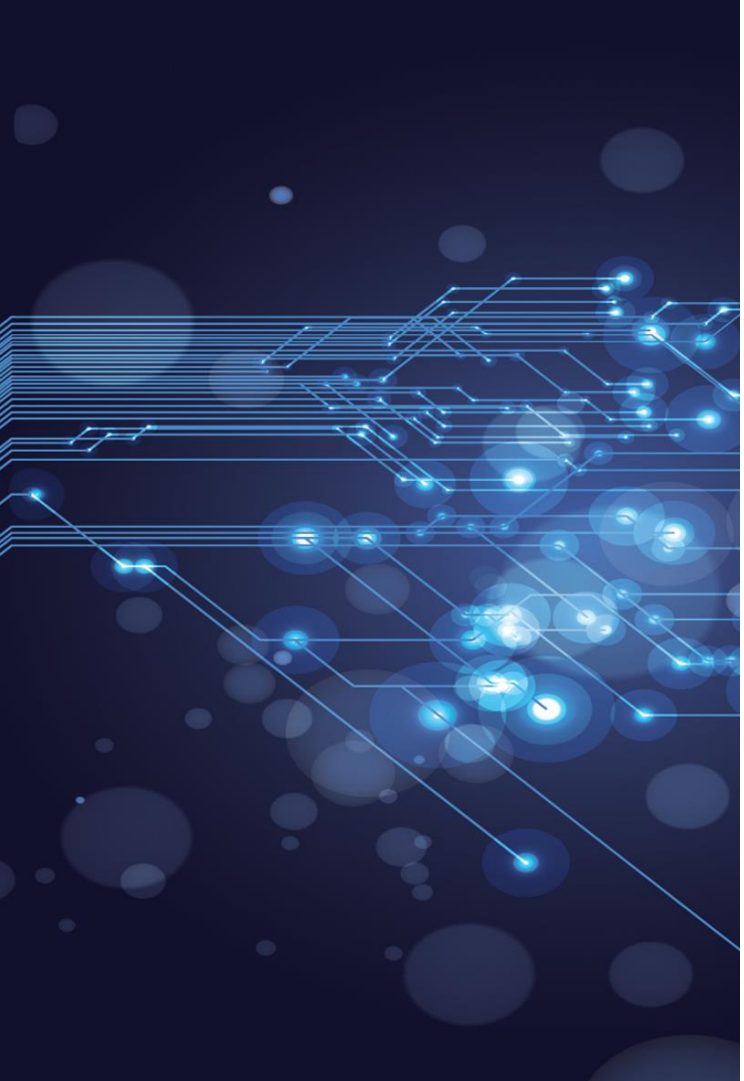
# Manufacturing Technology Working Group

Substitute Senate Bill No. 1021
Special Act No 21-24

Meeting 11
January 19, 2022



# Agenda

I. Welcome

II. Announcements / Roundtable
- Review schedule for i4.0 Provider features

III. Provider Spotlight
- Manufacturing Innovation Fund – Colin Cooper, CT Chief Mfg Officer

IV. SIRI Insights
- Smart Industry Readiness Index – Erik Fogleman, CONNSTEP

V. Adjourn

Next Meeting: Wed, Feb 2 @ 11a
Cadence: bi-weekly

# Service Provider Feature Schedule


**Feb 2:** Yale University

**Feb 16:** Connecticut Manufacturing Collaborative

**Mar 2:** Central Connecticut Chambers of Commerce

REMINDER: **Mar 15**: interim progress report due NLT

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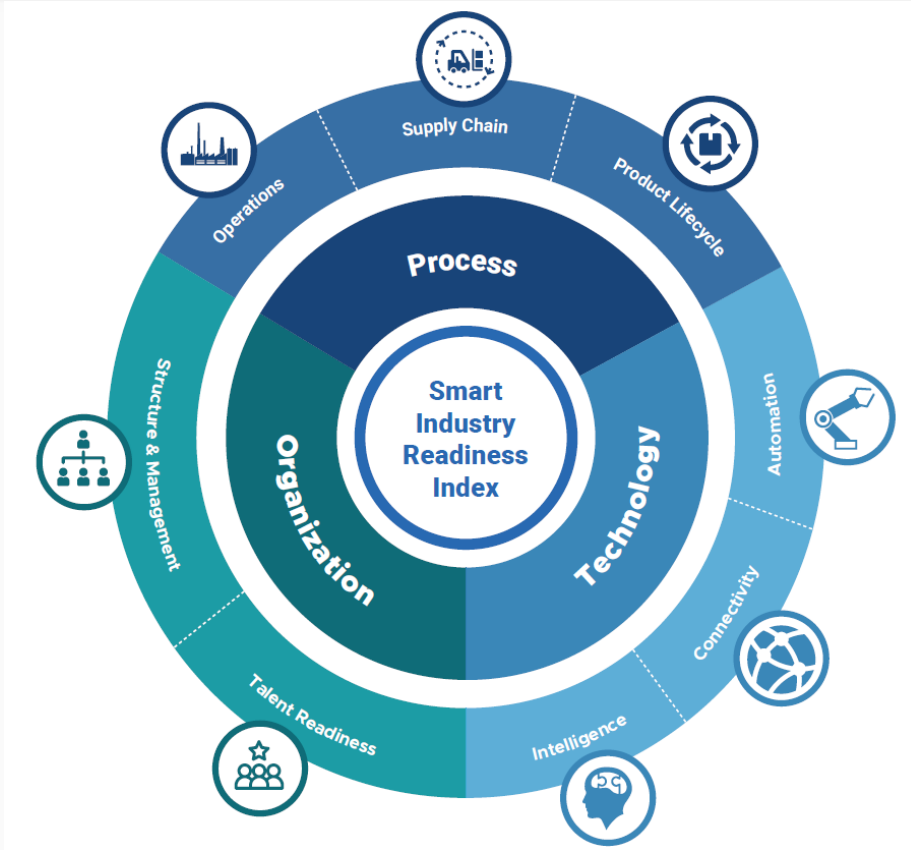
# Smart Industry Readiness Index (SIRI)

Outcomes and Insights into Connecticut Manufacturing and Digital Transformation

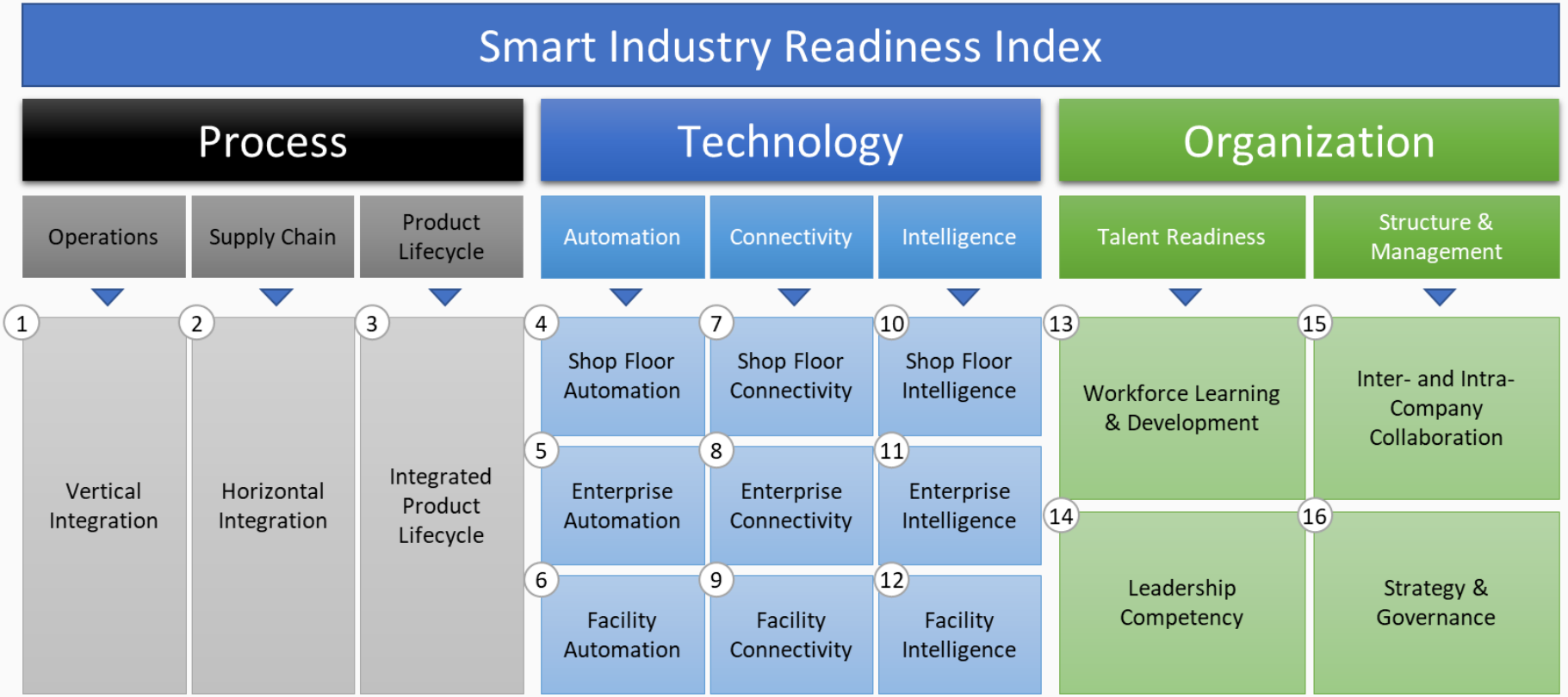
# SIRI Overview

# SIRI Approach

- Help companies **start, scale, and sustain** manufacturing transformation
- Equip companies with practical knowledge:
  - Understand Industry 4.0 and tangible business benefits
  - Capture current maturity levels of the organization
  - Roadmap for **targeted** and **incremental** improvement
- Evaluates three core elements of Industry 4.0
  - Process
  - Technology
  - Organization
- Provide **prioritized focus** elements and recommended **next steps**



# The Assessment Matrix (AM)



# The Prioritization Matrix (PM)

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## T

**TODAY'S STATE**

Develop an in-depth understanding of the company's current Industry 4.0 maturity level

**Assessment Matrix Score**

## I

**IMPACT TO BOTTOM LINE**

Analyse how distinct Industry 4.0 areas affect profits and identify those that can generate the greatest financial return

**Cost Profile**

## E

**ESSENTIAL BUSINESS OBJECTIVES**

Determine the most critical business objectives to guide the selection of relevant Industry 4.0 areas

**Key Performance Indicators**

## R

**REFERENCES TO THE BROADER COMMUNITY**

Emulate the successes of the broader manufacturing community, and learn from their mistakes as well

**Best-in-Class Benchmark**

## THE PRIORITIZATION MATRIX FORMULA

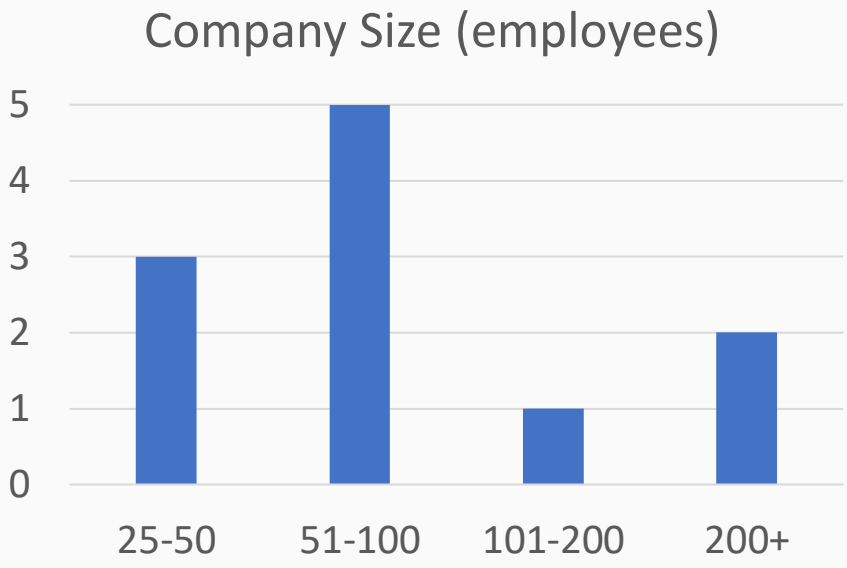
$$\text{Impact Value of SIRI Dimension}_i = \text{Weighted Cost Factor}_i + \text{Weighted KPI Factor}_i + \text{Weighted Proximity Factor}_i$$

Source: The Smart Industry Readiness Index, 2020 Singapore Economic Development Board

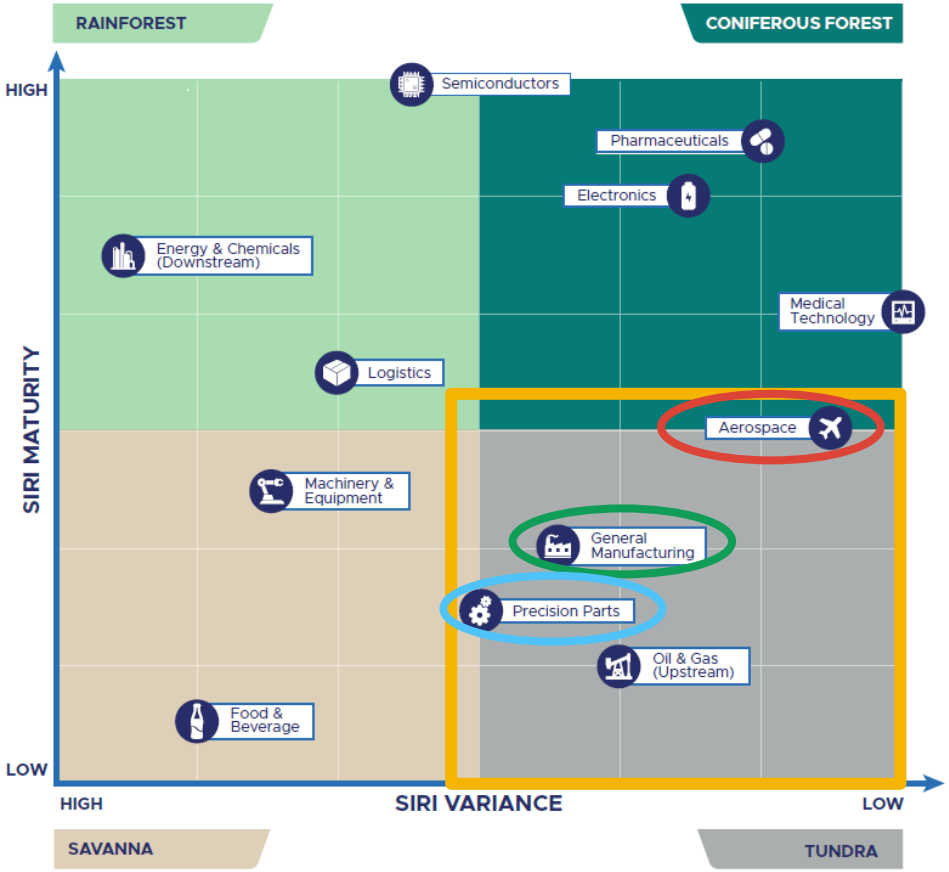
# CONNSTEP SIRI Results and Insights

# Demographics

- 11 Companies Assessed Jun-Dec 2021
- Breakdown by Industry
  - Aerospace: 4
  - Precision Parts: 5
  - General Manufacturing: 2
- Company Sizes
  - Full-time Employees: 30 to 430
  - Revenues: $5M-130M



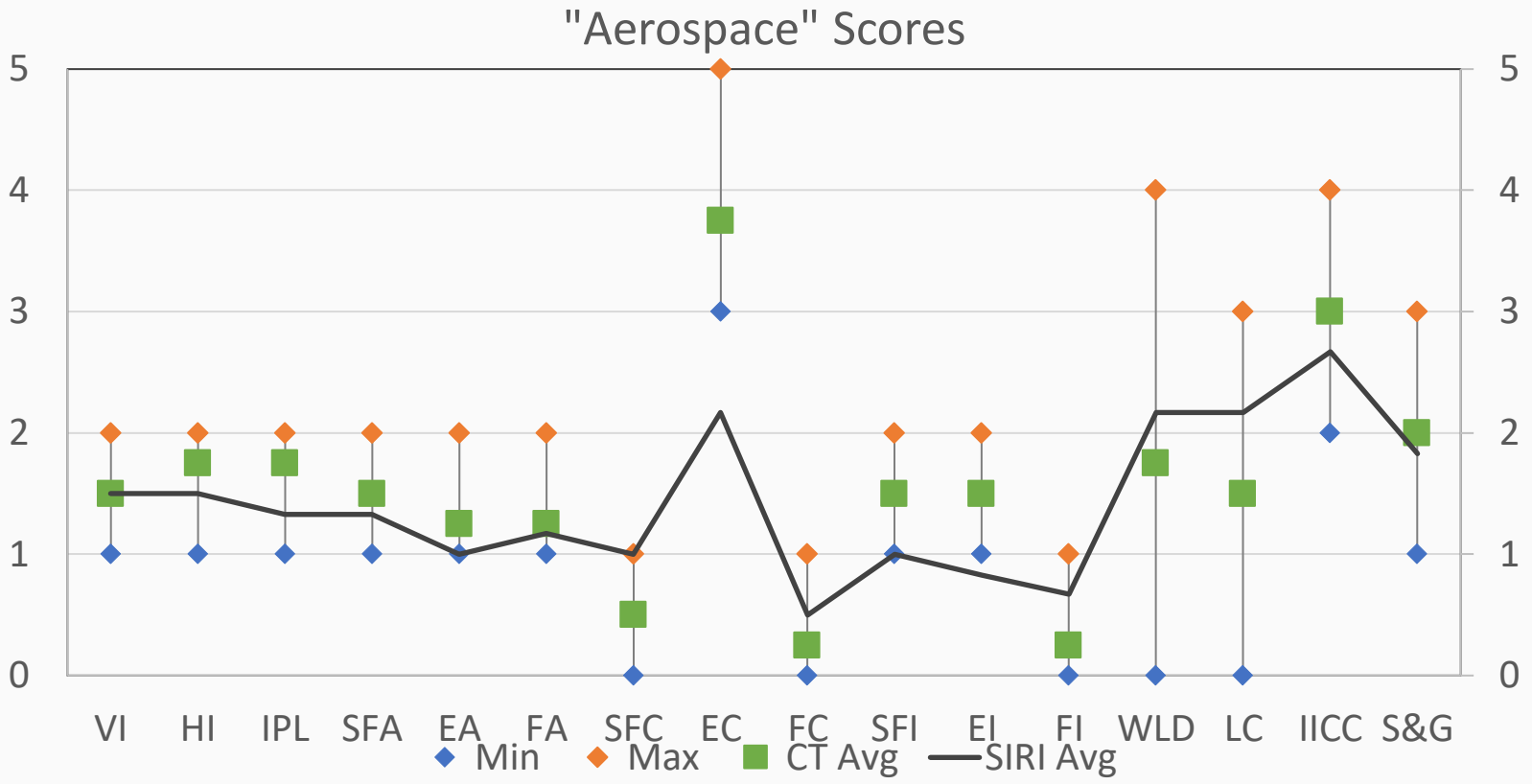
# Insights from SIRI Transformation Archetype



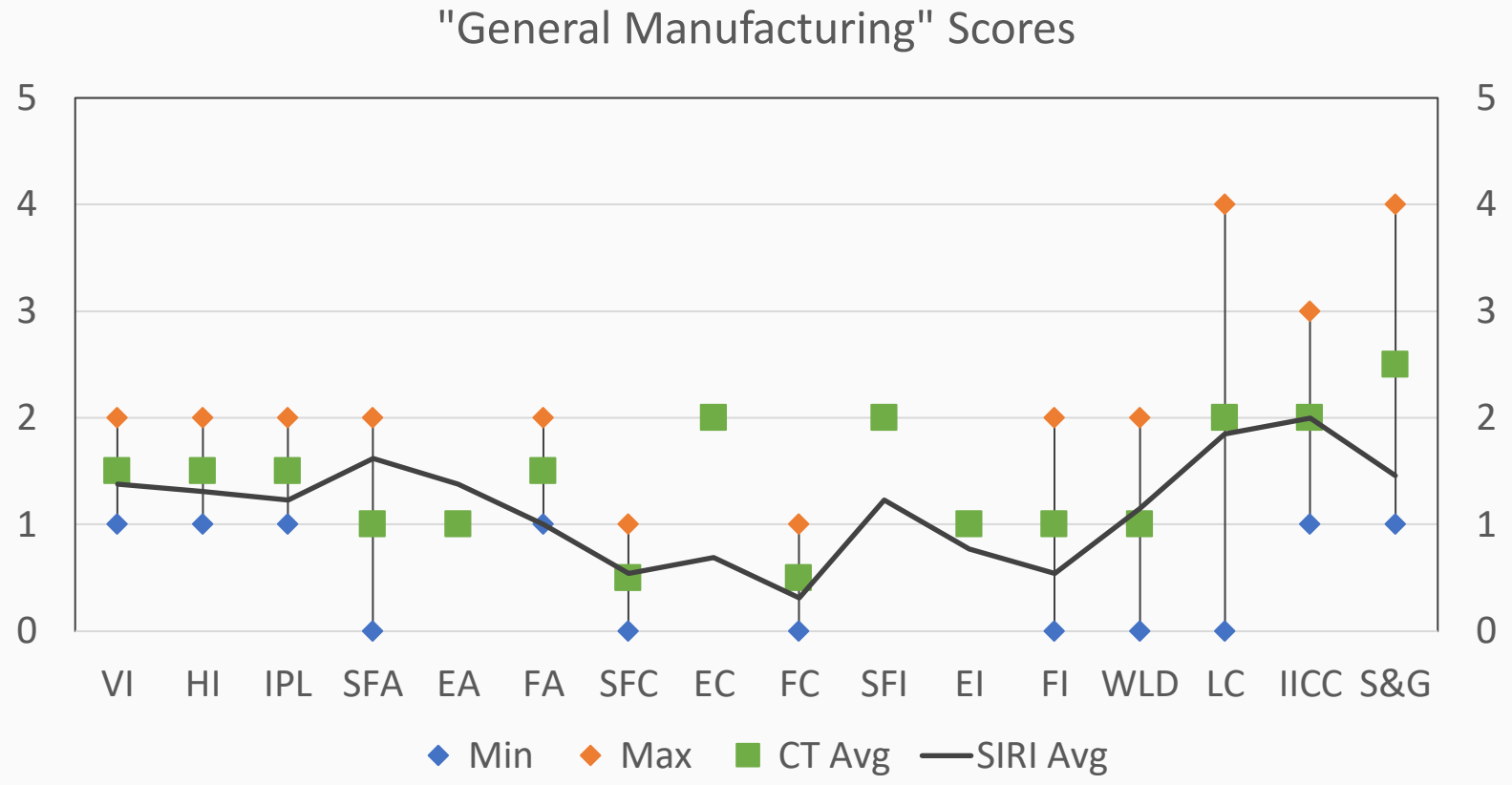

## Tundra

- Tundra habitat is associated with harsh climates – strong winds, low temperatures, and limited rainfall
- The Tundra Archetype characterizes industries that rank low in both SIRI Maturity and SIRI Variance
- Face greater challenges in industrial transformation
  - Highly customized products in relatively small volumes
  - Reliance on skilled labor, few large-scale automation benefits
  - Regulatory and compliance requirements limit large-scale industrial transformation efforts
- Other opportunities exist to realize Industry 4.0 benefits:
  - Flexible automation and machines leveraging product similarities
  - Redesign of manufacturing processes for efficiency
  - Enhancement of worker training programs and upskilling
  - Foster customer/supplier relationships for supply chain resilience and efficiency
  - Integration of management systems to improve efficiency and response times
  - Increased leverage of machine and enterprise data to provide actionable intelligence for improved decision making

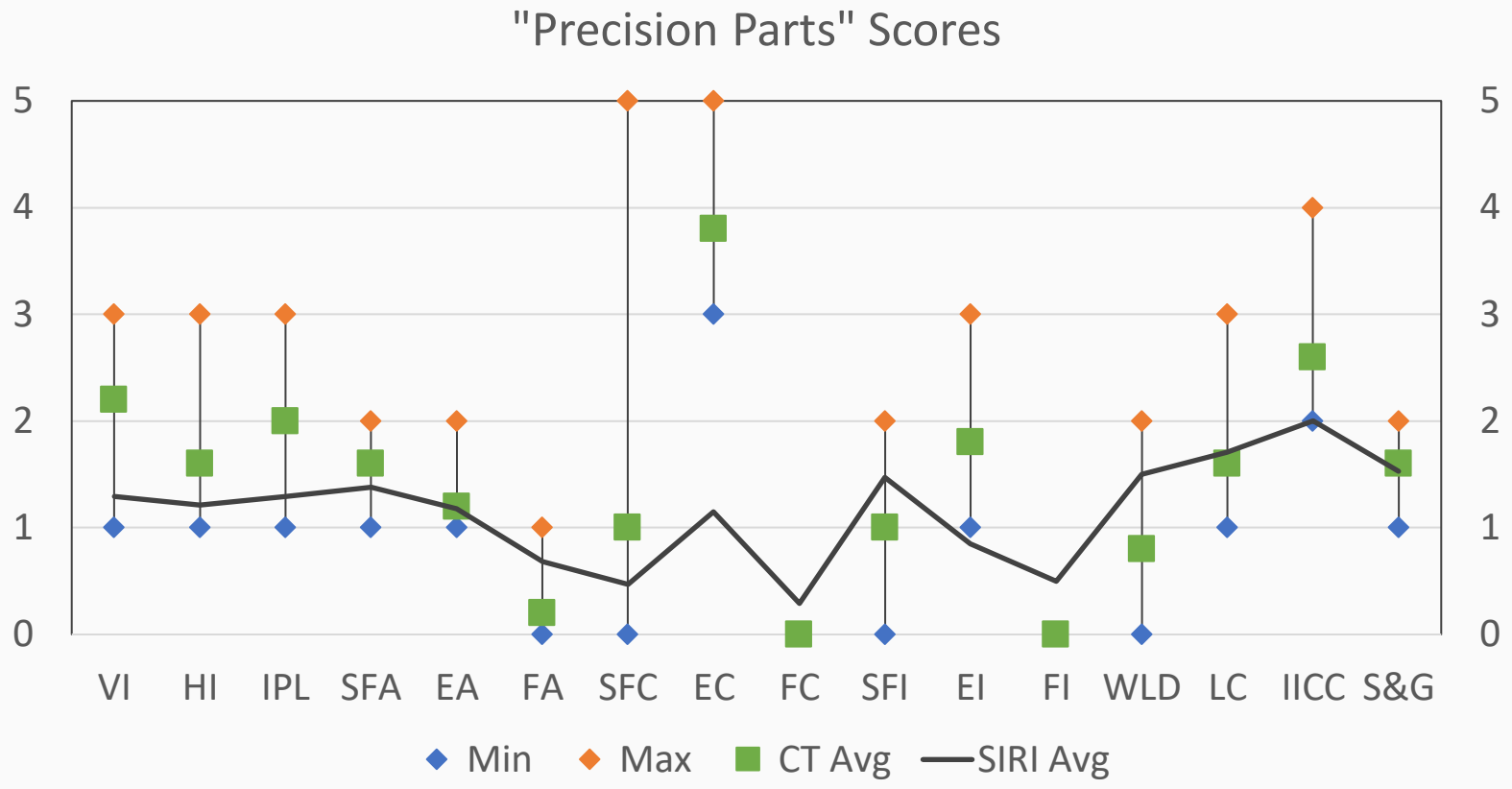
# Aerospace Scores



# General Manufacturing Scores

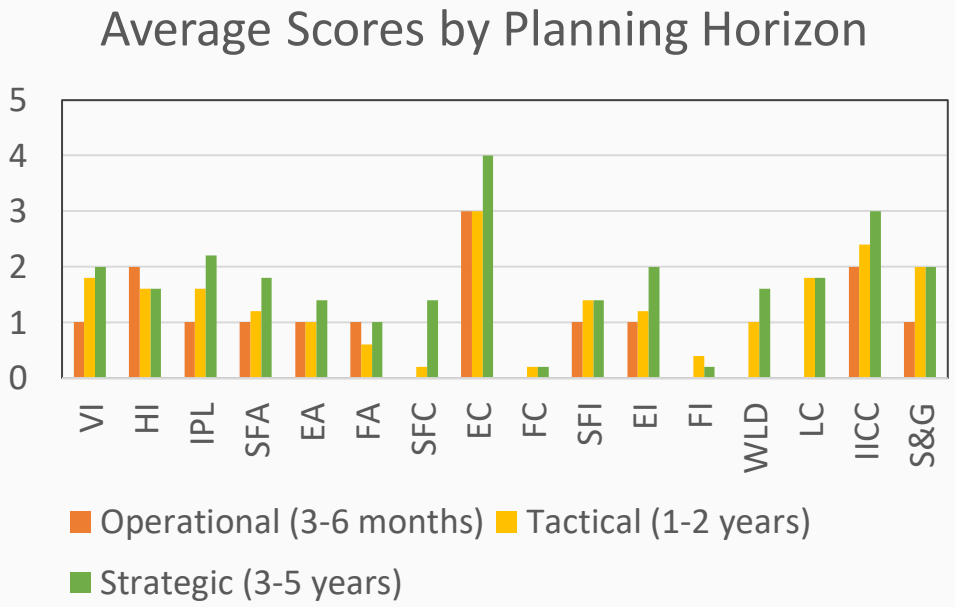


# Precision Parts Scores

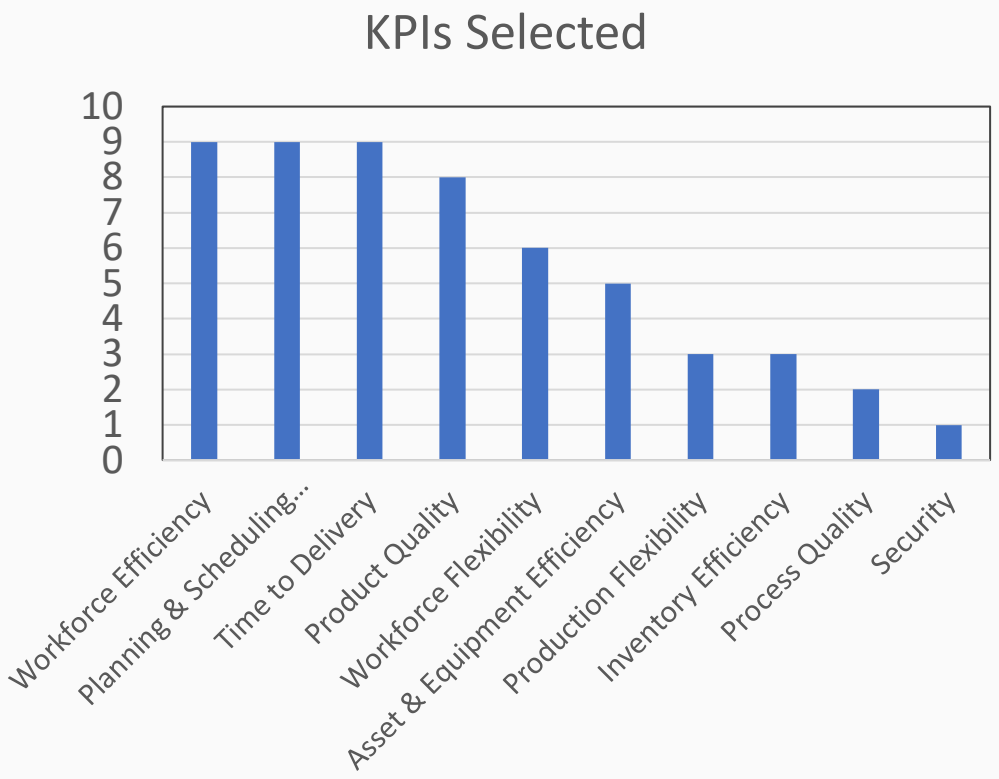


# Maturity Insights

- Companies with DoD ties tend to score highly on Enterprise Connectivity due to cybersecurity requirements
- In general, companies with a “Strategic” planning horizon have higher maturity levels
- Company size did not have a strong correlation to maturity levels

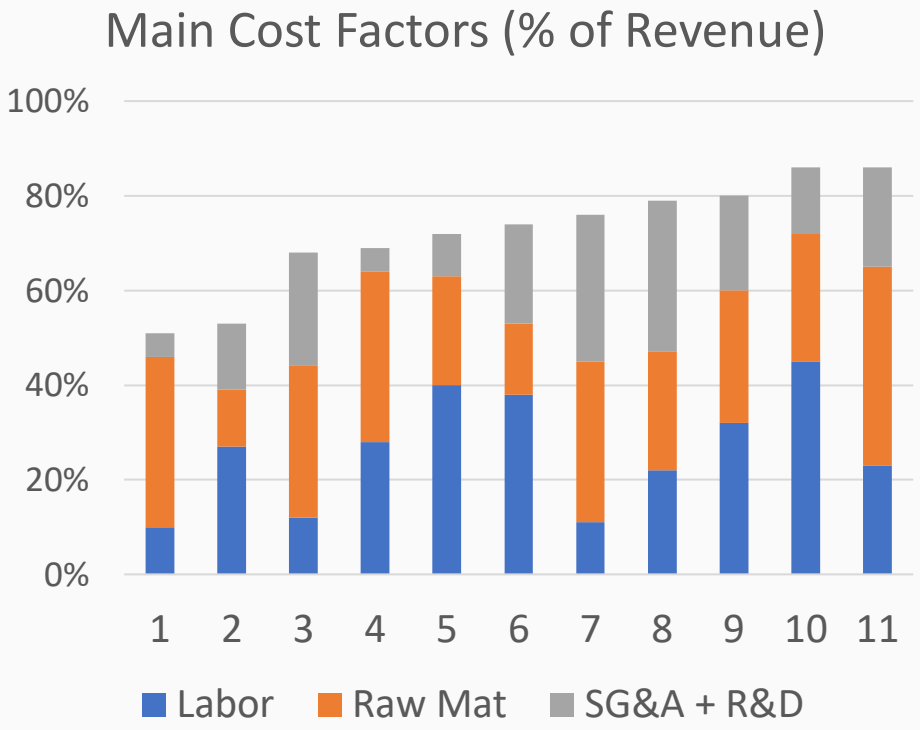


# Key Performance Indicators




- CT Manufacturing landscape fits “Tundra” model
  - Highly customized parts in low quantities
  - Efficiency and effectiveness of systems and equipment are critical to success
  - Focus on product quality and on-time delivery
  - Workforce needs to be flexible and efficient
- Stringent quality constraints for companies in Aerospace and Precision Parts supply chains
- Most companies battle with effective planning & scheduling to maintain on-time delivery in the face of shifting customer demands and supply chain issues
- Opportunities to improve equipment flexibility and performance
  - Condition monitoring
  - Predictive maintenance
  - Changeover time reduction

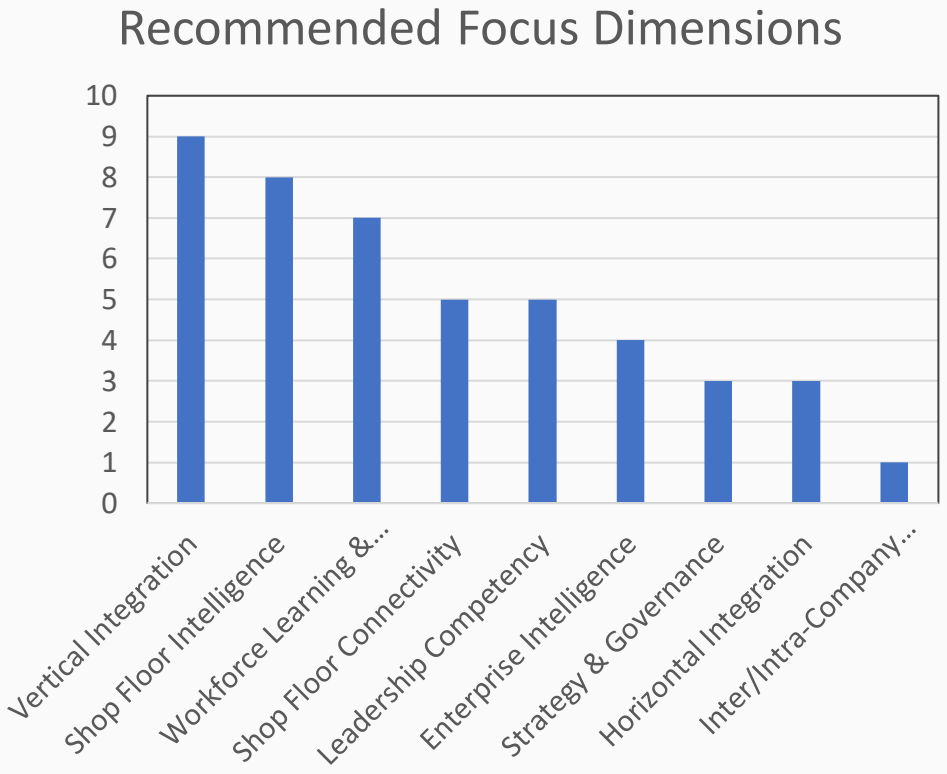
# Cost Factors




- Labor
  - Ranging from 10%-45%
  - Driven by reliance on skilled labor, complexity of parts, and maturity in automation
- Raw Materials & Consumables
  - Ranging from 12%-42%
  - Driven by customization options, specialty materials, supply chain, and capabilities of re-ordering process
- SG&A and R&D
  - Ranging from 5%-32%
  - Driven by complexity of parts, level of adoption of model-based design (self and customer), and quality requirements

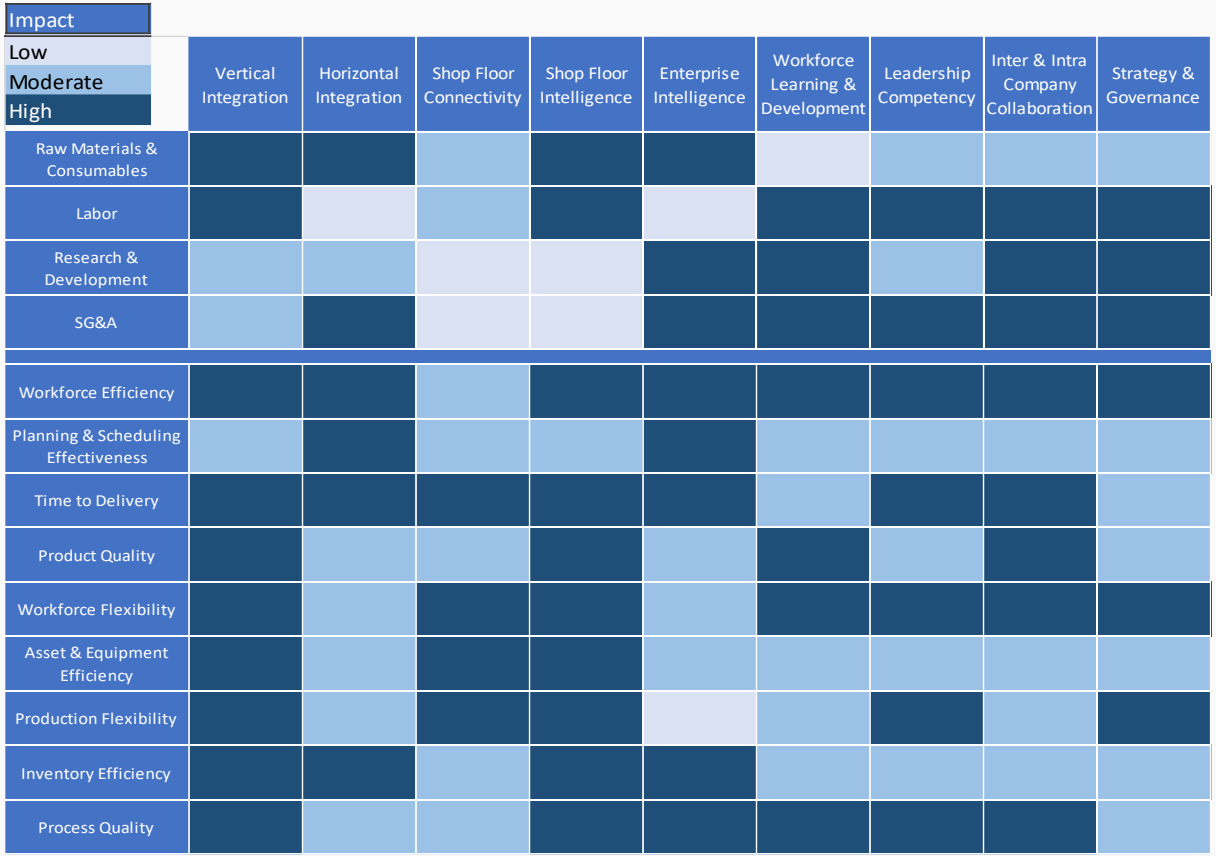
# Focus Dimensions

- Continue to see themes from the “Tundra” Archetype model
  - Fewer opportunities exist for large-scale automation deployments
  - Greater potential impacts from technologies related to Vertical Integration of processes and Intelligence on the Shop Floor and Enterprise
  - Greater impacts to be gained from upskilling, development, and augmentation of workforce
- Greatest needs and opportunities:
  - HI/VI – consolidating data to provide real-time information, improving effectiveness and agility
  - EI – acquiring and processing data to provide actionable intelligence on operational states
  - SFI/SFC – accessing rich data from machines to provide insight on machine condition and capacity
  - WLD – provide growth paths to improve Ind 4.0 adoption, augment training with Ind 4.0 tools
  - LC/SG – increasing leadership ability to drive Ind 4.0 strategy and create sustainable growth
  - IICC – (for mature companies) scale and sustain the momentum of early wins and improvements



# KPIs

- Helps to understand why focus dimensions are selected
- More importantly, shows how investments in each dimension **optimize costs** and **drive KPIs**
- Highlights:
  - Integration dimensions impact largest costs and all KPIs
  - Intelligence dimensions streamline decision making at all levels and create efficiency and quality gains
  - Organizational dimensions increase alignment and organizational excellence



# Lessons Learned

# Lessons

- SIRI **can** provide useful insight at **any** level:
  - SIRI works best for companies where leadership competency is high
  - Companies lacking effective process controls could be better served to start with a focus on process definition and improvement prior to technology adoption
  - Effective tool for those who have a strong ability to deploy technology but are looking for help with creating a roadmap (power of the Prioritization Matrix)
- Forward-thinking leadership teams are already making some connections:
  - Industry 4.0 technology adoption will equate to sustainability of the business
  - Effective technology adoption **must** be driven by business needs
- What insights did we find in Connecticut small manufacturers?
  - Need for increasing awareness and strategy at leadership levels
  - Priority of Intelligence over Automation on the shop floor at “Tundra” companies
  - Sustainability of transformation depends on balance between workforce adoption **and** leadership support of Industry 4.0 principles and initiatives

# Recommendations

# Recommendations

- Importance to find solutions to address the major gaps for Connecticut Manufacturers:
  - Leadership Competency, Strategy & Governance
    - Increase the awareness of available Industry 4.0 technologies and business benefits
    - Turning technology vision into strategies
    - Effective deployment and management of initiatives
  - Workforce Learning & Development
    - Upskilling workers on Industry 4.0 capabilities and with digital platforms
    - Augmenting worker skills with AR/VR tools for guided assembly and training
  - Shop Floor technologies
    - Intelligence/Connectivity on shop floor for real-time view of status and issues
    - Steer away from high-volume automation and focus on more flexible solutions (e.g. cobots)
  - Vertical/Horizontal Integration, Integrated Product Lifecycle
    - Leverage model-based tools to streamline exchange with customers/suppliers
    - Integration of management systems and intelligence to improve agility and responsiveness to shifting demands or supply chain disruptions

# Thank you

# Look Back & Ahead

## Aug '21

### Launch MTWG

Surveyed i4.0 Provider and SMMs of Working Group.

Awareness to Others in Ecosystem:
- AMEP: Adv Mfg Employer Partnership
- CMC: CT Manufacturing Collaborative
- CCIC Engineering Deans
- SW Regional Sector Partnership

## Sept-Q4

### Workstreams

Value Stream Mapping
Outreach, Resources
Ecosystem Mapping '22


## 2022

## Q1

### Progress Report

NLT 3/15 - identify barriers to accomplish goals

## Q2

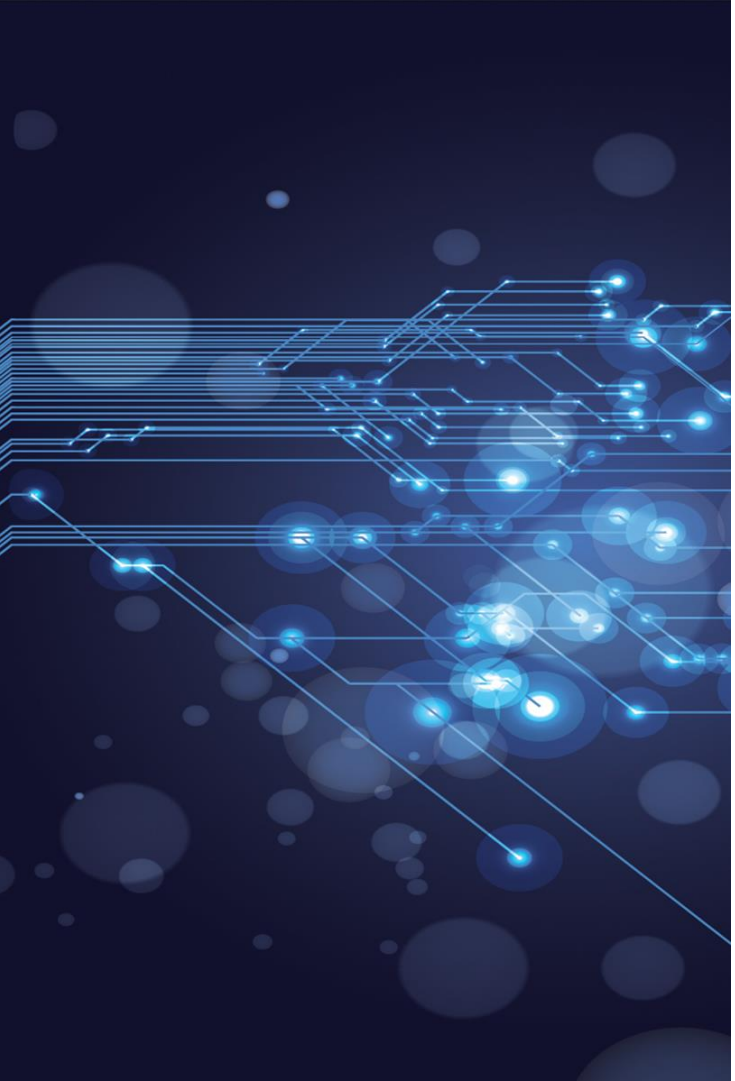
### Ecosystem

Comprehensive profiling; success stories; awareness of i4.0 resources

## Q3

### Strategic Plan

Due October 1

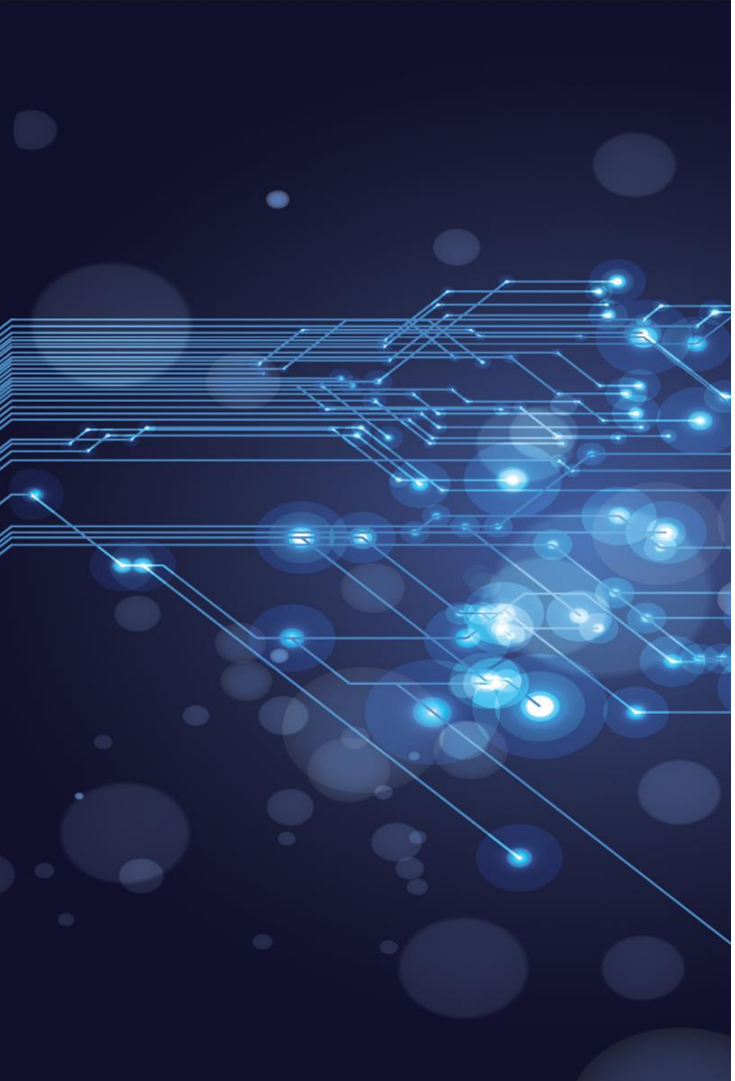


# Deliverables

Section 1c.1

Compile comprehensive profiles, including mission statements, and lists of services, for all entities that receive state or federal funding for the purpose of researching, developing, training, marketing, consulting or deploying Industry 4.0 technology or associates services, directly to, or for the benefit of, manufacturing startups, small and mid-sized manufacturers or other businesses primarily engaged in manufacturing.

I4.0 Providers



# Deliverables

Section 2

Conduct value-stream mapping and other analyses, as needed, to assess the flow of services from the entities identified. Such analyses shall include, but need not be limited to,

- identification of the extent to which such services complement, conflict with or duplicate each other,
- assessment of the relative impacts of such services on the manufacturers served,
- identification of gaps in services provided relative to the Industry 4.0 technology needs of manufacturers,
- identification of barriers and recommendations for achieving the goals of the working group described in subsection (b) of this section, and
- identification and assessment of participation levels in small business innovation research programs and small business technology transfer programs.

I4.0 Providers

Manufacturers

# Workstreams

## VSM: Value Stream Mapping

Map out current state value stream of provider network

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## Resources

Focus on SBIR / STTR; include other grant opportunities & resources

ctnext

## Outreach

Awareness of manufacturers to provider network

CAT Connecticut Center for Advanced Technology, Inc.

## Ecosystem Mapping

Cataloging comprehensive profiles of providers (Deliverable 1)

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Connecticut

Partner w/ Manufacturing Innovation Fund Initiative