Smart Manufacturing: A National Imperative

Requiring Local Mobilization and Engagement

sme.org

Jeannine Kunz
Chief Workforce Development Officer
SME

- 23 years in workforce development and training
- Lead the Tooling U-SME and WFD efforts at SME
- Co-Chair of the National Smart Manufacturing Executive Council with CESMII
- Appointed Committee Member – National Academies
  - Options for a National Smart Manufacturing Plan
- Advisory Board Member - THINKER graduate program at Clemson University
- Board Member – Coalition for Career Development
- Chair of NDIA's Manufacturing Division's Workforce Committee
- Education & Workforce Advisory Committee Member of ARM

Our Purpose

Advance manufacturing to drive competitiveness, resiliency, and national security

Our Vision

Manufacturing is a diverse, thriving, and valued ecosystem

Our Mission

Accelerate widespread adoption of manufacturing technologies and build North America's talent and capabilities

SME is a nonprofit organization that supports manufacturing based on our core belief:
Manufacturing is key to economic growth and prosperity.

Today

1. What is SMART Manufacturing?
2. Why SMART Manufacturing?
3. State of Adopting SMART Manufacturing
4. National Efforts - Smart Manufacturing
5. Impact on Roles

What is SMART Manufacturing?

It is all in the name

Liquor Store

Party Store

Glass Door

Window

Door

Wall

Smart Manufacturing

Industry 4.0

Advanced Manufacturing

Digital Manufacturing

Manufacturing USA is a national network of 16 manufacturing innovation institutes created to secure U.S. global leadership in advanced manufacturing through large-scale public-private collaboration on technology, supply chain, and education and workforce development. The institutes, sponsored by the U.S. Departments of Defense, Energy and Commerce, partner with six additional federal agencies.

Smart Manufacturing – Elevator Definition

Right **Information**

At the

Right **Time**

In the

Right **Form**

At the

Right **Place**

With the

Right **Technology**

For the

Right **People**

(or machines)

To enable

Smart **Decisions**

Industrial Revolutions

The Smart Manufacturing Revolution

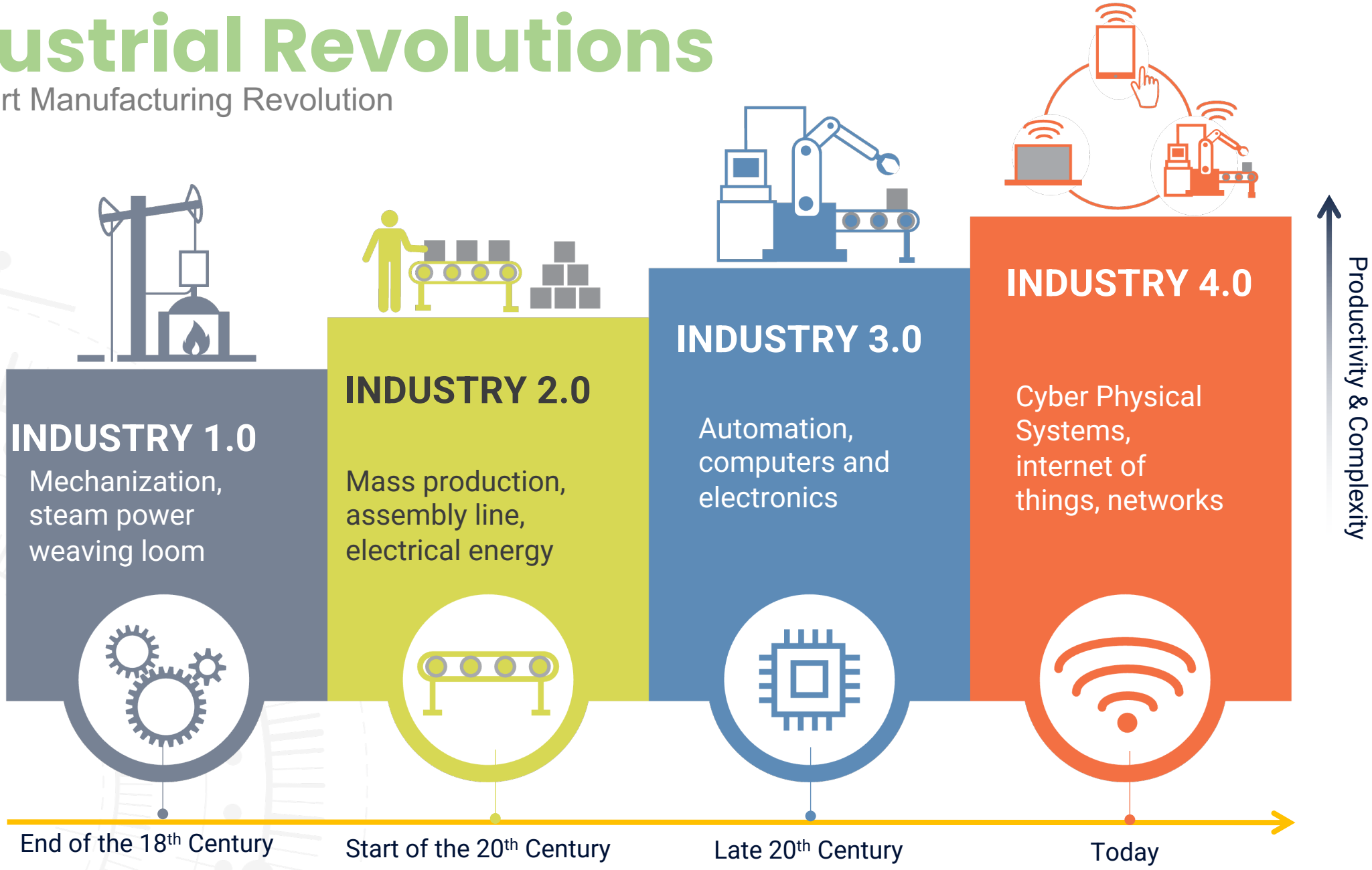
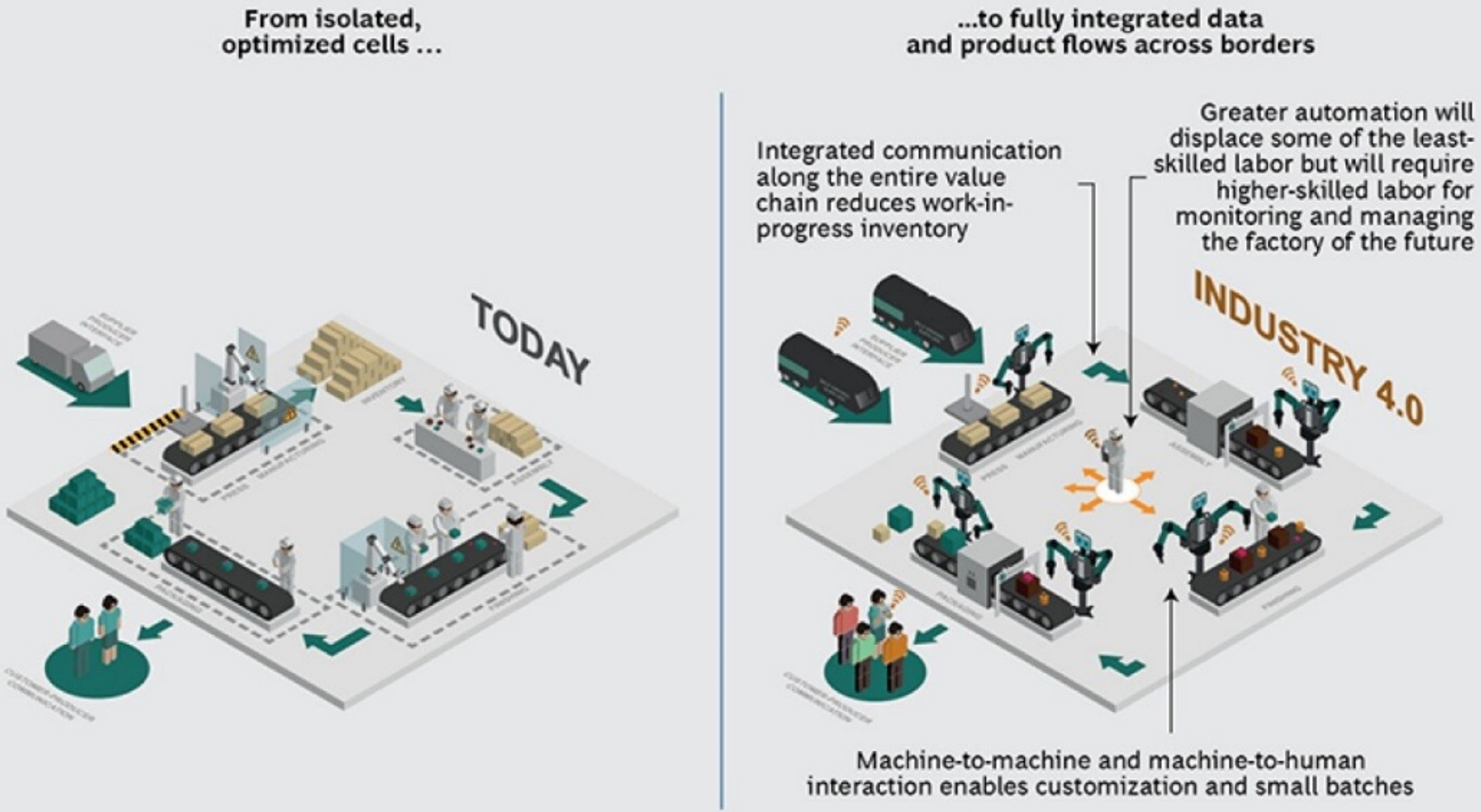


EXHIBIT 2 | Industry 4.0 Is Changing Traditional Manufacturing Relationships



Source: BCG.

SMART Transformational Technologies

Industrial Internet of Things (IIoT)	Big Data	Cloud Computing	Cybersecurity
Automation	Robotics	Artificial Intelligence and Machine Learning	Simulation & Visualization -Digital Twin - AR/VR

Why SMART Manufacturing?

Value of Manufacturing Digitization

McKinsey & Company

Source: McKinsey Digital, 2015

Why SMART Manufacturing?

Societal Benefits

- National security
- Supply chain resiliency
- Sustainability
- Decarbonization

Business Drivers

- Customer satisfaction
- Energy efficiency
- Productivity
- Data integrity
- Time to market
- Supply chain
- Workforce and resource optimization
- Responsive, decentralized decisions

National Imperative

- Pandemic showed us the power of supply chain, connectivity, data
- Manufacturing productivity as a nation declined for first time in 50 years
- Other parts of the world are surpassing

Not without Risks

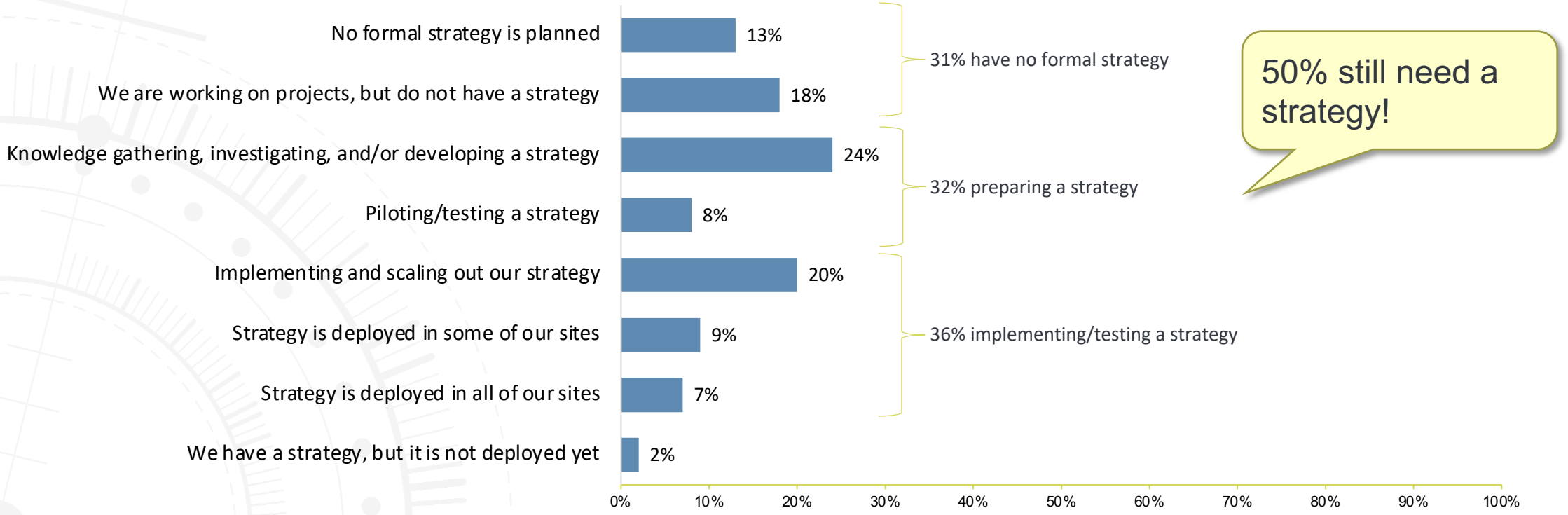
- This new digital thread ecosystems create opportunities to increase U.S. global competitiveness and enhance supply chain network resilience.
- With this exponential increase in connectivity, there is an exponential increase in exploitable weaknesses, leaving manufacturers vulnerable to massive consequences if their operational technology boundary detection systems fail.

CYMANII
the cybersecurity manufacturing innovation institute

State of Adoption – SMART Manufacturing

Manufacturers Lacking a Plan for SMART

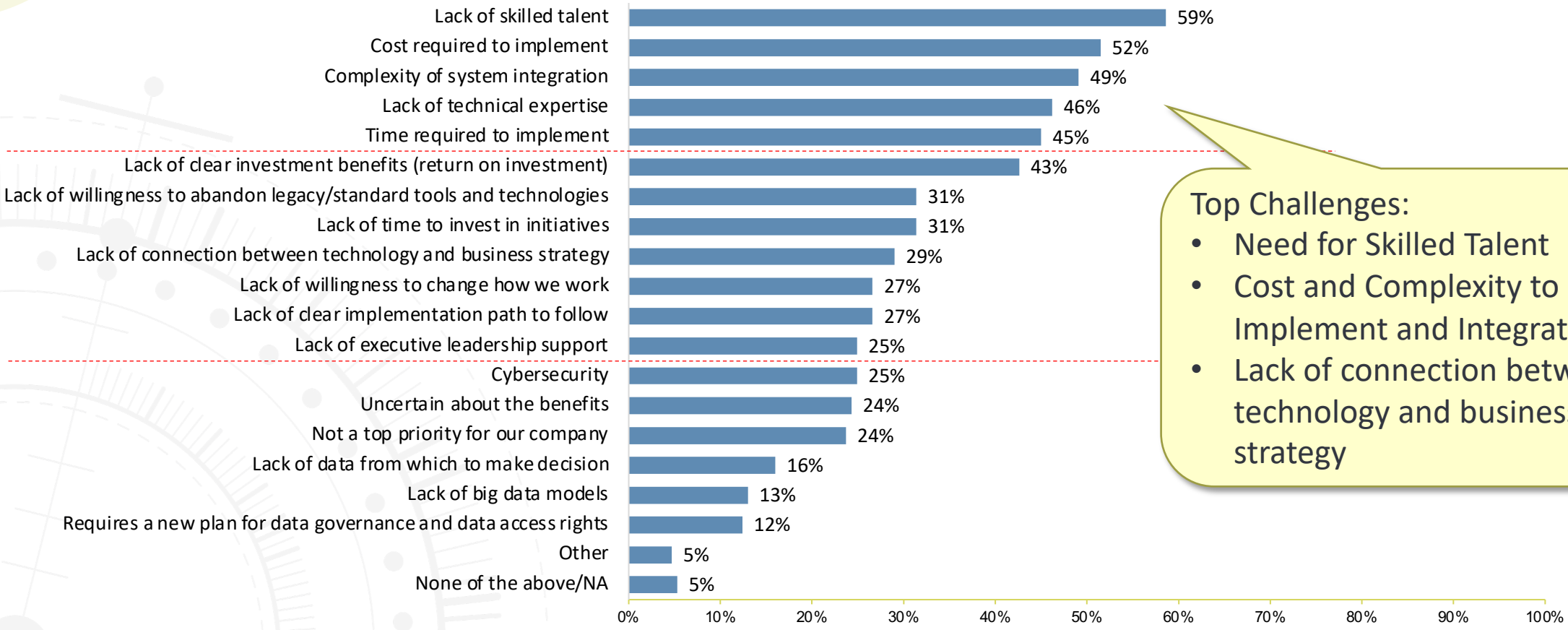
- Respondents fall into the 1/3 rule for their company's smart manufacturing strategy, where 1/3 have no formal strategy, another 1/3 are preparing their strategy and the final 1/3 are implementing/testing a strategy.



50% still need a strategy!

Source: 2022 Research Study, CESMII and SME

Lack of Talent #1 Challenge to SMART Manufacturing



Top Challenges:

- Need for Skilled Talent
- Cost and Complexity to Implement and Integrate
- Lack of connection between technology and business strategy

Source: 2022 Research Study, CESMII and SME

Current Challenges and Barriers

- We can’t get the data out contextually & at the right resolution
- We don’t know how to use the data to build a model
- We can’t operationalize the insights
- We can’t staff the implementation of the solution

(From Large National Employer)

National Efforts and Programs for SMART Manufacturing

CESMII and SME Joined Forces to Accelerate Smart Manufacturing

Leading Digital Transformation. Partnering for Innovation

Champion Smart Manufacturing First Principles and Thought Leadership Topics

Educate the Current and Future Workforce

Accelerate and Amplify the Adoption of Smart Manufacturing

SMART MANUFACTURING EXECUTIVE Council

A National 'Think Tank' of Smart Manufacturing Leaders, Advocating for the Transformation of the Ecosystem

Our Charter: The Smart Manufacturing Executive Council was formed to engage business and technology executives, thought leaders and visionaries advocating for the transformation of the U.S. manufacturing ecosystem.

Our Objective: To develop practical guidance and policy recommendations that will help this ecosystem across this digital divide.

LEARN MORE

SMART MANUFACTURING EXECUTIVE Council

- Leverage admired Manufacturing Businesses, **demonstrating their leadership on this journey**, and showing others the way
- Inspire this ecosystem to evolve their strategies and business models to truly **support the democratization of manufacturing technologies** and ensure that SMMs can engage in Smart Manufacturing as well
- Provide guidance for each of the **8** stakeholder groups in our manufacturing ecosystem, helping them understand their role in this evolution, and **invest in the knowledge and skills** required for this transformation
- **Inform US policy makers** on the transformative actions and policies that will **accelerate US adoption** of Smart Manufacturing

LEARN MORE

SMART MANUFACTURING EXECUTIVE Council

A National 'Think Tank' of Smart Manufacturing Leaders, Advocating for the Transformation of the Ecosystem

Kelly Aronson
Anderson Windows

Antoine Dhennin
ArcelorMittal

Larry Megan
Baldwin Richardson Foods

Lance Fountaine
Cargill

Alpen Patel
Caterpillar

Venu Pillai
Corning

Craig Sutton
Eaton

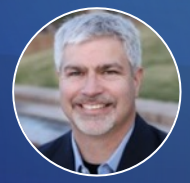
Habib Quazi
ExxonMobil

Michael Bastian
Ford

Scott King
Ford

Lisa Zasada
General Mills

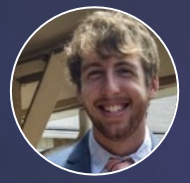
Jeff Abell
General Motors



Jon Hobgood
Honeywell

Ken Creasy
Johnson & Johnson

Audrey St. Onge
Lallemand Baking



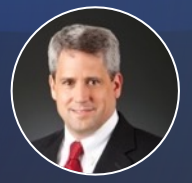
Matthew Laing
Lilly

Jesus Flores
Linde

Don McCartney
OshKosh

Brian Perlstein
Owens Corning

Jeff Kent
Procter & Gamble



Rich Van Dyke
PepsiCo

Mike Tomasco
Pfizer Digital

Kelly Dodds
Raytheon

Jason Trujillo
Stanley Black & Decker

John McKenzie
Stellantis

David Hinkler
Thermo-Fisher Scientific

Trever White
Toyota

Rachelle Howard
Vertex Pharmaceuticals

LEARN MORE

SMART MANUFACTURING EXECUTIVE Council

Meet the Advisory Board

SMART MANUFACTURING EXECUTIVE COUNCIL CO-CHAIRS

John **Dyck**

CESMII

Jeannine **Kunz**

sme

Dean **Bartles**

MTDG Manufacturing Technology Deployment Group, Inc.

Rick **Bullotta**

Formerly thingworx

Simon **Jacobson**

Gartner

Matthew **Littlefield**

LNS Research

Peggy **Smedley**

specialty publishing media

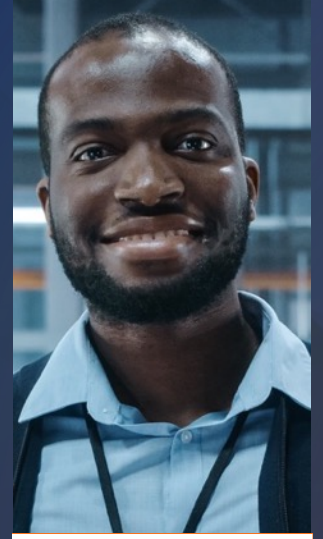
Jim **Wetzel**

NxGen Group

Jeff **Winter**

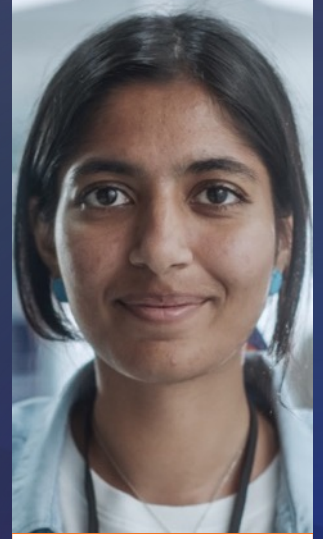
Hitachi Solutions

Corporate Manufacturing & Supply Chain Leadership



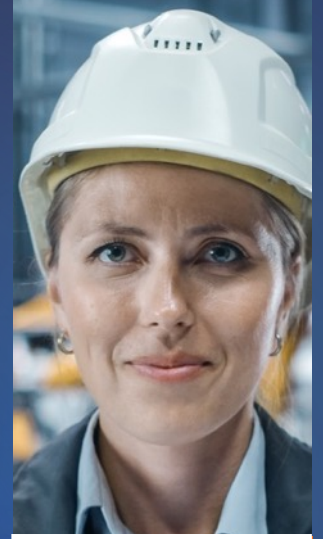
Plant Leadership Team

Strategy Consultants



Technology Providers

System Integrators



Machine Builders

Education & Training Ecosystem

Operator

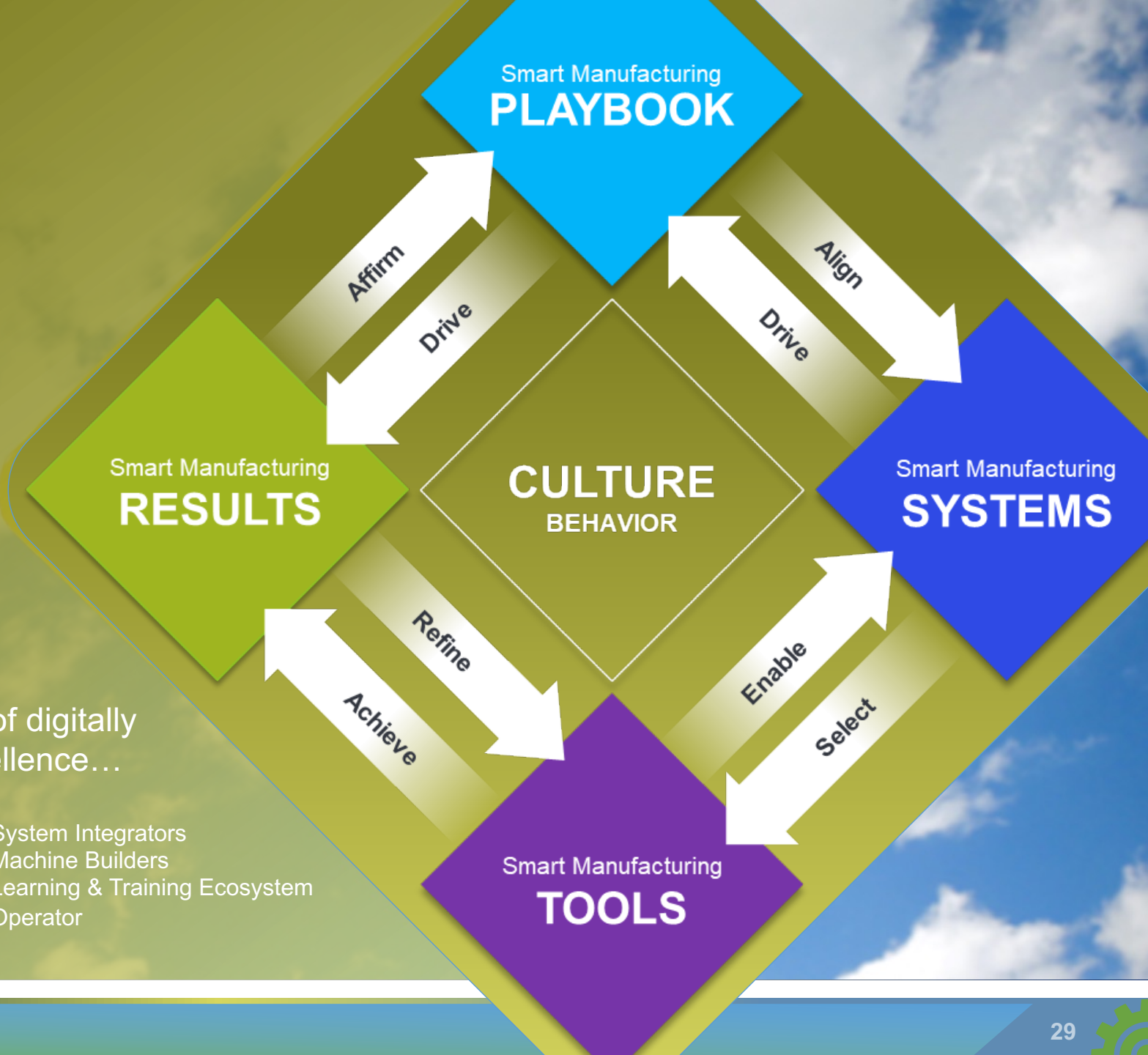
What are the Guiding Principles – the behaviors & strategies – for each SM stakeholder group that the SMEC would establish as **essential for Smart Manufacturing success?**

Developing a
Smart Manufacturing Mindset…

The Smart Manufacturing *Playbook*

The basis for building a sustainable culture of digitally enabled operational and organizational excellence…

- Corporate Manufacturing & Supply Chain Leadership
- Plant Leadership Team
- Strategy Consultants
- Technology Providers
- System Integrators
- Machine Builders
- Learning & Training Ecosystem
- Operator



sme

NATIONAL ACADEMIES

Sciences
Engineering
Medicine

Options for National SMART Manufacturing Plan

Statement of Task: A National Academies of Sciences, Engineering, and Medicine-appointed ad hoc committee will develop options for a national plan for smart manufacturing technology development and deployment.

- Congressional request, Dept of Energy sponsored
- Committee to develop report and recommendations to:
    - inform legislation, policy, funding
    - improve the productivity and energy efficiency of the manufacturing sector
    - ensure U.S. competitiveness
- Last nine months - workshops, input sessions and report writing
- Release late 2023

Options for National SMART Manufacturing Plan

Recommendations to Congress and broader ecosystem address:

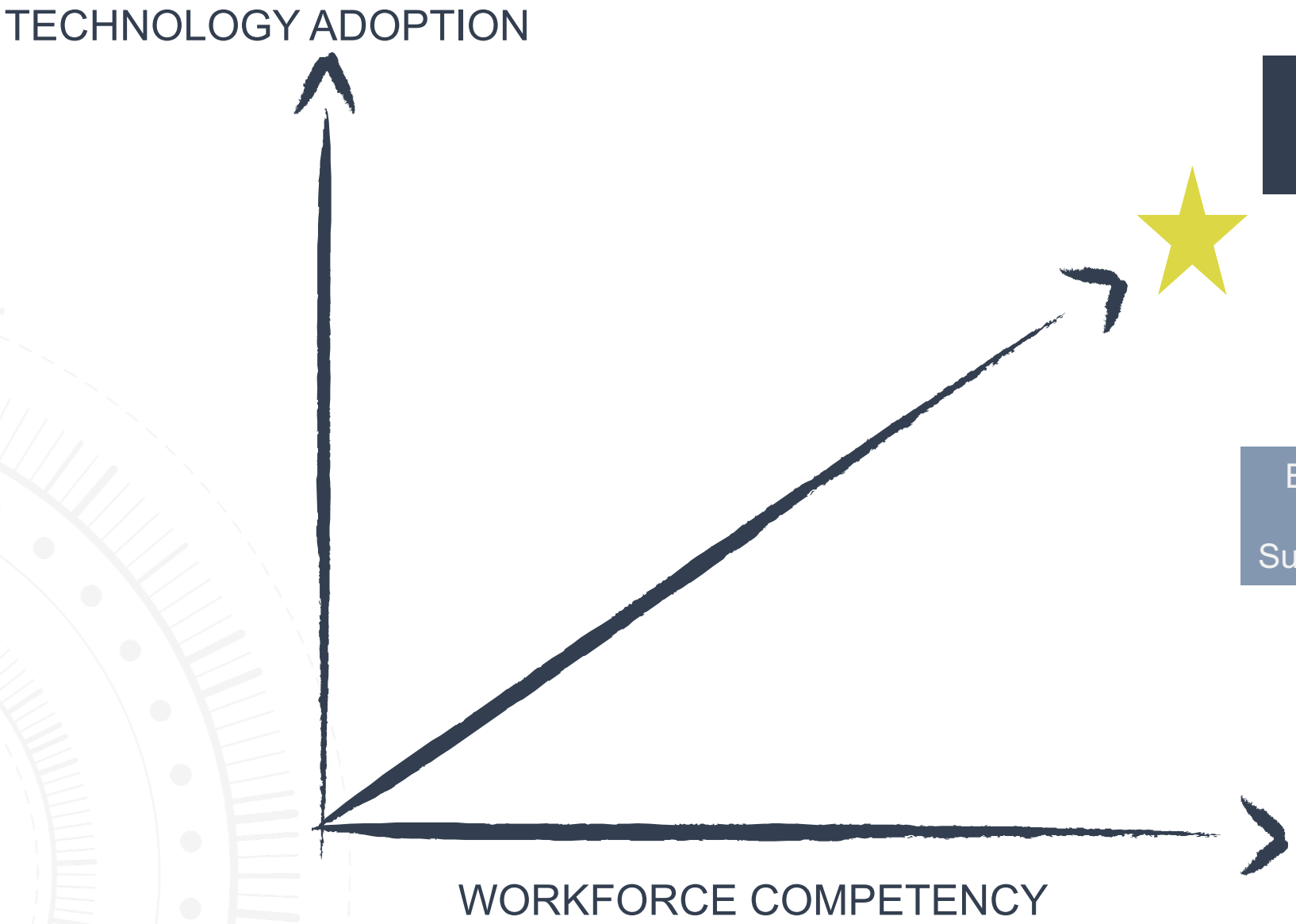
1. **state of the art smart manufacturing and future directions and needs;**
2. **potential broader impacts of smart manufacturing; and**
3. **education, training, and workforce needs for smart manufacturing.**

Input was gathered from representatives of the manufacturing institutes, developers of past cross-agency national plans, and experts from smart manufacturing research communities in academia, industry, nonprofits and government.

National Academy Study Committee

- **Thomas Kurfess** (*Chair*), Georgia Institute of Technology
- **Billy Bardin,** Global Digitalization Director, Dow Inc.
- **Richard Braatz,** Massachusetts Institute of Technology
- **Jian Cao,** Northwestern University.
- **Krystel Castillo-Villar,** Energy VP, CYMAII
- **Lili Cheng,** Cooperate Vice President, Microsoft
- **Jim Davis,** Vice Provost IT, UCLA
- **Robert Gao,** Case Western Reserve University
- **SK Gupta,** University of Southern California
- **Susan Houseman,** Upjohn Institute for Employment Research
- **Jeannine Kunz,** SME
- **Stuart Lawrence, III**, CEO and President of Titan Robotics
- **Blake Moret**, Chairman and CEO of Rockwell Automation
- **Chinedum Okwudire**, University of Michigan
- **Melissa Orme**, Vice President, The Boeing Company
- **William Spriggs**, Howard University
- **John Sutherland**, Purdue University
- **Karen Thole**, Penn State University

Impact on Jobs and Educators



Competitive Manufacturing Industry

Economic Prosperity
National Security
Supply Chain Resiliency

Confluence of People and Technology

Disruption of How we Work

Technology.
People.
Work.

Digital Skills Impacting All Jobs

- Being tech-and data-literate will be an integral part of the job description for everyone
- 78% of middle skilled jobs required digital skills
- Digitally intensive jobs are growing twice as fast in middle skilled jobs than those not digitally intensive.
- OT meets IT….Electrical meets Mechanical
- AI, ML, Data Analytics, Robots, Automation, Cyber, Cloud Computing have all seen dramatic demand increases in the last 5 years
  - It is not just manufacturing – expands into healthcare, finance, etc.
- 72% of executives reporting that they have or can source the AI talent they need.

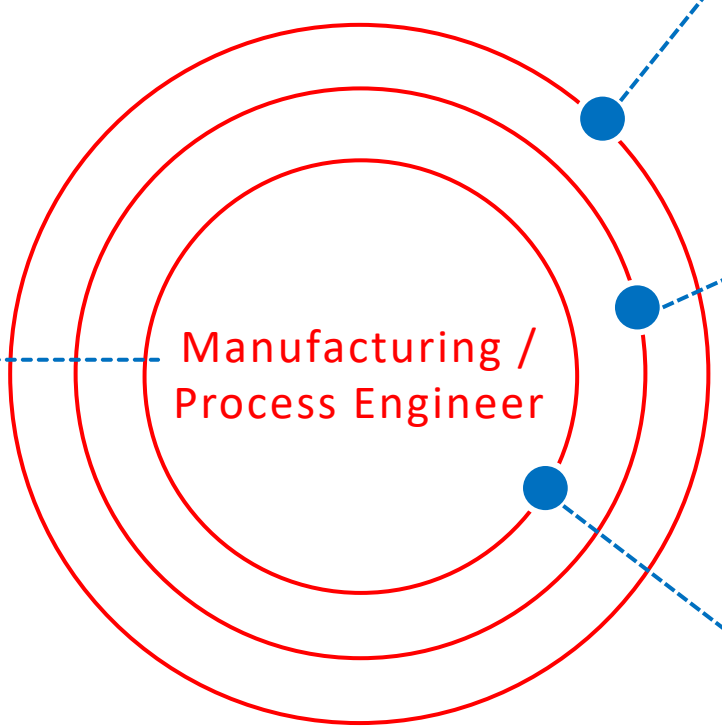
Jobs are paying premium for Smart Manufacturing skills

> 25,000
Job Postings

6.4%
Projected Growth in Employment

$77,000
Median Salary

46 days
Days to fill



Necessary Skills
- Data Analysis, Statistics, Business Intelligence
- Lean Manufacturing
- Complex Problem Solving

+ Smart Manufacturing Skills
+ $10,000

Skills include:
- Smart Manufacturing Concepts
- Automation, IIoT, Big Data , Cybersecurity
- IT-OT Integration, Information Models
- Optimization, Simulation

+ Advanced Smart Manufacturing Skills
++ $10,000

Skills include:
- AI, Machine Learning
- Programming in Python, C#
- Edge, Cloud Computing
- Connected Augmented Worker

Data Source: Labor Insights, Burning Glass, 2021 June

The Critical Role of Higher Education

“Education is the most powerful weapon which you can use to change the world.”

Nelson Mandela

Take Aways

1. Keep an eye on the national program outputs

2. Opportunity to lead

3. Roles and lines not as clear
   - Multi-disciplinary (mechanical/electrical, OT/IT)

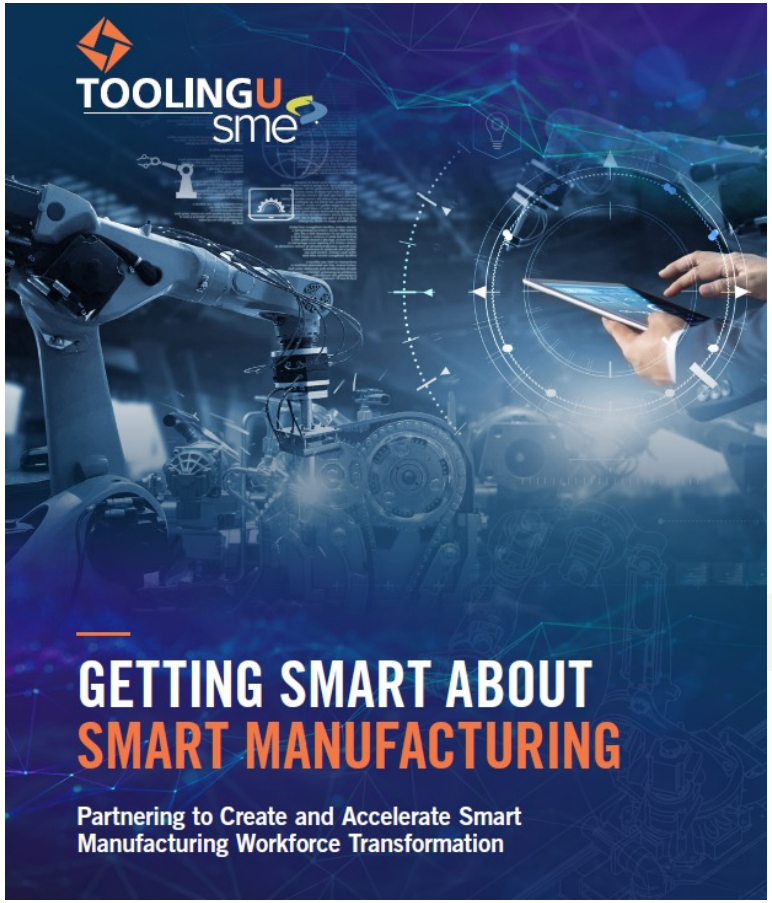
4. Stay close to industry for insights

5. Participate in grants or consortiums

6. Leverage opportunity to diversify enrollment and marketing – data, AI, analytics

SME Resources

SMART MANUFACTURING EXPERIENCE



Thank you

Jeannine Kunz
Chief Workforce Development Officer
SME
jkunz@sme.org