Northeast Microelectronics Coalition

- **Mission and Focus:** Transform the greater Northeast into the innovation engine needed to accelerate domestic development, scaling, and adoption of the disruptive microelectronics innovations that will ensure U.S. leadership of the **NEXT GENERATION** of semiconductor technologies and systems



Healthcare & Life Sciences



Robotics



Industrial IoT



Automotive



Aerospace & Defense

Responding to the \$2B DoD ME Commons Opportunity

- Establishing 9 regional hubs to help bring DoD technologies to production
- 6 Proposals submitted
 - Secure Edge/IoT Computing
 - 5G/6G Technology
 - AI Hardware
 - Quantum Tech
 - Electromagnetic Warfare
 - Commercial Leap Ahead Technologies
- Innovative Lab to Fab initiatives
- Comprehensive education and workforce development programs
- Robust and scalable ecosystem programs



ubmits-proposal-create-northeast-microelectronics-hub

MassTech | Broadband | Cyber | eHealth | Innovation | Manufacturing

Com MASSACHUSETTS CENTER for ADVANCED MANUFACTURING at the MassTech Collaborative

About Programs News Events

Home > News > Massachusetts Submits Proposal to Create Northeast Microelectronics Hub through Federal CHIPS and Science Act

Massachusetts Submits Proposal to Create Northeast Microelectronics Hub through Federal CHIPS and Science Act

Coalition of 85 Organizations Across Seven States Submits Request for Investment from Federal CHIPS and Science Act; Massachusetts Proposes up to \$40 million in Matching Funds to Boost Infrastructure, Workforce Development

February 28, 2023

Source: Massachusetts Center for Advanced Manufacturing at MassTech

FOR IMMEDIATE RELEASE

Com MASSACHUSETTS CENTER for ADVANCED MANUFACTURING at the MassTech Collaborative

Media Contact(s):
Brian Noyes, MassTech

Email

WESTBOROUGH — The Center for Advanced Manufacturing at MassTech Collaborative (CAM) and more than 85 organizations from across the Northeast have submitted a proposal to the federal government to create the Northeast Microelectronics Coalition, a regional hub that will advance the microelectronics needs of the U.S. Department of Defense (DoD) while spurring new jobs, workforce training opportunities, and investment in the region's advanced manufacturing and technology sectors. The Coalition submitted the proposal to the DoD's Microelectronics Commons program, which is funded by the 2022 CHIPS and Science Act that aims to onshore the manufacturing of microelectronics and semiconductor technologies and support workforce training for these industries.

"Massachusetts is a leader on innovation, technology, and advanced manufacturing, and we're proud to continue that legacy by submitting this proposal," said **Governor Maura Healey**. "This is a once in a generation opportunity to invest in cutting-edge sectors that will be key to our country's national security and ensure Massachusetts companies have the resources and workforce they need to succeed. We're thrilled to put forth this competitive proposal to bolster the industries keeping Massachusetts at the forefront of innovation."

"Massachusetts has amazing potential when we leverage our research institutions, universities, innovative companies, and unmatched talent," said **Lt. Governor Kim Driscoll**. "This proposal invests in programs to train highly skilled workers and connect them to rewarding careers in the industries of tomorrow. We are excited about this chance to expand economic opportunity for underserved communities by boosting workforce development programs and forging new pathways to good-paying jobs."

The proposed \$40 million in matching funds from the Commonwealth are included in the Immediate Needs Bond Bill filed by the Healey-Driscoll Administration in mid-January, which seeks \$987 million in bond authorization to

Coalition Engagement and Participants

- MassTech (Hub Lead)
- Activate Global
- Amherst College
- Analog Devices*
- Analog Photonics
- Ansys
- APEX Accelerators
- Applied Materials
- Atlantic Quantum
- Aerocyonic
- Aura Intelligent Systems
- BAE Systems*
- Ben Franklin Institute of Technology
- Boston University
- Cadence
- Collins Aerospace
- Columbia University
- Community College of Rhode Island
- Community College of Southern NH
- Connecticut Community Colleges
- Dartmouth College
- Draper
- DuPont
- The Engine
- Ericsson
- Expedited Climb Capital
- Ferric

- Finwave Semiconductor
- GlobalFoundries
- Harvard University
- Intrinsic
- IQE
- Kinnami
- Lockheed Martin
- MACOM
- MassHire Workforce Boards
- MassVentures
- Manufacturing USA Institutes: AFFOA, ARM, NextFlex
- MA Assoc. of Community Colleges
- MA Institute of Technology (MIT)*
- Manufacturing Extension Partnerships (MEP: CT, MA, ME, NJ, RI, VT)
- Millimeter Wave Systems
- MIT Lincoln Laboratory (MIT-LL)*
- MITRE Corporation*
- MRSI Mycronic
- Nano OPS
- NE Regional Defense Industry Collaboration (NERDIC)
- Nokia Corporation
- Northeastern University
- Northrop Grumman
- NYU Tandon School of Engineering

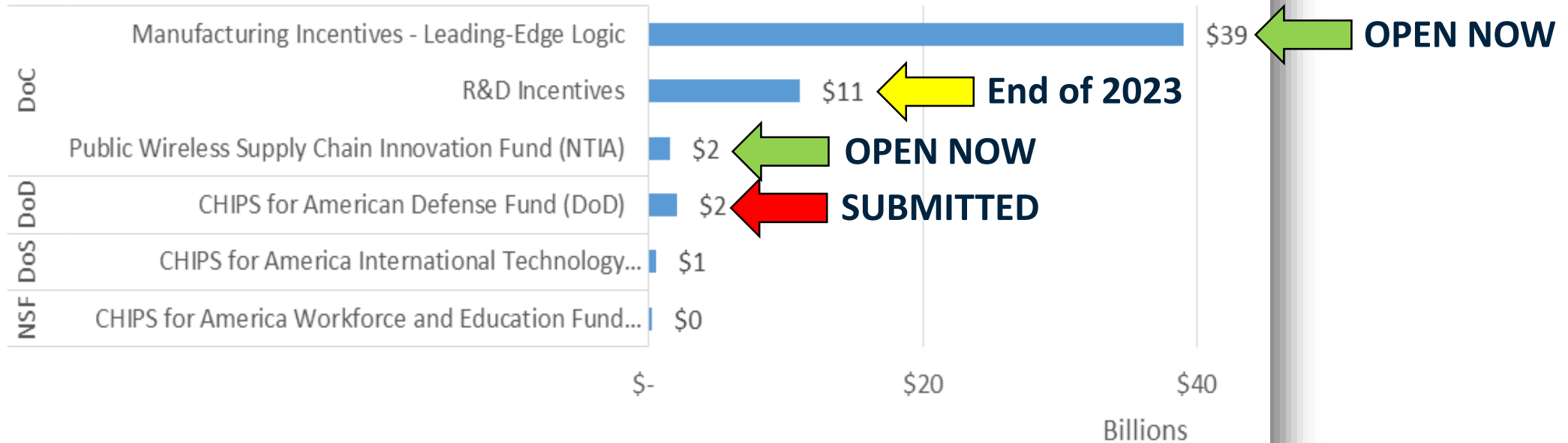
- Olin College of Engineering
 - Onto Innovation
 - Pison
 - Pratt & Whitney
 - Princeton University
 - PsiQuantum
 - RaGe Systems
 - Raytheon*
 - Riverlane
 - Siemens EDA
 - Sionyx
 - Sivers Semiconductors
 - Synopsys
 - Teradyne
 - Tufts University
 - Ubicept
 - University of Connecticut (UConn)
 - University of Massachusetts (UMass: Amherst, Boston, Dartmouth, Lowell)
 - University of New Hampshire (UNH)
 - University of Rhode Island
 - University of Vermont
 - Vermont State Colleges System
 - Western New England University
 - Worcester Polytechnic Institute (WPI)
 - Yale University
- (* indicates advisory group members)

Entity	Count	% of total
Academic	28	33%
Commercial	16	19%
Defense	6	7%
FFRDC	3	4%
MFG USA	3	4%
Non-profit	11	13%
Startup	12	14%
VC	1	1%
SME	4	5%

- Representation from:
- Massachusetts
 - Connecticut
 - New Hampshire
 - Vermont
 - Maine
 - Rhode Island
 - New York
 - New Jersey

CHIPS (\$54.2B)

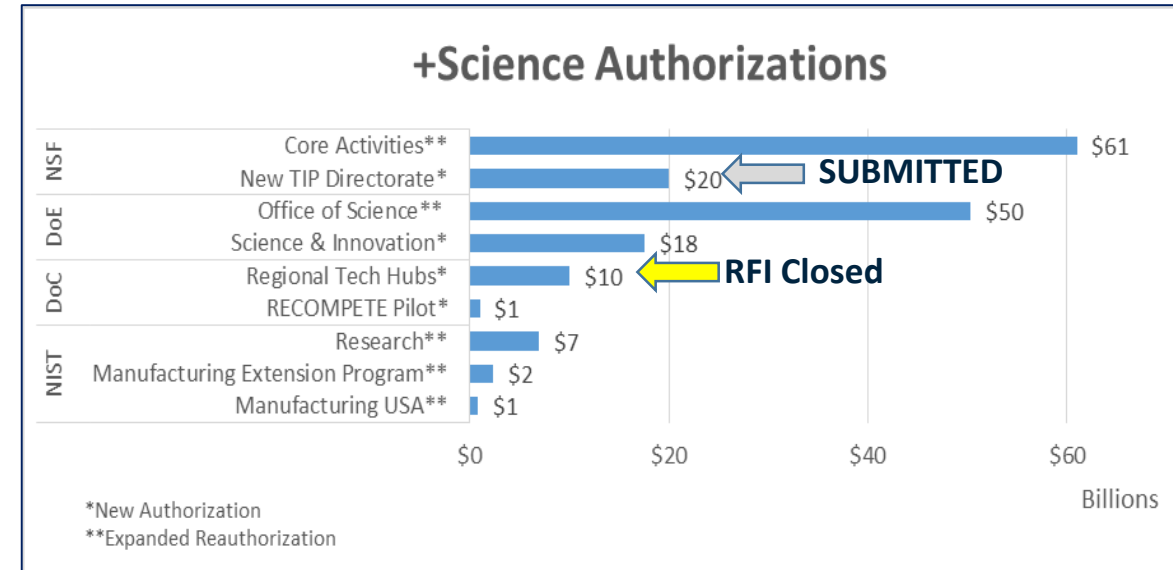
CHIPS Appropriations



Opportunity #3 – EDA Regional Tech Hubs

- \$500M appropriated of the \$10B
- Related to DOC Build Back Better and Regional NSF Innovation Engines
- Goals:
 - Designate Tech Hubs and award grants to help U.S. regions support critical, emerging technologies; accelerate economic growth; and ensure industries of the future start, grow and remain the U.S.

- Quantum, Biomanufacturing, Advanced Manufacturing (robotics, automation, additive manufacturing)



Challenge”

With these demands across the region and the country:

Micro in NY hiring 9000 workers

Intel in Ohio is hiring **~3,000 people** ~70% are technicians, 25% will be engineers, and 5% will be support staff.

Average salary for Ohio’s Intel plant will be **\$135,000 per year**, and the company said roughly 30% of that talent will likely be relocating to central Ohio from somewhere else.

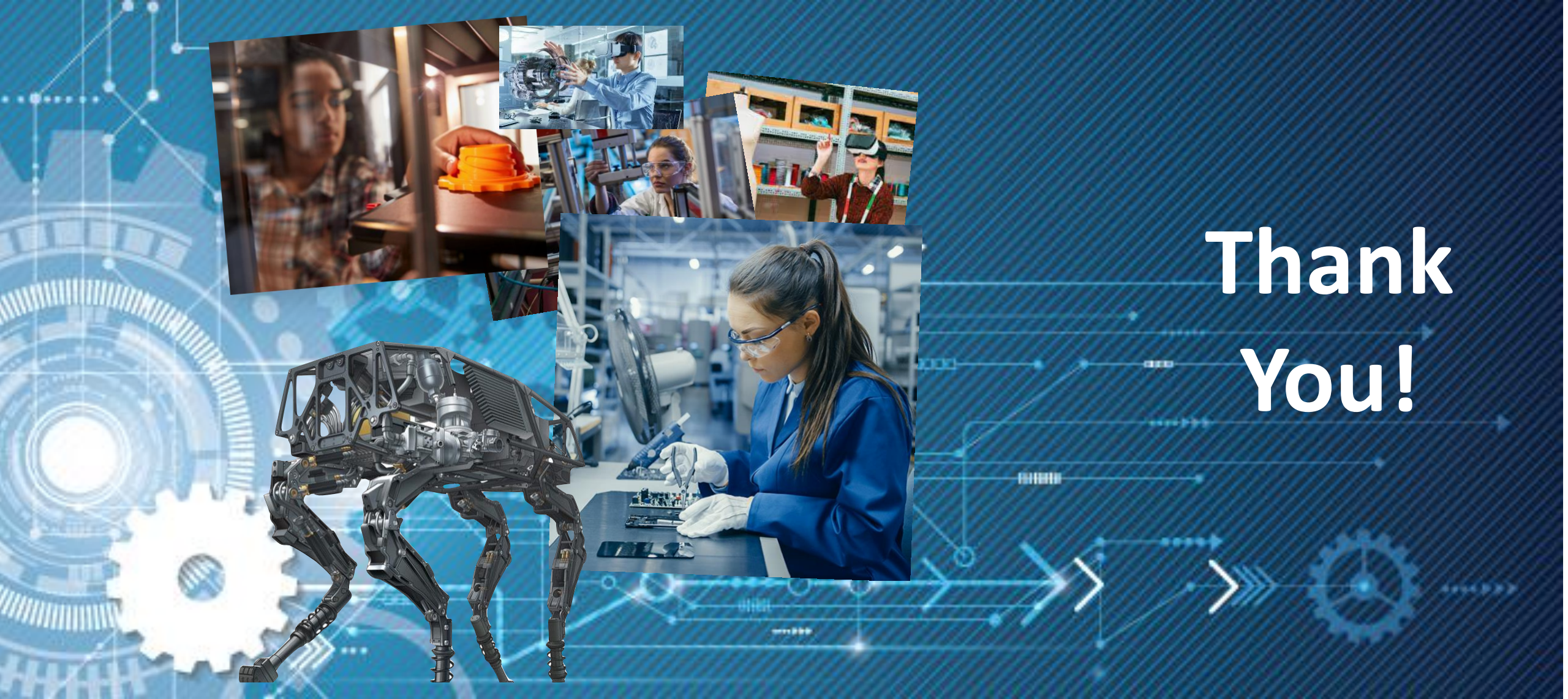
The Navy expects to hire 100,000 individuals in next 10 years to build the Columbia class submarine across New England

New emerging clusters: Clean Tech, Biomanufacturing, Quantum Computing..... And so on.....



It's more important
than ever to build
upon our
REGIONAL STRENGTHS
to create a **SECURE &
COMPETITIVE** future.





Thank
You!



MASSACHUSETTS CENTER for
ADVANCED MANUFACTURING



at the MasTech
Collaborative

General Dynamics Mission Systems

Dr. Laura Hooks
Vice President and General Manager of Maritime and Strategic Services



- **General Dynamics workflow across New England.**
- **Workforce and Supply Chain challenges and opportunities**

Dr. Laura Hooks

Vice President and General Manager of Maritime and Strategic Services



Workforce Overview

- Workforce needs and skills gap data
Dr. Beth Unger, MIT Research Scientist
- Electric Boat Workforce Training Model
Nancy Martin, Electric Boat Chief of Training
- Berkshire Innovation Center (BIC) Manufacturing Academy
Ben Sosne – BIC Executive Director





The Road to a Modernized and Resilient Manufacturing Workforce

Insights on Skills Gaps in Advanced Manufacturing
Industries

Frank Field, Randolph Kirchain, **Beth Unger**, Liz Moore

Semi-structured interviews go beyond surveys to capture data



- Level of integration within the NE defense supply chain
- How are manufacturers upskilling



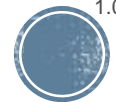
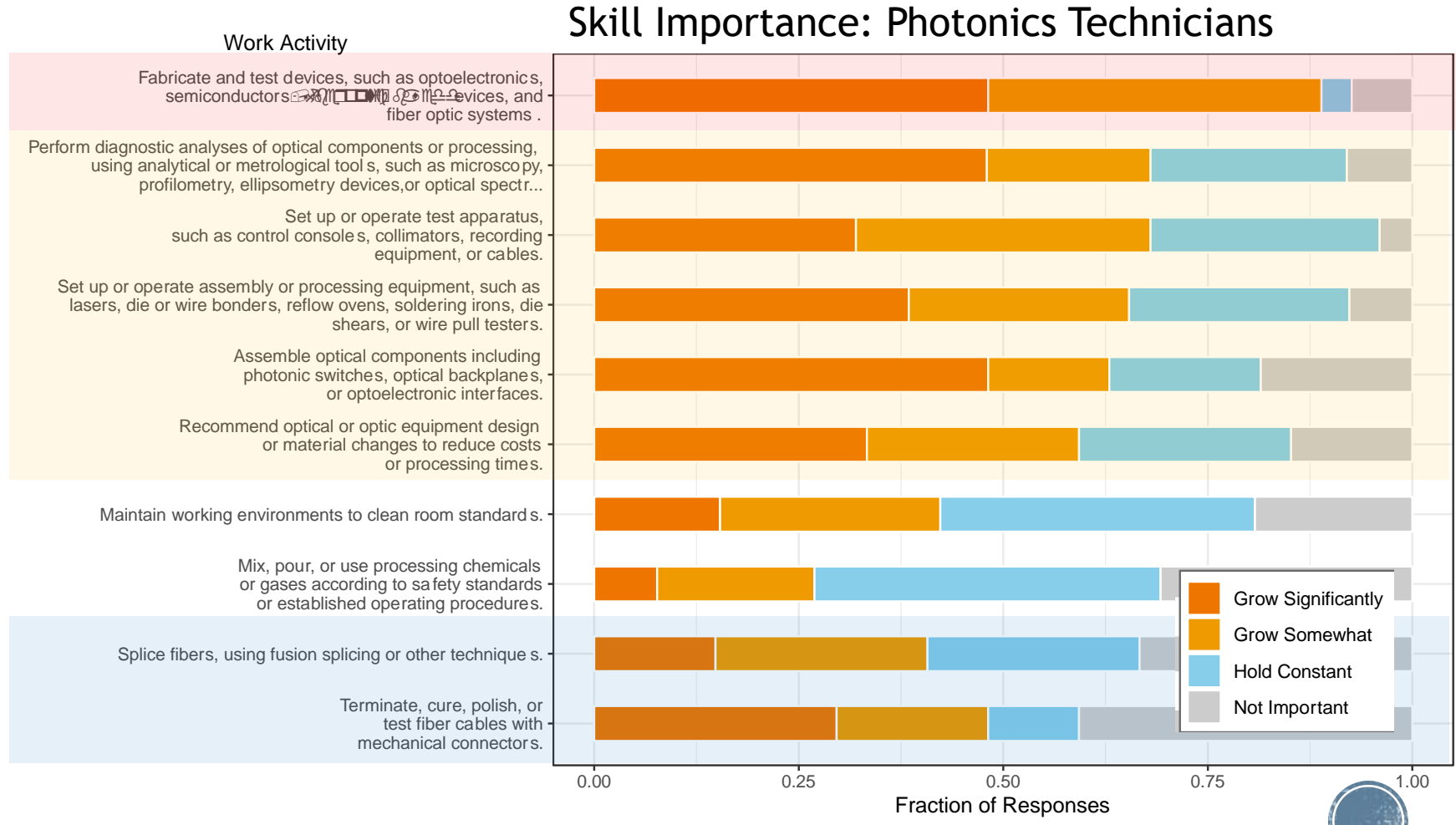
- Skills gap assessment for middle-skilled techs



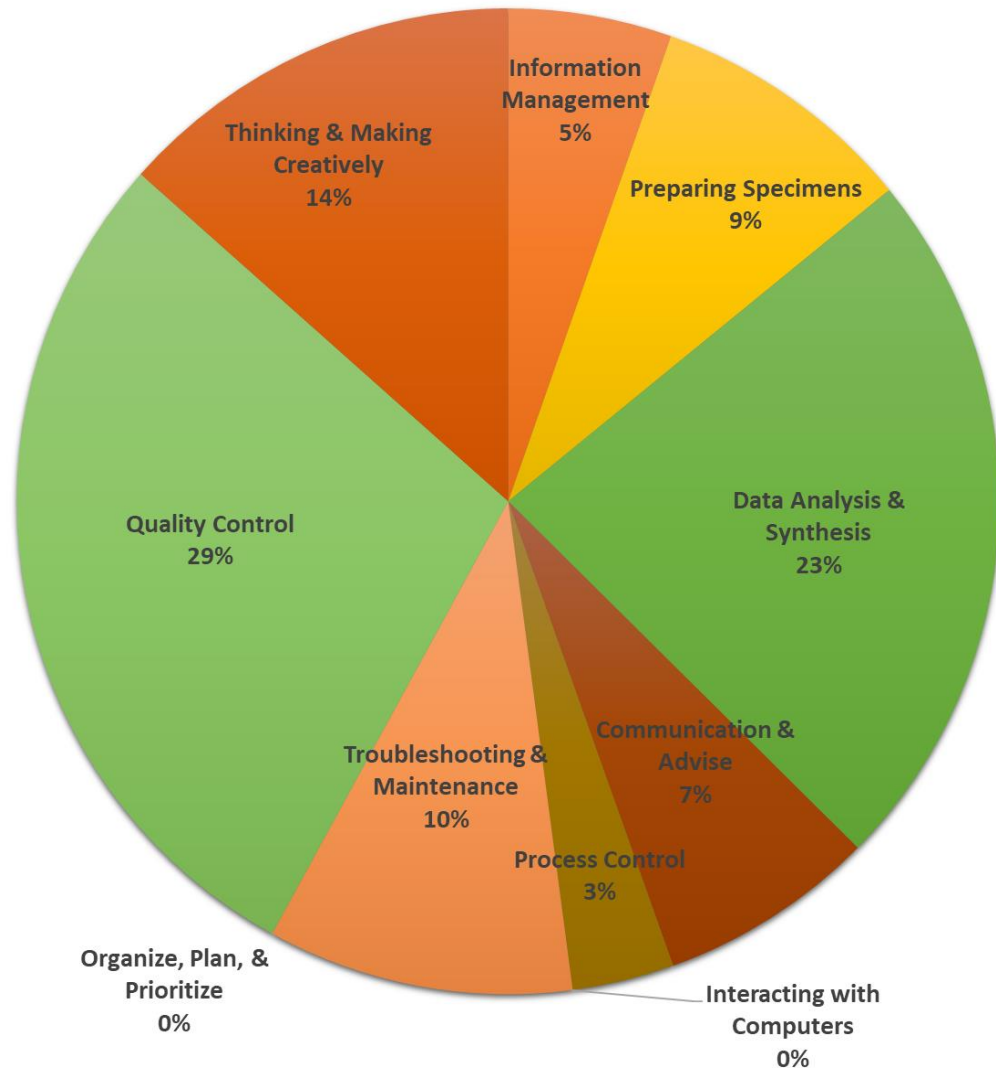
- Mapping Industry 4.0 skills technician roles

We have learned, for photonics techs: Importance of fab processes, testing, and data analysis

- A key challenge for photonics technicians: Fabrication processes, testing, and data analysis
- Interesting insights emerge from analyzing trends across positions and across industries



Existing Photonics Curriculum Was Not Fully Aligned with Industry Skills



Learning outcomes from MA community college's photonics courses mapped to industry skills to identify existing gaps.

A small percentage indicates little emphasis within the photonics curriculum is placed on skills corresponding to that particular competency.

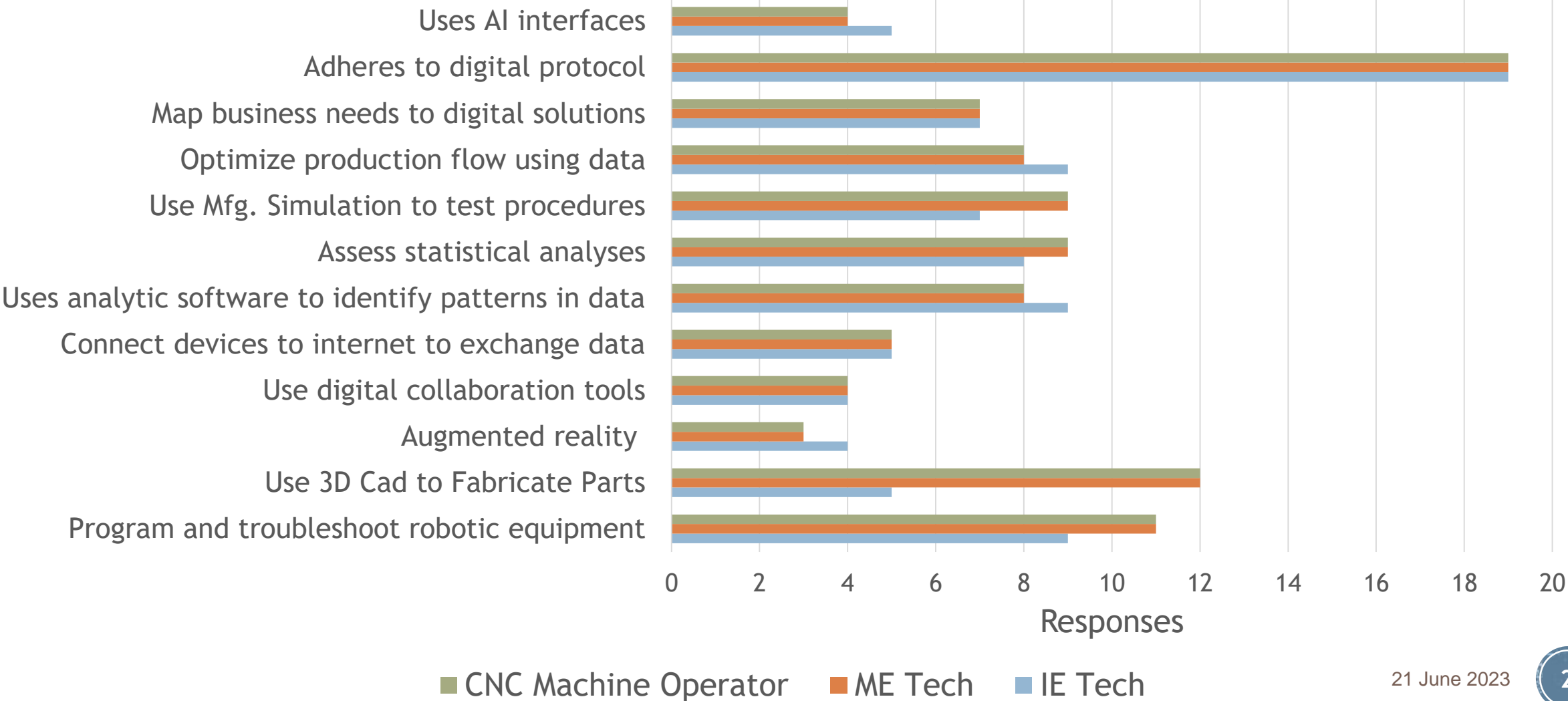
Top Five Competencies for Photonics Technician According to Cluster Analysis:

1. Information Management
2. Preparing Specimens
3. Data Analysis & Synthesis
4. Communication & Advise
5. Process Control

Faculty now know where to augment courses to bridge the middle-skilled technician skills gap.



Industry 4.0 Reshaping Specific Roles



New discoveries from interviews

- Changes in cyber security requirements could potentially negatively impact small manufacturers.
- One company is employing a competency-based training model for techs.
 - For each skill, there are different levels of mastery.
 - The techs know what they must learn, i.e., transparency
 - Techs are assessed
 - Pay is based on scores
- Cross-talk across different occupations is an overlooked skill.

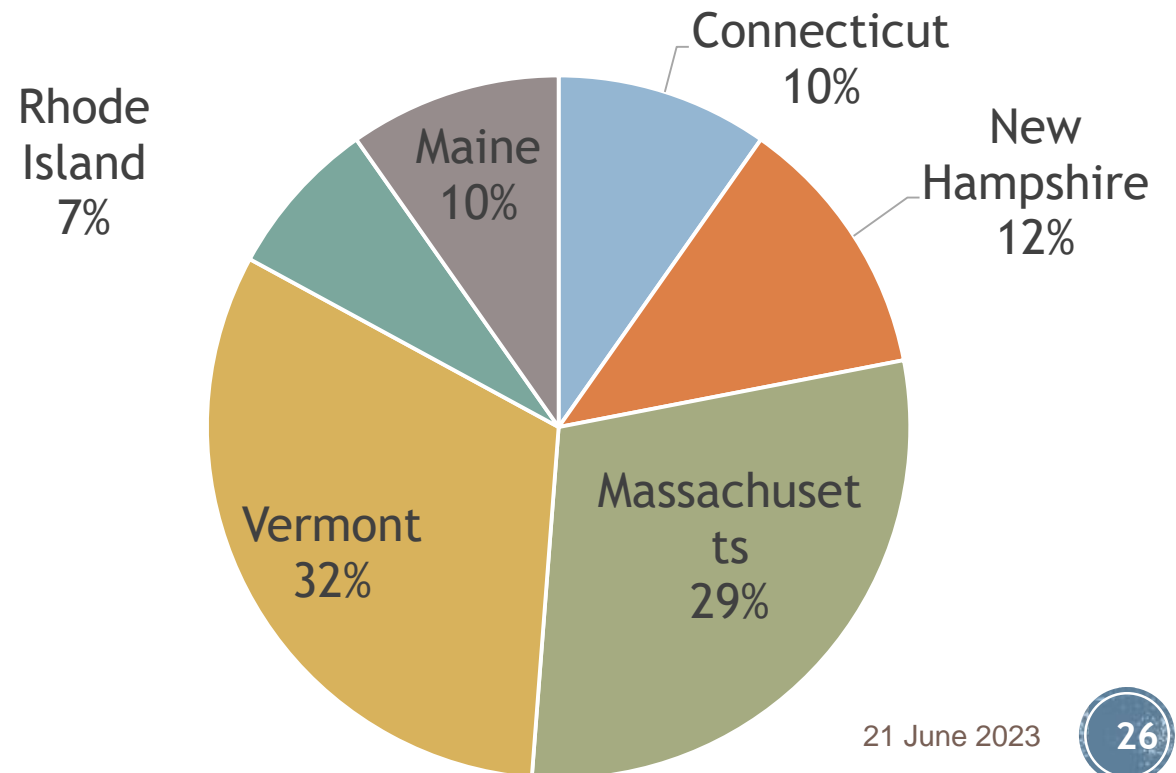
“They work in silos, and they need to have a general understanding of what others do.” - Mechanical Engineer at MA Mfg. company



“We currently farm out our IT to a third party, but to stay compliant, we are moving it in-house. It is expensive and complicated. I think many small manufacturers will close shop.” - Owner of NH machine shop

Next steps

- Continue interviewing manufacturers
- Synthesize data
- Prepare a cohesive report that summarizes other reports and how it maps to our findings



Thank you

For questions on the presentation,
please contact Beth Unger at
eunger@mit.edu

Break-out Session – Workforce

We have two focus areas:

- **Powering the Future** – How can we inspire and develop a skilled workforce (Awareness and Marketing)
- **Building a coordinated and connected education system** – From high school to post-secondary, and across borders.



Powering the Future

Topics to drive the conversation:

1. What are we currently doing to market, brand, and increase awareness about careers in Manufacturing?
2. What structures exist (high school, post-secondary, and workforce development) in our regions that can:
 - Support scaling
 - How might we leverage these resources to expand/grow awareness and interest in manufacturing?
3. What is missing?



Powering the Future

Key Takeaways:

- Opportunity with NERDIC for a regional marketing campaign (content marketing and storytelling). Create a regional media ecosystem to brand manufacturing ; Social Influencer to support paradigm shift in re-branding manufacturing;
- Making defense exciting; not scary;
- Utilize what's already been built
- Career Assessment tools and career pathways
- Engage at the executive level of education
- All social media (Campaigns)
- Dynamic and flexible media plan
- Classroom through careers
- Communicate life work satisfaction and pathway (Gen Z)

Next steps:

- Utilize Human-Centered Design to Re-Brand Manufacturing (bring Gen Z, A, B, etc. to developing solutions)
- Convene a team to investigate proven elementary school models (Boston STEMatch; Robotics; etc.)
- Media/marketing assessment, brand/content strategy, phased operational plan
- Regionalized marketing campaign through NERDIC “Brand manufacturing”; Spokesperson (Sports figure, etc.)
- Small Business industry coaching ecosystem - SBs don't know what they don't know; how might we engage with SB leaders to be part of pathway solutions; e.g. ecosystem for internship development



Building a coordinated and connected education system

Topics to drive the conversation:

1. What are we currently doing to coordinate training across the systems – Secondary to post secondary and workforce (pipeline to incumbent)?
2. How do we better connect industry with our training system?
3. Are there players missing from the table?
4. What are the missed opportunities or gaps in our system?



Building a coordinated and connected education system

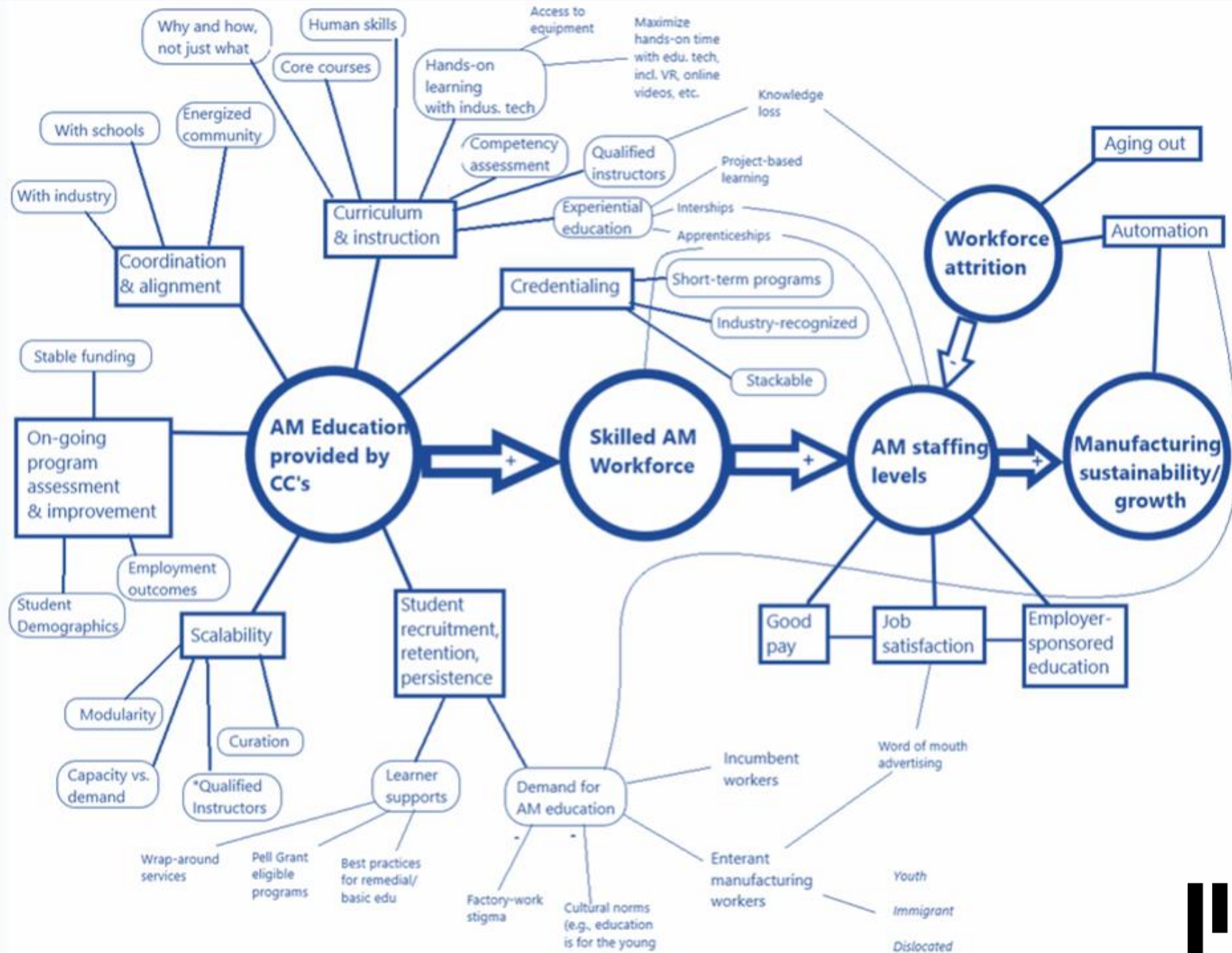
Key Takeaways:

- Good programs are happening across NE: Learn more about what EB is doing in CT & RI, ME and ARPA \$ for Community College, VT and Apprenticeship and pre-apprenticeship models.
- General Dynamics has an Ambassador program – Goal is to help create a talent pipeline and raise awareness about manufacturing.
- Leadership changes at school district level (3-4 years) impact programs and make it difficult to sustain programs and connections with manufacturers.
- Relationships need to be at all levels – For large scale systemic change need to have state level players (education, workforce, etc.) at the table and involved in the discussions.
- Relationship building and sustaining connections takes time and effort.
- Many good programs out there, but are they scalable and can they be sustained beyond grant \$.
- What role does government play – Making changes at the K-12 level requires involvement and engagement of the state's department of education (e.g. RI and GD/EB worked to make changes to curriculum standards)

Next steps:

- At a state level – Need support from the top, including manufacturing champions (e.g. CT - Chief Mfg Officer) and the Department of Education. Identify key state partners and other key partners that need to be at the table – to support scale and sustainability.
- Host state partnership meetings in late summer/early fall to identify and share best practices in each state. Identify what components in these programs are replicable, scalable, and sustainable.
- Industry engagement is key – Identify where we have strong industry engagement partnerships/programs. How do we support these relationships to drive programming in our schools/colleges? What is replicable across our states?





Benchmarking the education and training ecosystem: This is obviously a complex problem.



What we are hearing

There is still a **stigma** to working in manufacturing.

The **cost of living** is too high in New England for many workers to afford to stay in manufacturing.

Finding qualified instructors is a burden – and most won't have prior education training.

Often **classes aren't filled** with enough students to make running them profitable.

Collaboration between industry and education leaders is constant in order to prepare students for current job openings

We often work with stakeholders in our own state, but rarely across state borders.



Open Learning

What you've said

The most common topics of discussion during interviews fall under what we are calling supported students.

Nearly all interviewees said that workforce shortages were a major problem caused by two things:

- A general lack of interest in—and even aversion to—manufacturing careers and;
- Too few wraparound supports for students and workers, supports such as transportation, childcare, mental health care, and housing.

The consensus among interviewees was that stakeholders should take a few steps:

- Through marketing and career guidance, stakeholders should show more people that manufacturing offers good careers.
- They should offer more wraparound support to draw in people who may be struggling to enter the labor market or attend school.

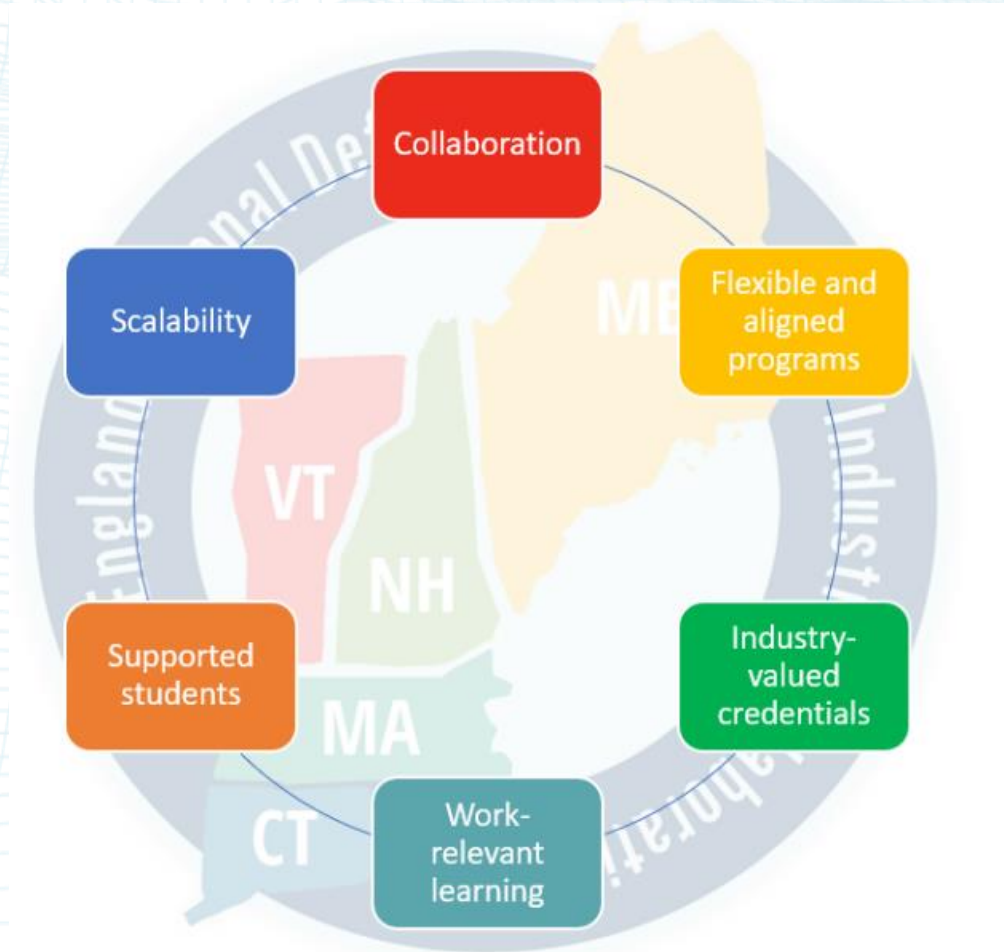


Open Learning

What you've said

MIT Open Learning has completed the following steps:

- Created a training ecosystem readiness framework (Fig. 1) to assess the region's workforce training ecosystems in advanced manufacturing
- Interviewed 22 key regional stakeholders working in schools, community colleges, non-profits, workforce boards, and industry
- Designed a survey to gather more comprehensive data to assess New England's workforce training ecosystems



Open Learning

Afternoon Break-out Session – Navigating Supply Challenges

- **Panel Discussion - Voice of Suppliers**
 - **Suzanne Trinh - GD, Supplier Diversity Program**
 - **Freddy Lawrence - GD, Director Supply Chain**
 - **Justin McKennon - EMA**
 - **Larry Mazza- Nortek**
 - **David Allen - Sinicon Plastics**



General Dynamics – Supplier Panel & Discussion

“Voice of the supplier”

What 2 to 3 things give you heartburn or keep you up at night when thinking about supply chain?



General Dynamics – Supplier Panel & Discussion

Key Takeaways:

- Cyber – the onboarding system is a cumbersome and challenging process. It is costly if you need to put across your whole system.
- MEPs, APEX Accelerators, and SBAa are available to help you with the process, but many manufacturers are not familiar with them.
- Finding the right person to talk to is a challenge, in the supplier application process. If you don't know what question to ask, it is hard to get to the right person.
- Finding a skilled workforce is a challenge – lack of qualified works impacts our lead times.
- Identifying outside services that are approved suppliers (e.g. re-prints or paint shops).

Next Steps:

- Help manufacturers connect the dots. Who are the players (e.g. MEPs, APEX, etc.) and how can they support you?
- Forums/Lunch and Learn – are good ways to create awareness.
- Ambassadors to support suppliers – 1 or 2 go to people who can then connect them to the right people. Or create a one-stop shop to connect manufacturers to the resources that can help them navigate the process.

