

EMBARGOED UNTIL JUNE 15

HYTADVISORS
At the crossroads of the digital manufacturing revolution

The Rise of Smart Manufacturing Platforms and Standards

June 2021

The Promise of Smart Manufacturing Platforms

1

Rapid Adoption of Digital Innovations in Legacy Enterprise



2

Standard and Interoperable Solutions and Services



3

Shared Approaches to Training and Education



Industry 4.0 – Why is this different?

An Industrial Commons Promotes Sharing

Basic Research, Education, Training, & Pre-Competitive Collaboration

We Deserve This



An Anti-Commons Promotes Exclusion

Competition, Patent Protections, Trade Secrets, & Copyrights

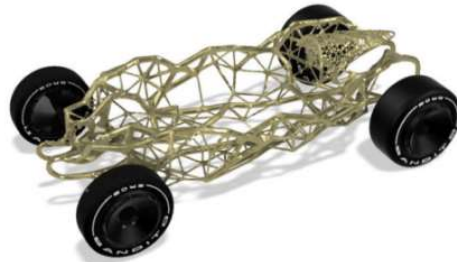
We Need This

We're running out of time to decide how we're going to close this gap

Artificial Intelligence



Additive Manufacturing



Collaborative Robotics



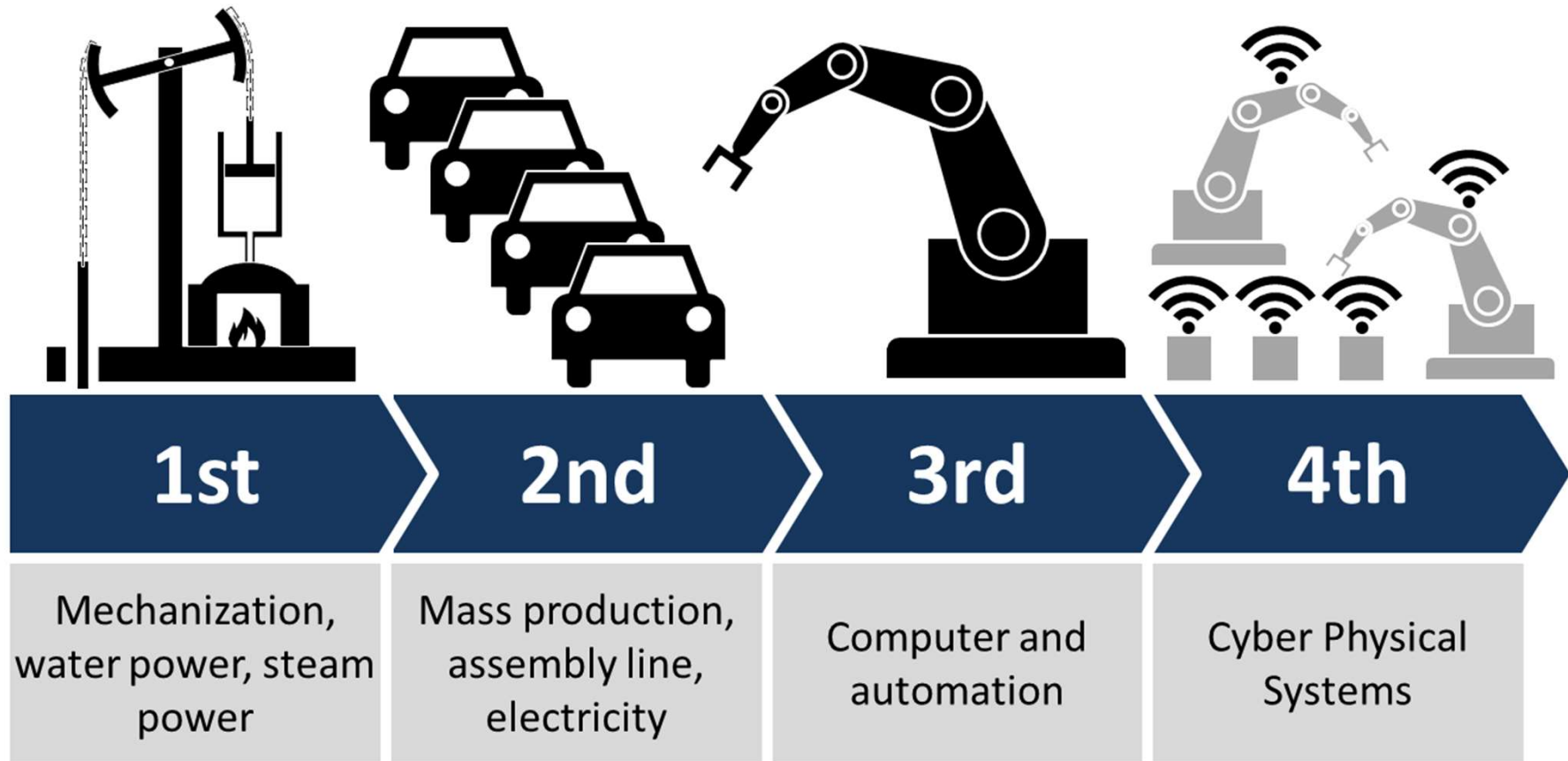
Smart Manufacturing



Industry will need to create solutions with the support of governments and academia to strike a balance between sharing and owning

Industry 4.0 – Why is this different?

Industrial History



Industry 4.0 – Why is this different?



Jeff Kowalski, Chief Technology Officer
Autodesk University, Las Vegas 2015

“What happens
when things we
design wake up?”

- Mickey McManus, Maya Design
and Autodesk Visiting Scholar & Co-
Author of *Trillions*

Industry 4.0 – Why is this different?

Past

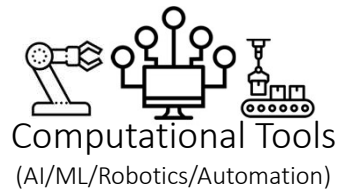
Today

Tomorrow

We are increasingly yielding more authority to autonomous systems in a positive way that free us to better use human capital, creativity, and insight to drive solutions and innovations which is leading to an era of Augmentation



Decision Sciences are at the heart of the Industry 4.0 revolutions



Industry 4.0 – Why is this different?

New impact of dissimilar industries and technologies

Radical new industry entrants

Pace and scope of change across operations is unprecedented

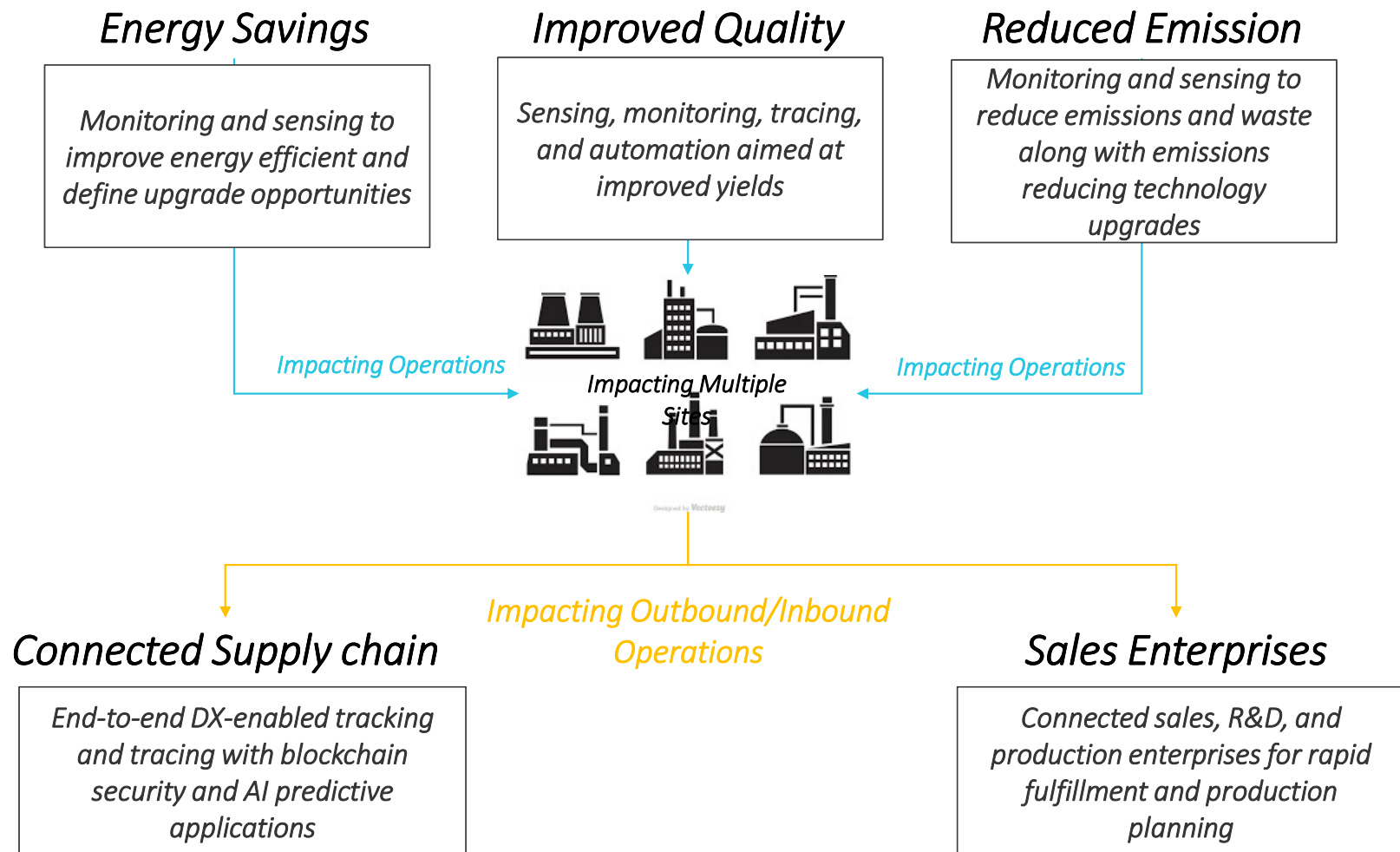
Sources of relevant innovations are broad and flat



Transitioning to Smart Manufacturing

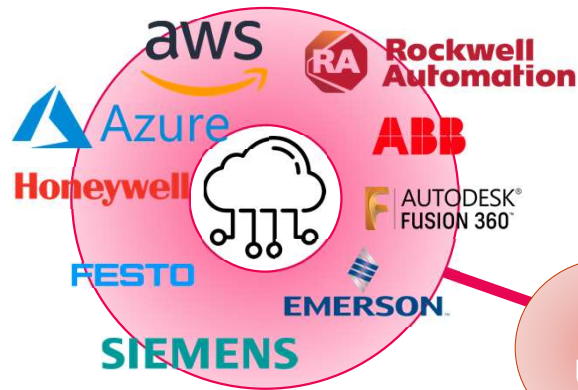
- Industrial Internet of Things (IIOT) and Big Data
 - How do we leverage data?
 - Where is it useful and how do we sort good from bad data?
- The Factory as a 'Robot'
 - Can all factory operations be connected into a single enterprise?
 - How do I integrate legacy systems to connect dissimilar systems?
- Automated Decision Making
 - When should we allow for computers and processes to automate decisions?
 - How much and in what form will humans interact, audit, or control these decision making processes?
- Open vs. Closed Operating Environments/Platforms
 - Should it be proprietary or open source?
 - Should I build my own system or buy solutions from others?

Defining Smart Manufacturing Needs and Outcomes



Navigating Associations, Institutes, Partners, and Vendors

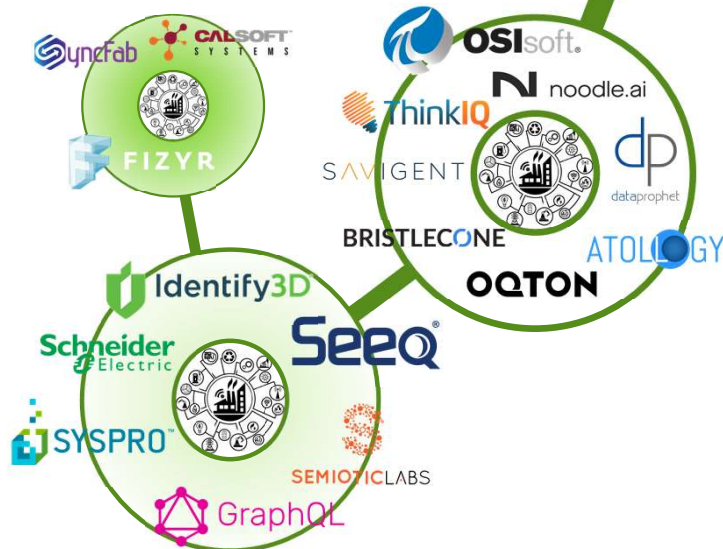
Data & Service Partners



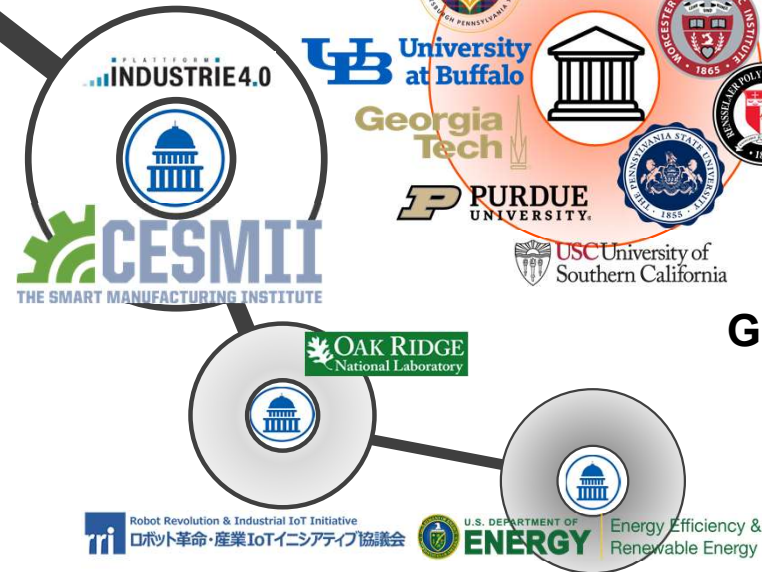
Academic Partners



Solutions Partners



Government Partners



Adopt, Share, Build or Buy?

The demand for SM tools and services as meant that multiple approaches have emerged, including the private initiatives to address the demand

Smart Manufacturing as a Service



OQTON

Smart Manufacturing for Integration

e-Factory
for your journey to Industry 4.0

**MITSUBISHI
ELECTRIC**
Changes for the Better

Smart manufacturing...

...what is actually meant by "smart manufacturing" what are the the benefits of adopting the concept and what challenges may lie ahead?



Emergence of Global SM Initiatives

Government & Public-Private Initiatives



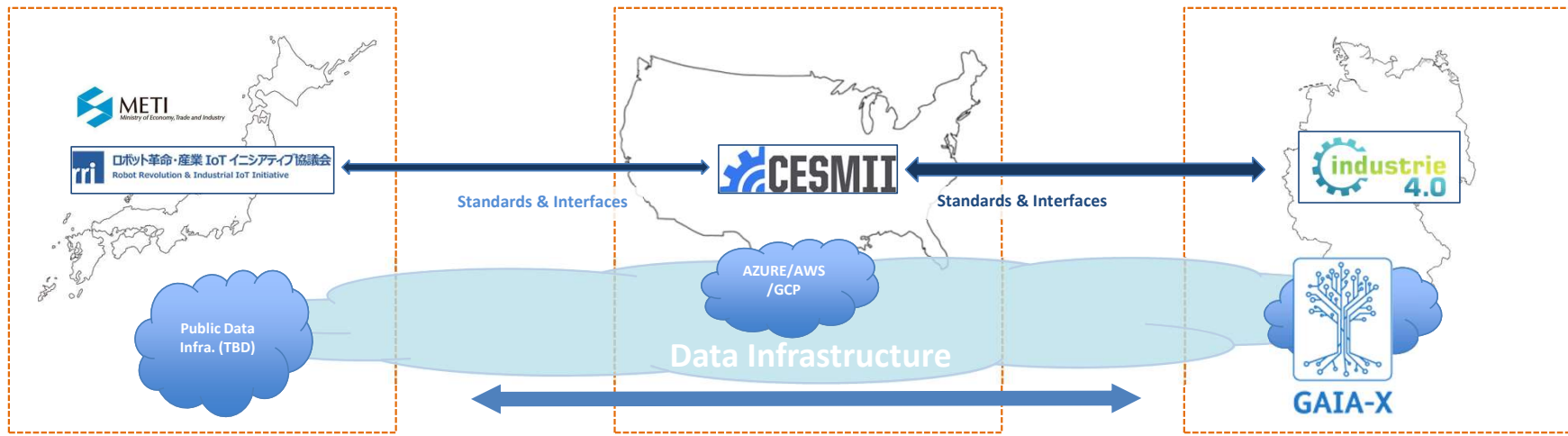
Industry Standards

Drive interoperability & commonality

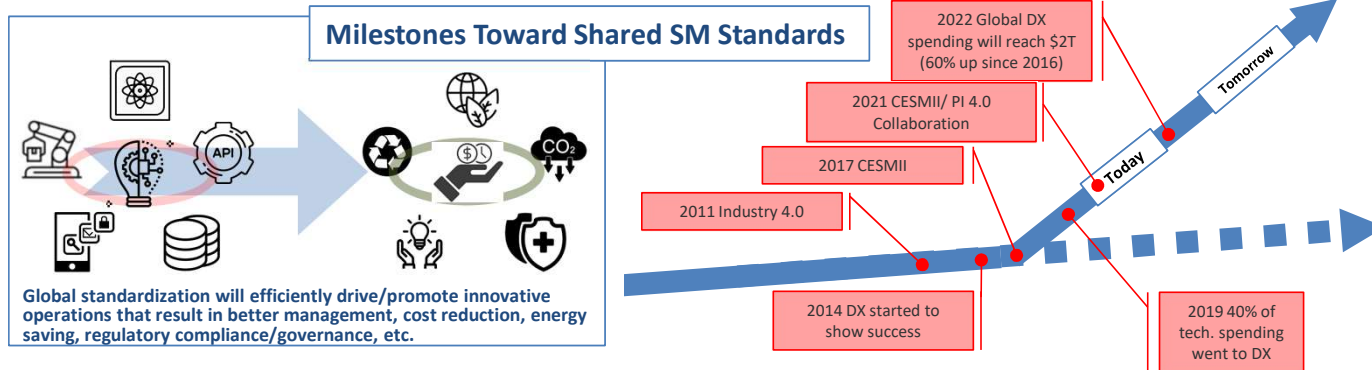


Emerging SM Standards and Platforms

National SM Initiatives and Organizations



Milestones Toward Shared SM Standards



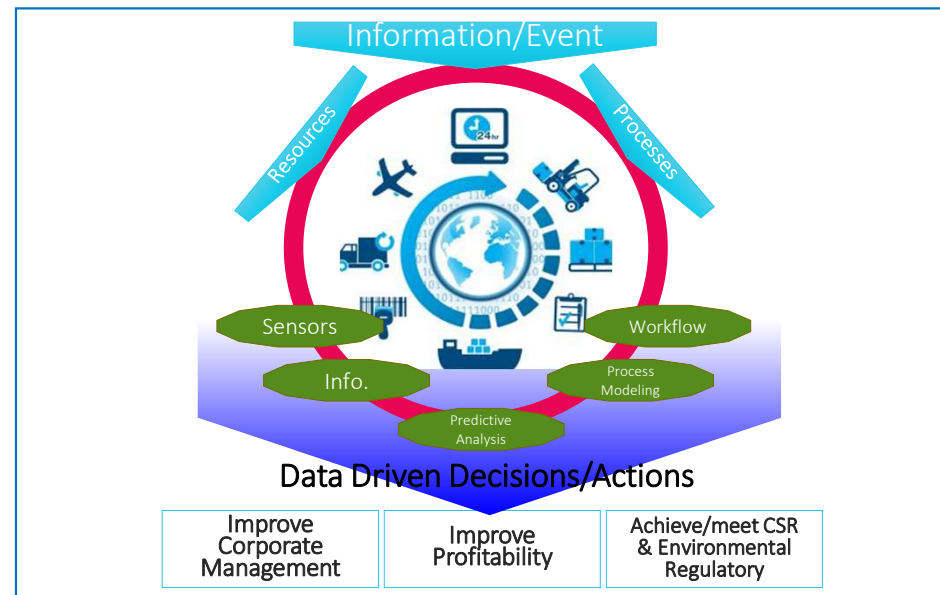
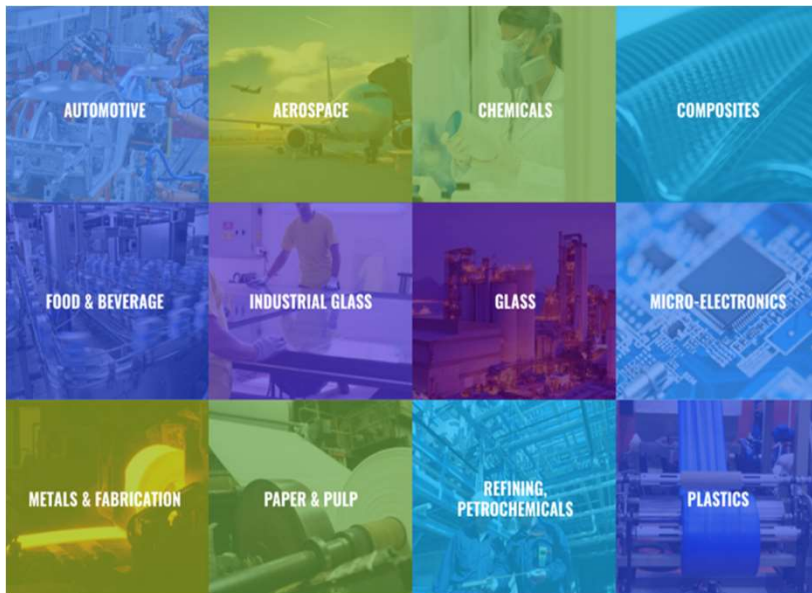
US Smart Manufacturing National Institute

 **C**lean **E**nergy, **S**mart **M**anufacturing, **I**nnovation **I**nstitute -

Public-Private-Partnerships created in 2017, funded by the US Govt – DoE with \$70M dollars to drive Smart Manufacturing

CESMII aims to bring...

- *Profits faster through global competitiveness & customer satisfaction*
- *Improved accessibility & use of data vertically & horizontally across the enterprise*
- *Reduction of the amount of time and resources to reach the organizations objectives*
- *Optimization of the existing assets through improved energy efficiency, modeling and agility*
- *Improved safety & environmental objectives*



US Smart Manufacturing National Institute

Obama Administration selected SMLC and UCLA as the a new national institute in 2016 based in Los Angeles

The new institute was re-branded as CESMII or the 'Smart Manufacturing Institute' with executive sponsorship from the Department of Energy

The mission remained focus on developing an open architecture platform

**the WHITE HOUSE**
PRESIDENT BARACK OBAMA

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Pending Legislation

Signed Legislation

Vetoed Legislation

Nominations & Appointments

The White House
Office of the Press Secretary

For Immediate Release June 20, 2016

FACT SHEET: President Obama Announces Winner of New Smart Manufacturing Innovation Institute and New Manufacturing Hub Competitions

The Smart Manufacturing Innovation Institute, headquartered in Los Angeles, CA, brings over \$140 million in public-private investment from leading universities and manufacturers to develop smart sensors for use in advanced manufacturing.

Throughout this week, the Obama Administration will be highlighting America's capacity for creativity and invention and how our innovative processes over the

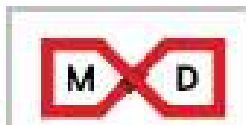
Manufacturing USA Public Private Partnerships



Flexible Hybrid Electronics
San Jose, CA



Smart Sensors and Digital Process Control
Los Angeles, CA



Digital Manufacturing
Chicago, IL



Sustainable Manufacturing
Rochester, NY



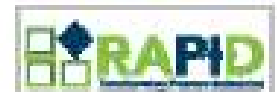
Integrated Photonics
Albany, NY
Rochester, NY



Regenerative Manufacturing
Manchester, NH



Advanced Fibers and Textiles
Cambridge, MA



Modular Chemical Process Intensification
New York, NY



Bio-pharmaceutical Manufacturing
Newark, DE



Lightweight Materials
Detroit, MI



Additive Manufacturing
Youngstown, OH
El Paso, TX



Advanced Composites
Knoxville, TN
Detroit, MI



Advanced Robotics
Pittsburgh, PA



Wide Bandgap Semiconductors
Raleigh, NC

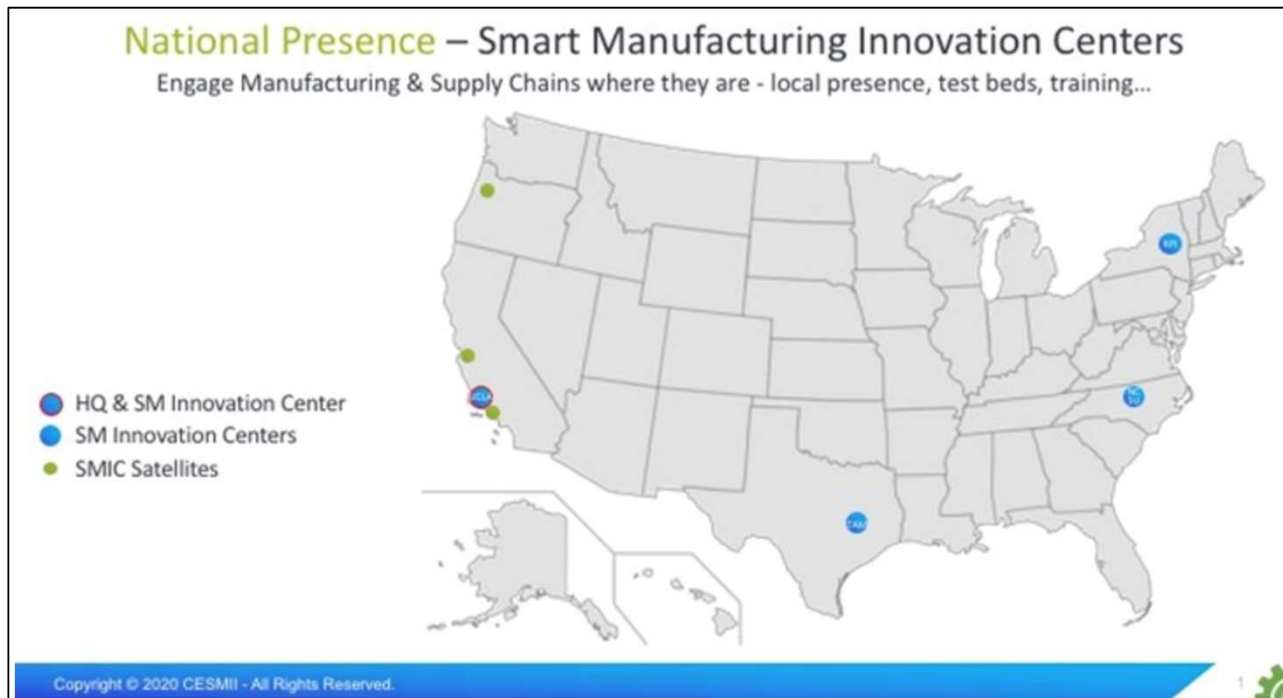
www.ManufacturingUSA.com



US Smart Manufacturing National Institute



As the national institute, it is critical to have outreach and connections to regional centers to be able to connect with SMEs and educational partners



North Carolina State University (NCSU)

Engineering Building I, Room
2036 911 Partners Way Raleigh,
NC 27695



Northern Smart Manufacturing Innovation Center

Located at Rensselaer
Polytechnic Institute (RPI) in
Troy, NY.



Southern Smart Manufacturing Innovation Center

Located at Texas A&M's Energy
Institute and the Engineering
Experiment Station on the
College Station, TX campus.



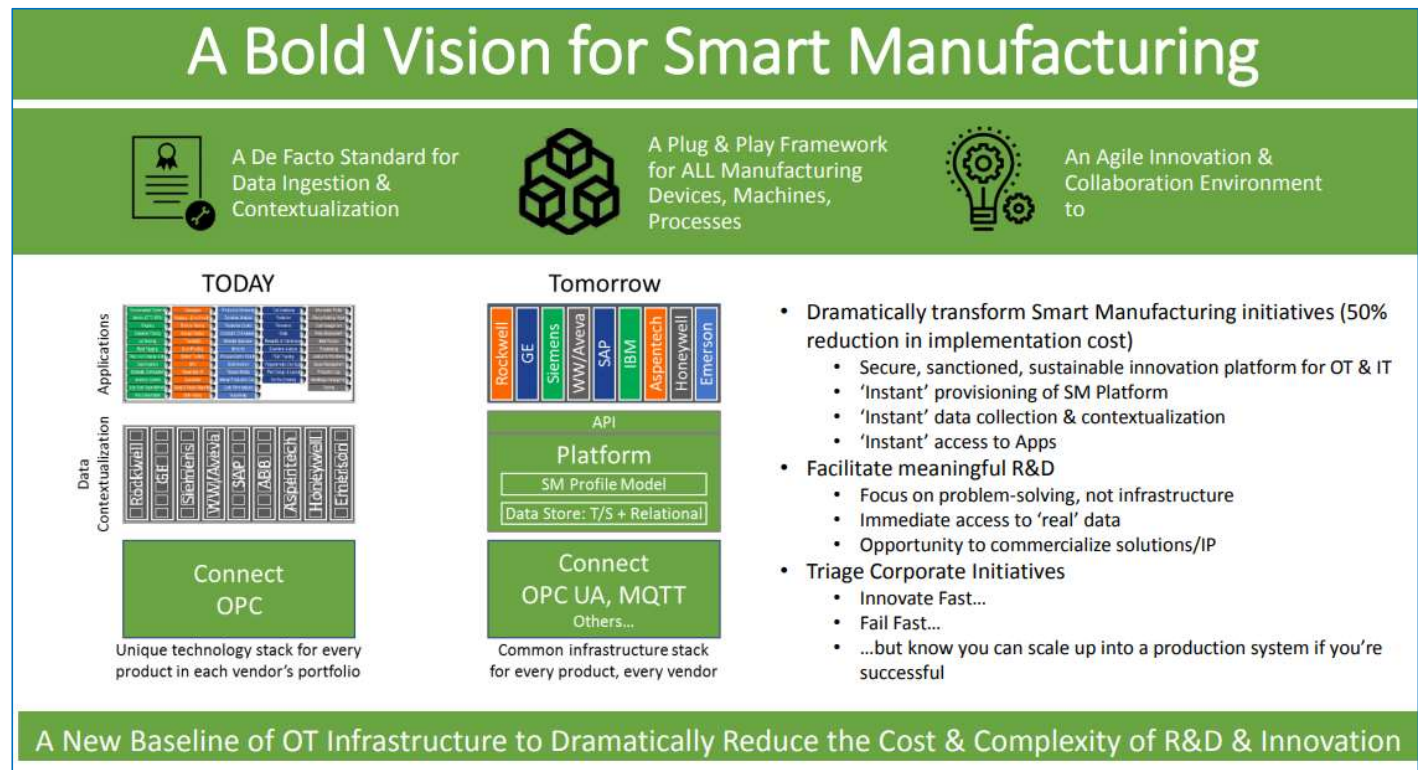
Western Smart Manufacturing Innovation Center

Located at UCLA in Los Angeles,
CA

US Smart Manufacturing National Institute

CESMII is developing a standard Platform approach to address:

- Data Interoperability
- Ease of Adoption
- Education & Workforce Training
- Access to SM COTS solutions
- Innovator connectivity



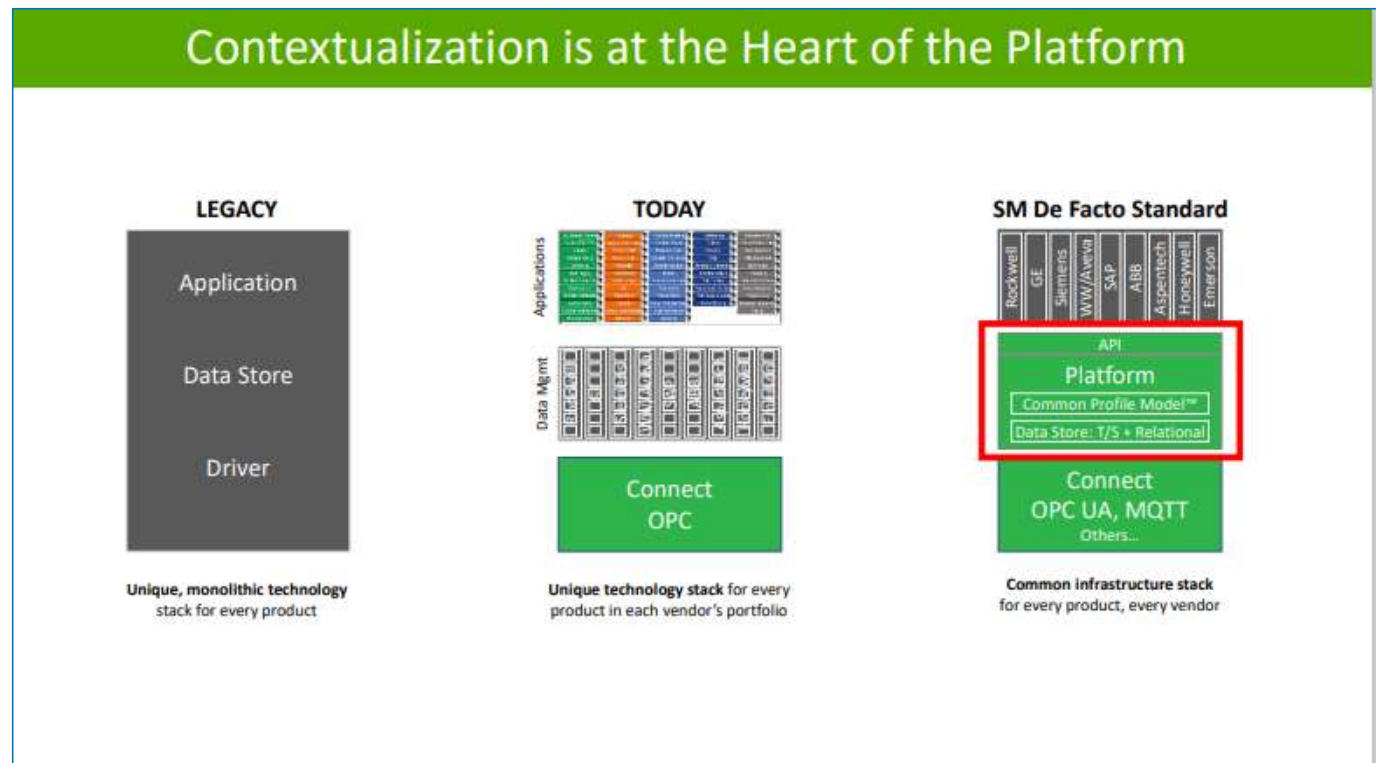
Source: www.cesmii.org

CESMII's Open Platform aims to reduce barriers to entry for SMEs who would otherwise face significant barriers to adopting SM due to cost, operational disruption, and training requirements

US Smart Manufacturing National Institute

CESMII's vision for an Open Platform aims to create:

- Standard protocols across dissimilar manufacturing environments
- A Multi-side Marketplace
- Global Connectivity between SM developers and users



Source: www.cesmii.org

CESMII's marketplace approach allows for the maximum range of innovators and users to collaborate and insert novel technologies and innovations into existing manufacturing enterprises

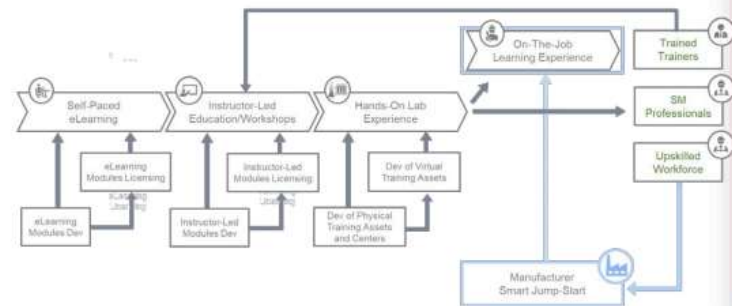
US Smart Manufacturing National Institute

CESMII's mission includes training to ensure:

- Direct connection to industry needs
- Ready access to evolving training needs for both large manufactures as well as SMEs
- An open-source approach to best practices

3 Education and Workforce Development

Create a national learning infrastructure & drive competitiveness through **broad-scale adoption of Smart Manufacturing** and development of SM Workforce and SM Professionals



- **Engage** at scale
Virtual – regional – national
- **Deliver** formal *and* informal education
Social, expert networks, collaboration, crowdsourced experiences and knowledge bases
SM curriculum and SM learning centers
- **Address** entire SM ecosystem
Students, integrators, manufacturers, practitioners *and* business leaders
- **Offer** open-source access to education, best practices, tools, methodologies, benchmarks...
- **Scale** national pool of SM Workforce and SM Professionals
- **Empower** and engage executives
- **Breakthrough** Transformational Thinking!

Source: www.cesmii.org

CESMII has a mission to educate and train current and future workers to be SM-ready. This includes close cooperation with academic, industry, and vocational programs across the US

The Public-Private Partnership SM Platform Option

1

Easing Adoption Barriers

Through participation in a PPP SM Platform, large and small industry has rapid access to standard tools, protocols, and a shared architecture

2

Inclusive and Democratic

PPP SM Platforms are open to users, vendors, innovators, and disruptors regardless of business model or SM strategy

3

Education and Upskilling

PPP SM Platforms are industry-powered champions and can drive the development and promotion on training across the manufacturing community

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