Doing More with Less:

Digital Manufacturing and Design Opportunities

6/19/2018

Presented by:

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Abstract –

The workforce challenge is not going away anytime soon. How can businesses continue to **Do More with Less**? UW-Stout's Manufacturing Outreach Center (MOC) facilitates a systematic approach to determine the best path for your operation's future. Recent advancements in Digital Manufacturing and Design (DMD) technology are providing new opportunities to support growth and productivity. The MOC and DMD are here to support your need to **Do More with Less**.

Ron's Background

- 20+ years in Engineering
- BSME, MS Eng, MS PM
- Research, Development and Education
  - Product Development Engineer
  - Procurement Engineer
  - Senior Engineer
  - Remote ET Program Lead/Lecturer
  - Senior PM

- Lead engineer for family of products that became it's own business unit.
- Experience with early adopter of Digital Manufacturing and Design strategy.
- Lead engineer for a $10M+ DOD R&D project in marine wear coatings. Generated MMC IP.

UW-Stout:

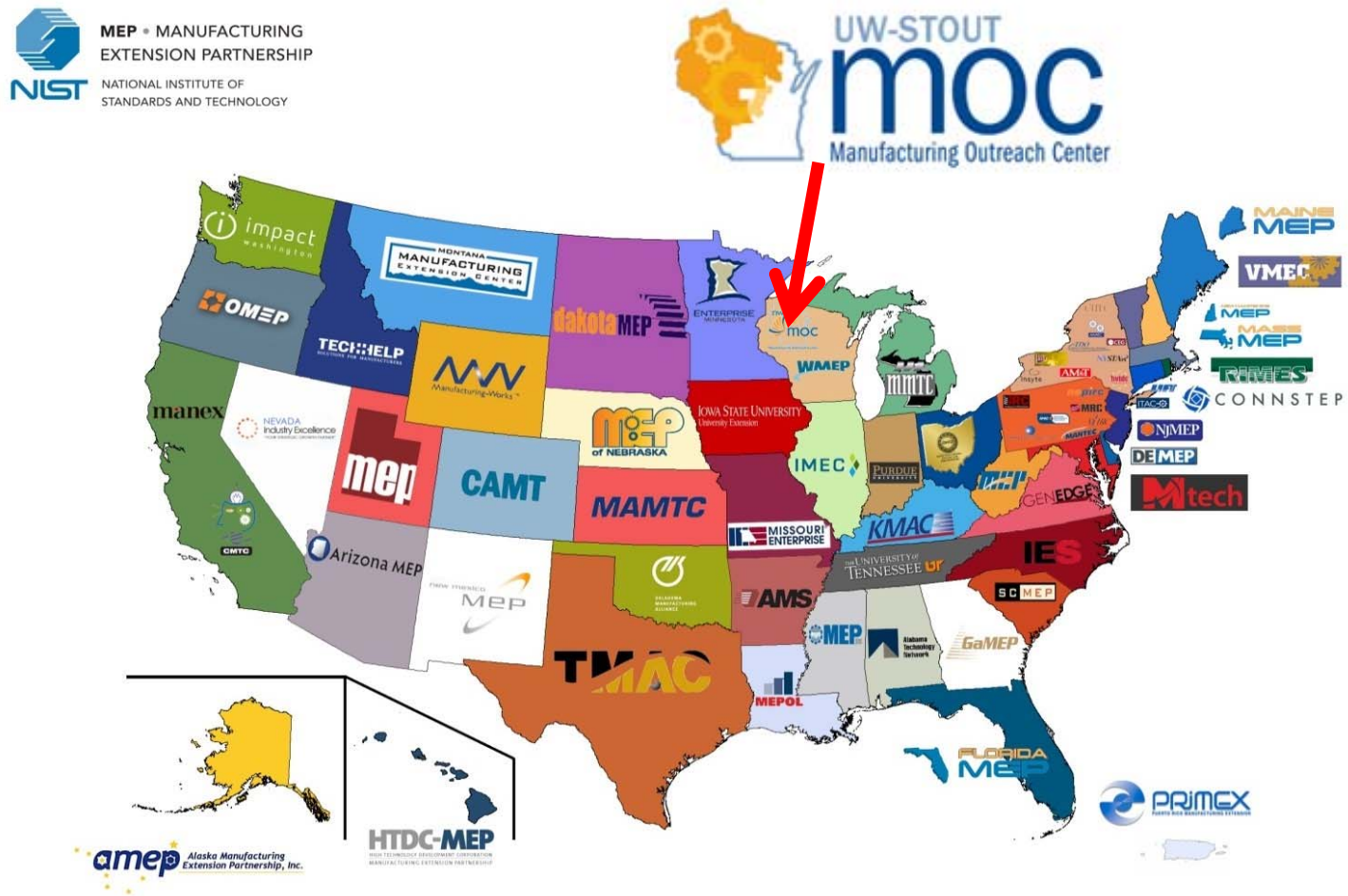
Wisconsin's Polytechnic University

Manufacturing Engineering, Packaging, Food Science, Math, Plastics Engineering, Industrial Design, Hotel and Restaurant Management, Mechanical Engineering, Video Game Design …

OUR SAYING: HANDS-ON, MINDS-ON
IN-MAJOR PLACEMENT OF OVER 97%

9,600+ STUDENTS AND INCREASING

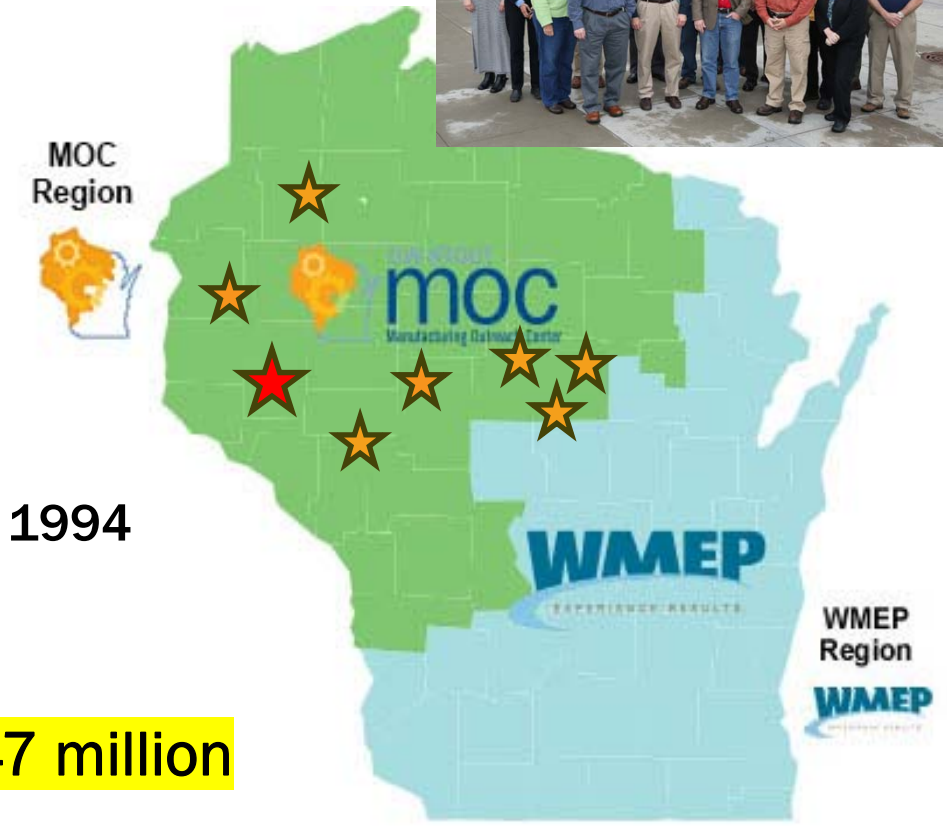
UW-Stout MOC


MEP • MANUFACTURING EXTENSION PARTNERSHIP
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
NIST
UW-STOUT
moc
Manufacturing Outreach Center
impact
MONTANA MANUFACTURING EXTENSION CENTER
dakotaMEP
ENTERPRISE MINNESOTA
moc
WMEP
MMTC
OMEP
TECHHELP
Manufacturing Works
MEP of NEBRASKA
IOWA STATE UNIVERSITY
manex
NEVADA Industry Excellence
mep
CAMT
MAMTC
IMEC
PURDUE
MAINE MEP
VMEC
MASS MEP
RIMES
CONNSTEP
NJMEP
DEMEP
Mtech
MISSOURI ENTERPRISE
KMAC
GENEDGE
IES
SC MEP
Arizona MEP
CMTC
mep
AMS
THE UNIVERSITY OF TENNESSEE
MEP
GaMEP
TMAC
MEPOL
FLORIDA MEP
PRIMEX
amep Alaska Manufacturing Extension Partnership, Inc.
HTDC-MEP

UW-Stout MOC – A Snapshot

3,584 manufacturers in
33 Wisconsin Counties
(green shaded region)

Home Office
Satellite Offices



- 8 Project Managers
- 200+ years of industry experience

- Over 700 million $$ in impacts since 1994
- In the last 4 quarters: (June 2018)
  - Served 198 Manufacturers
  - Create / retained 413 jobs
  - Achieved *client reported* impacts of $147 million

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a NIST MEP | Network Affiliate

MOC Service Areas

1. Define & Solve Project Resource:
   - Strategic Direction
   - Growth Services
   - Process Improvement
   - Digital Manufacturing and Design

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Current Condition

- Discussion:
  - Labor?
  - Capacity?
  - Lead times?
  - Why? Why? Why!
    - Trends…
    - Technology…
    - ???…

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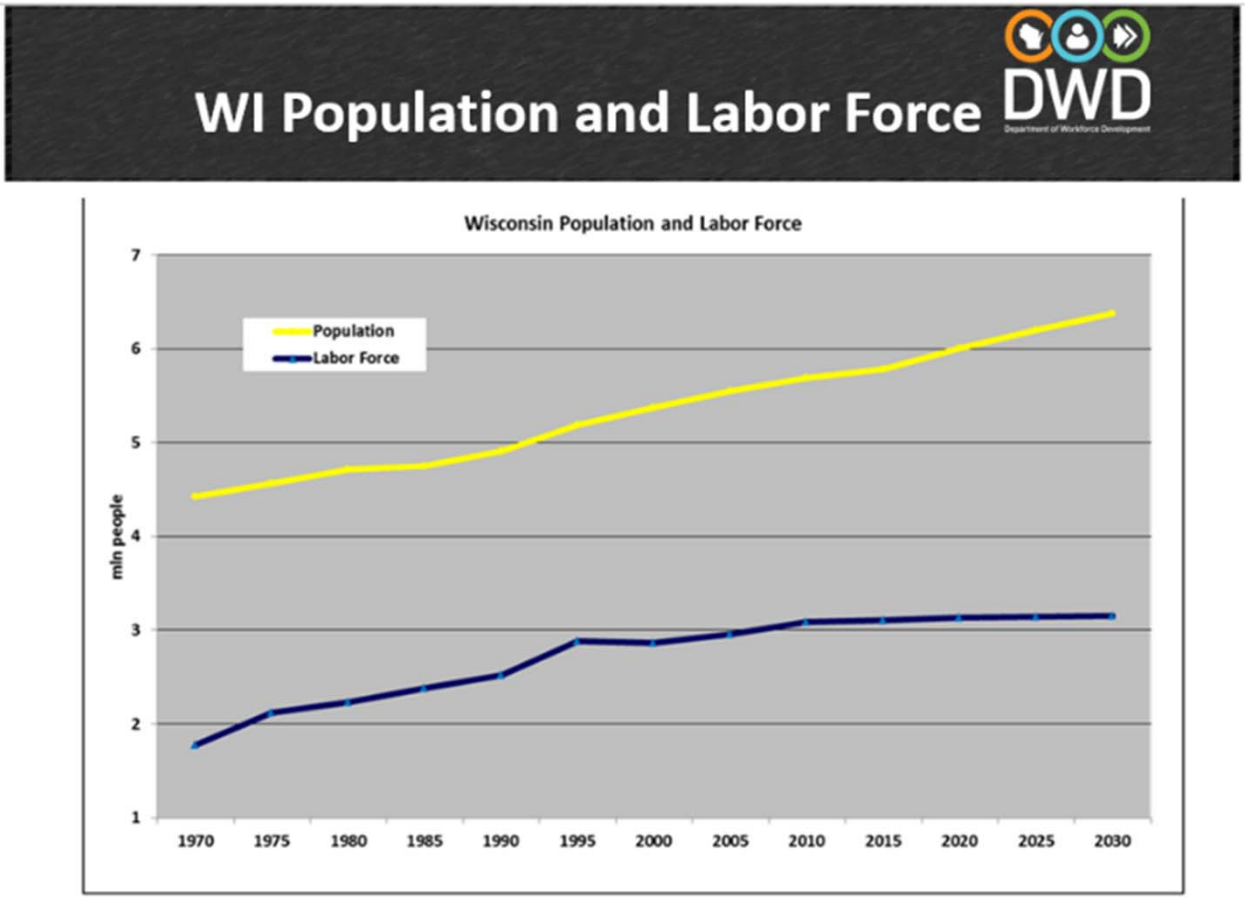
Trends

Population increase but, available Labor flat…



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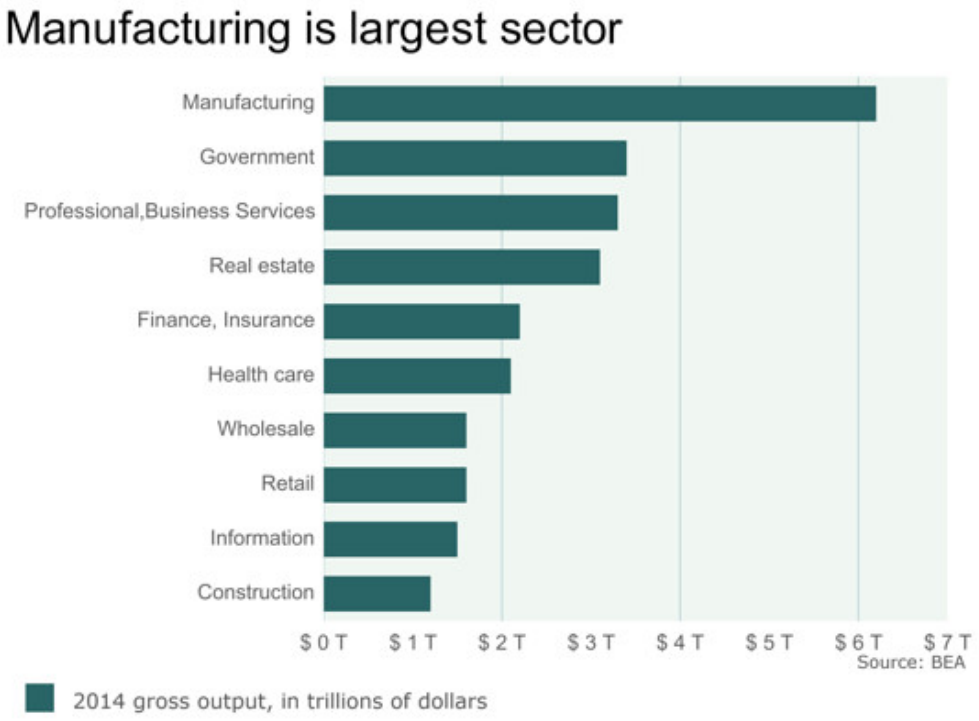
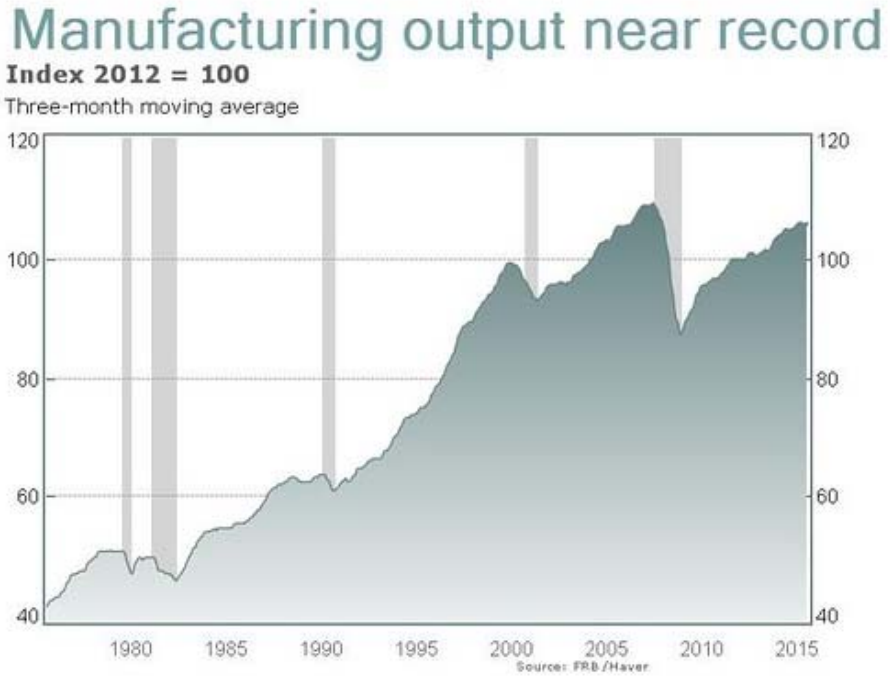
Trends

...still manufacturing is largest sector and growing...How?

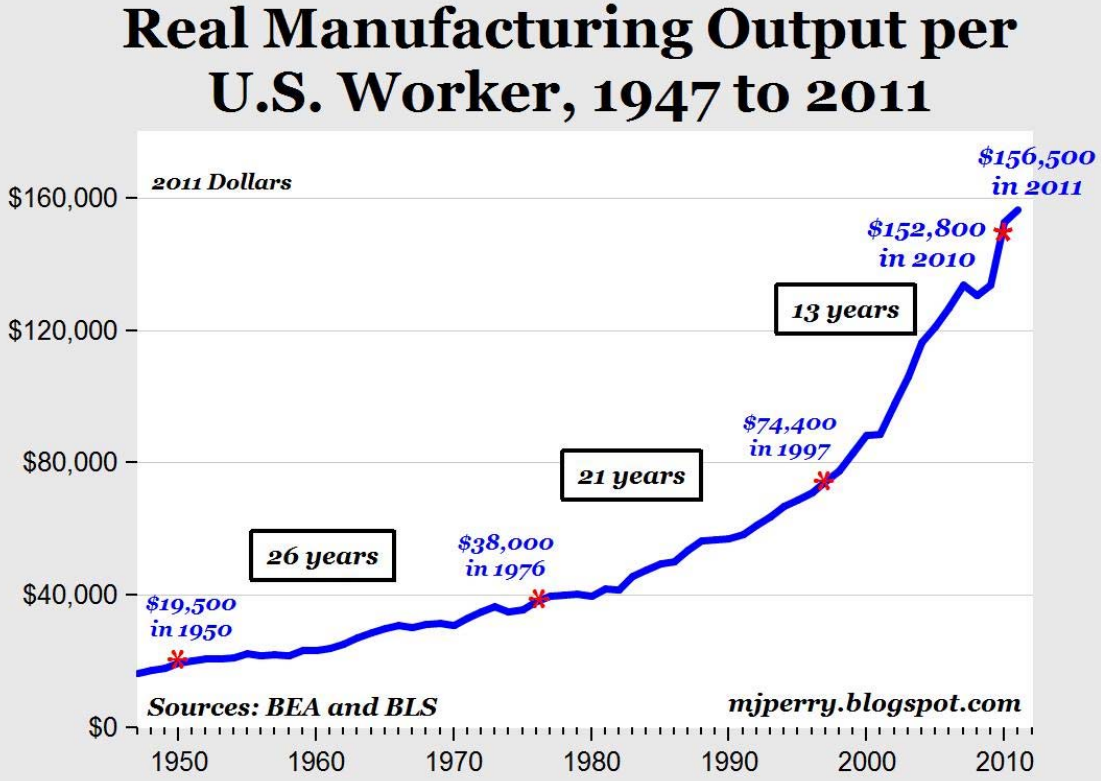




https://www.marketwatch.com/story/us-manufacturing-dead-output-has-doubled-in-three-decades-2016-03-28

Trends

...driven by exponential Productivity gains, Technology.



BOTTOM LINE:

Today's factory workers produce more output in an hour than workers in the 1940s produced in a day.

https://mjperry.blogspot.com/2012/04/phenomenal-gains-in-manufacturing.html

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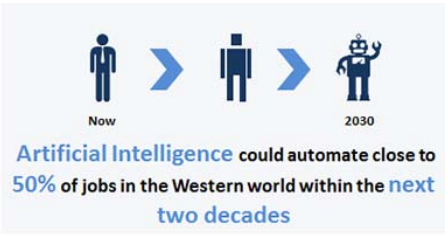
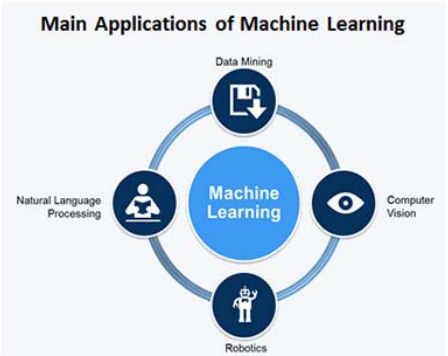
Technology

Digital technologies have changed dramatically in recent years, driven largely by three key developments:

- ✓lower computing costs
- ✓cheaper storage
- ✓less costly bandwidth





https://willrobotstakemyjob.com/

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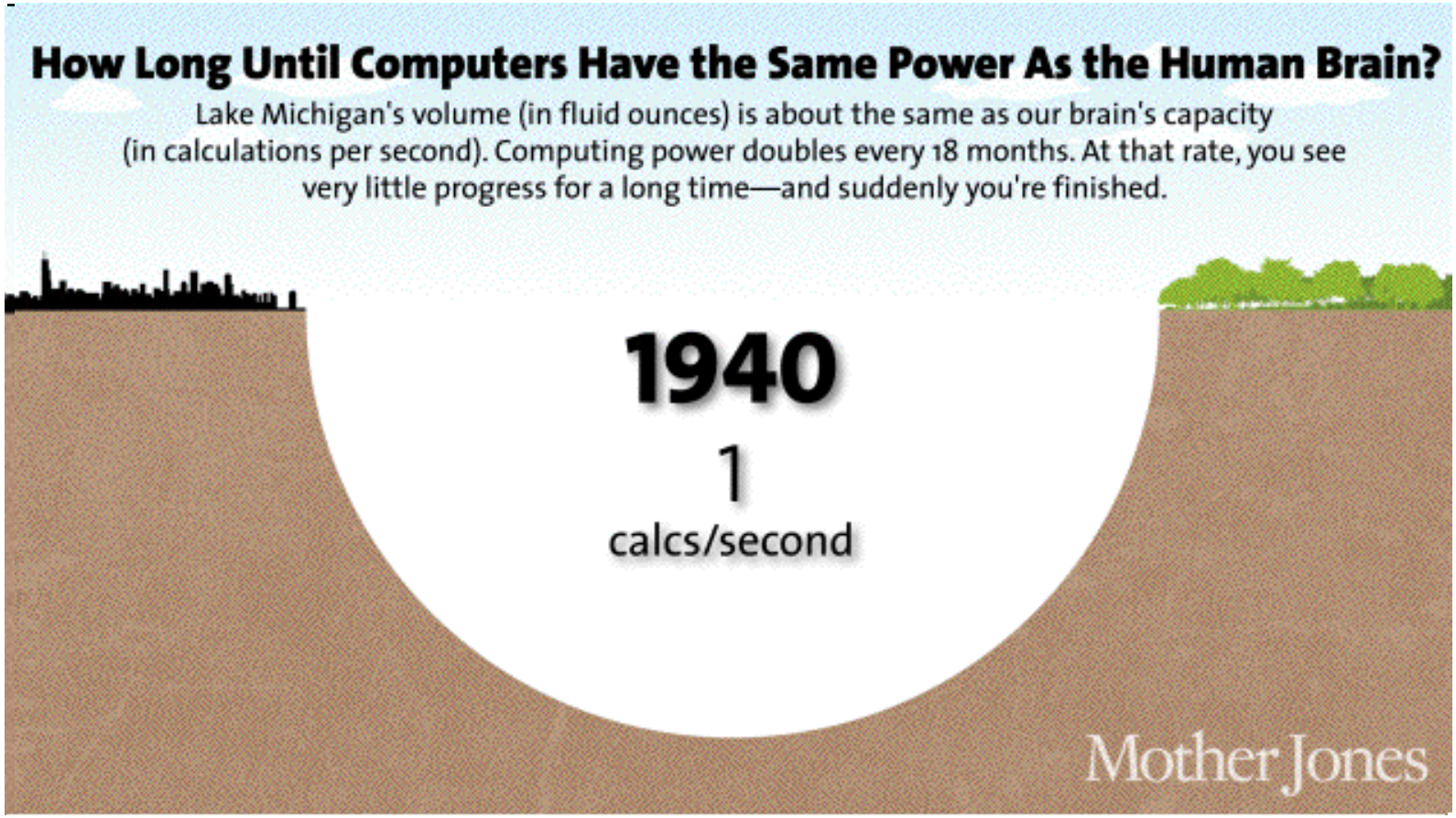
Technology

Moore's Law in Action



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Technology => Data Driven Decision (3D)

"If you went to bed last night as an industrial company, you're going to wake up this morning as a software and analytics company."

Jeff Immelt, GE Chairman & CEO

3D = 5 to 6% more Productive

3D + IOT = 25% more Productive

Erik Brynjolfsson, Lorin M. , Hitt and Heekyung Hellen Kim, Strength in numbers: How does data-driven decision making affect firm performance?, (ICIS Proceedings, Paper 13, 2011).

https://www.upwork.com/hiring/trends/iot-business-cost-reduction-revenue-growth/

Technology => Data Driven Decision (3D)

Example: Digitally enabled smart home with IOT

Industrial Manufacture

1957
Honeywell T87 Round

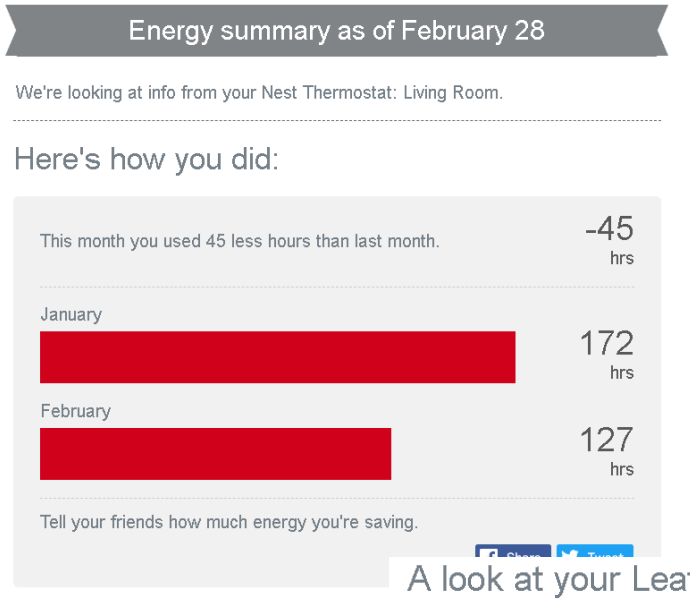
Besides introducing new form factors and programmability, they typical residential thermostat has not significantly changed in nearly *60 years*

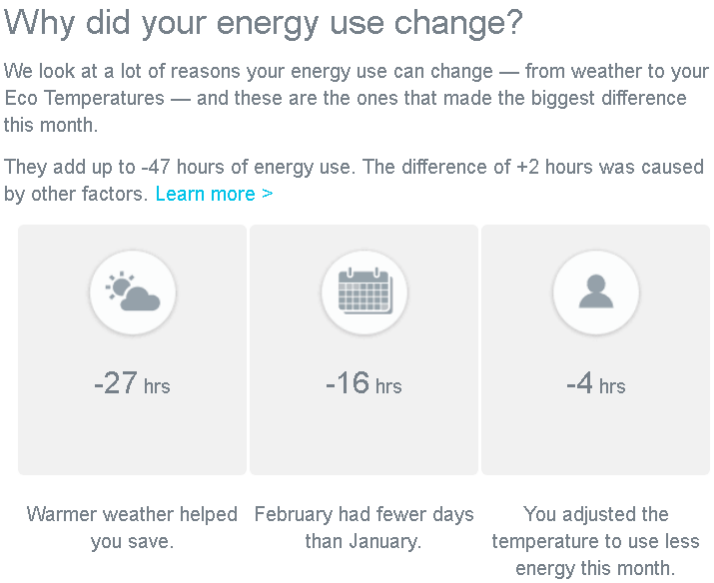
2011+
Nest disrupts the thermostat industry by launching a smart, learning, connected thermostat and data platform

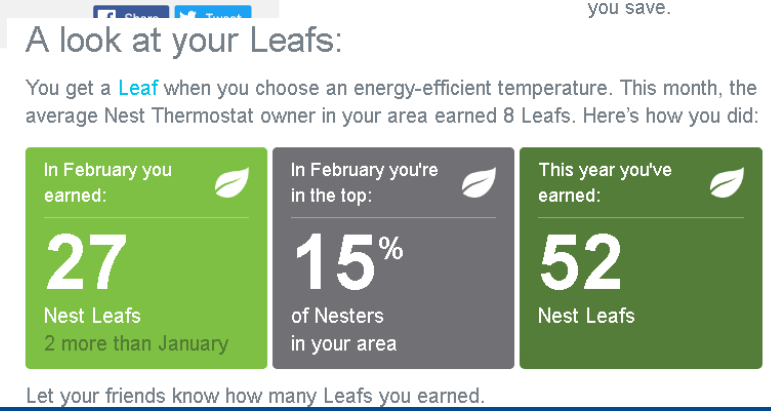
Software & Analytics

Technology => Data Driven Decision (3D)

Smart home data leads to information and decisions







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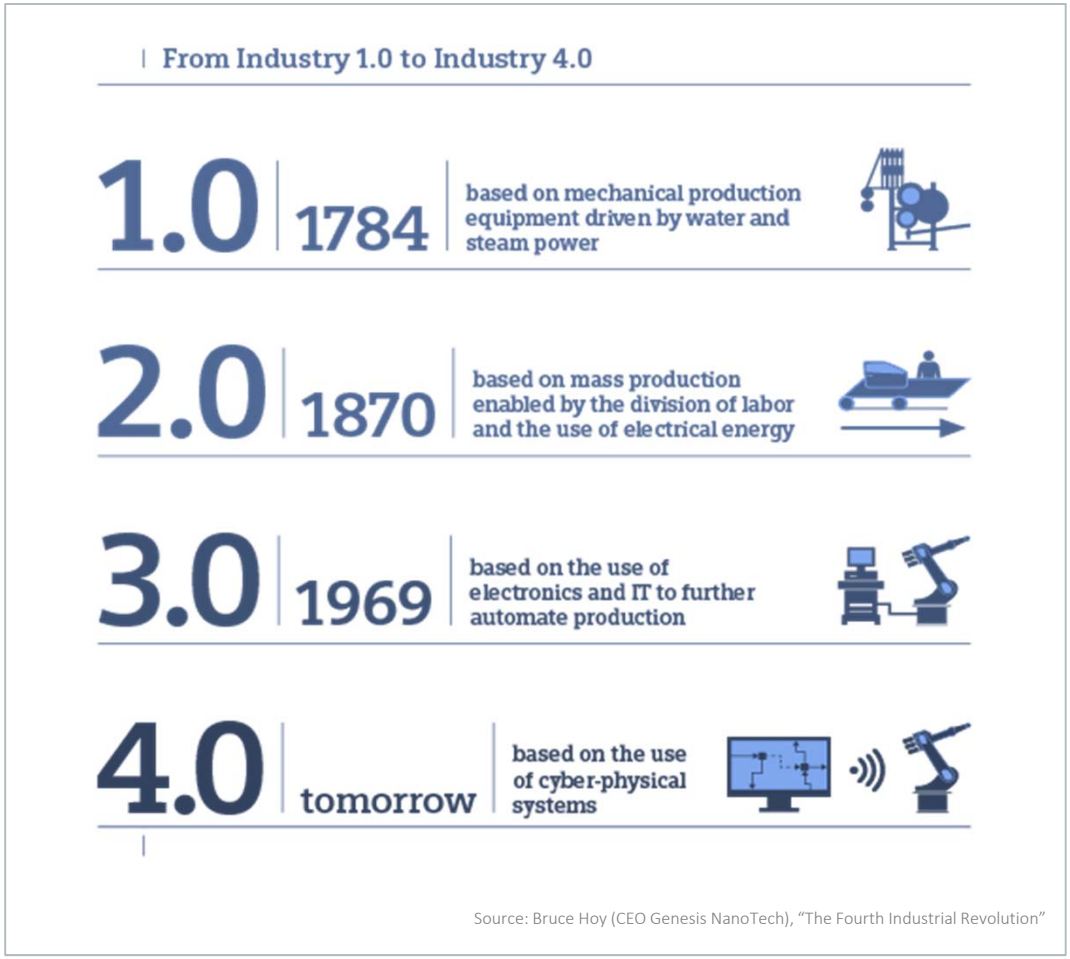
The Fourth Industrial Revolution



Source: Bruce Hoy (CEO Genesis NanoTech), "The Fourth Industrial Revolution"

Industry 4.0 design principles:

- ✓ Interoperability
- ✓ Information transparency
- ✓ Technical assistance
- ✓ Decentralized decisions
- ✓ <u>All enabled through data</u>

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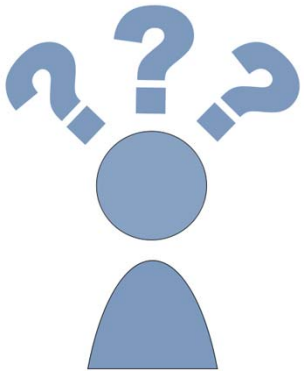
The Fourth Industrial Revolution

Digitally connecting products, people, and equipment will enable business and operational decisions



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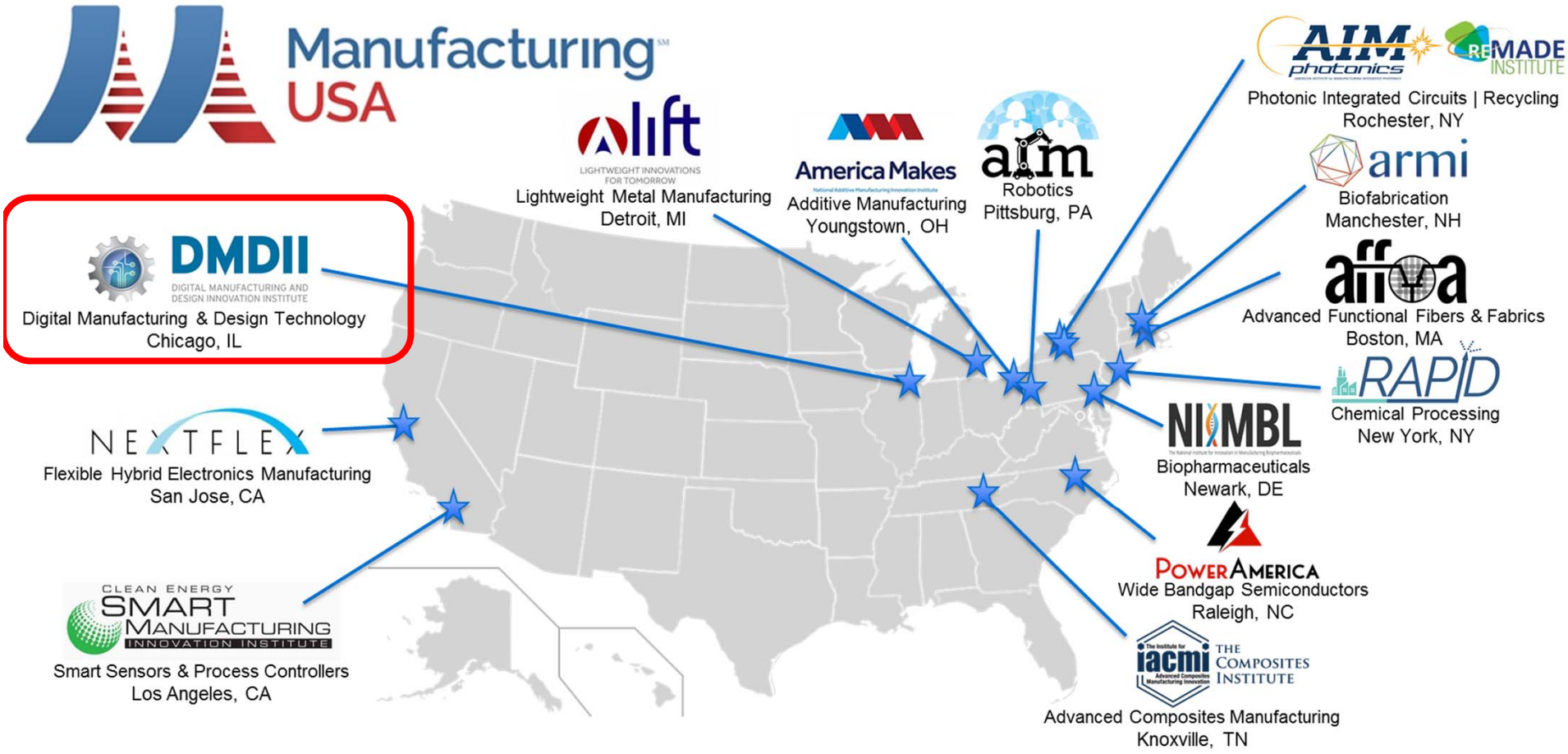
The Manufacturing USA program exists to allow U.S. manufacturers to lead the disruptive innovation impacting their industries



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DMDII Snapshot: A Public-Private Partnership with 300+ Members

applied research & development
REDUCE COST AND RISK OF COMMERCIALIZING NEW TECHNOLOGY

technology integration & commercialization
DEVELOP INNOVATIVE METHODS AND PRACTICES FOR SUPPLY CHAIN INTEGRATION

education, technical skills & workforce development
ENGAGE WITH SMALL & MEDIUM-SIZED MANUFACTURING ENTERPRISES

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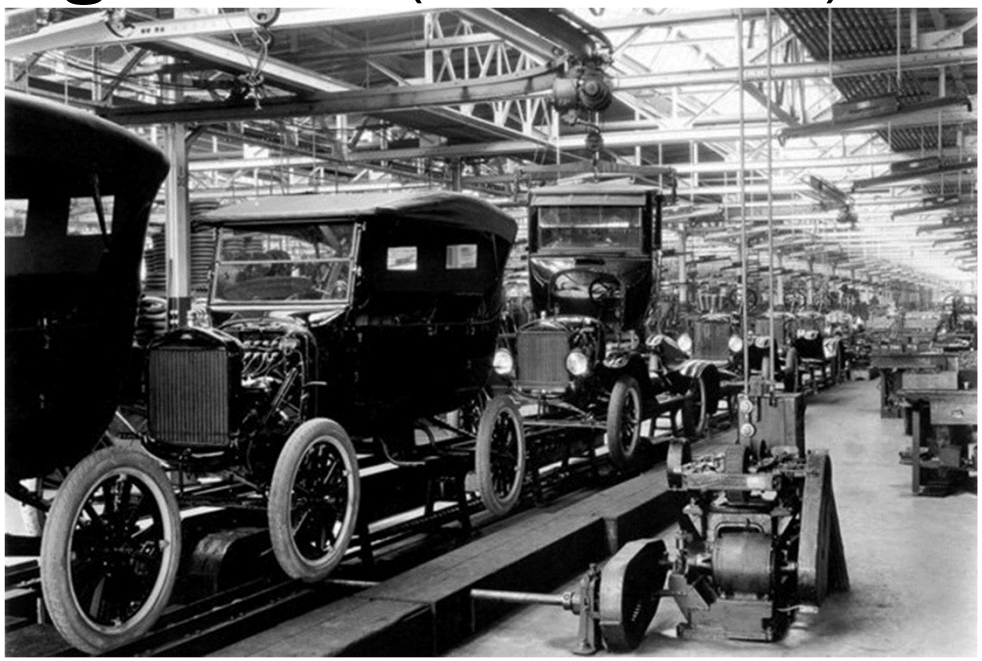
Factory's of the Future

Ford River Rogue Plant(Circa 1913)



Vertical Integration and the Manual Assembly Line

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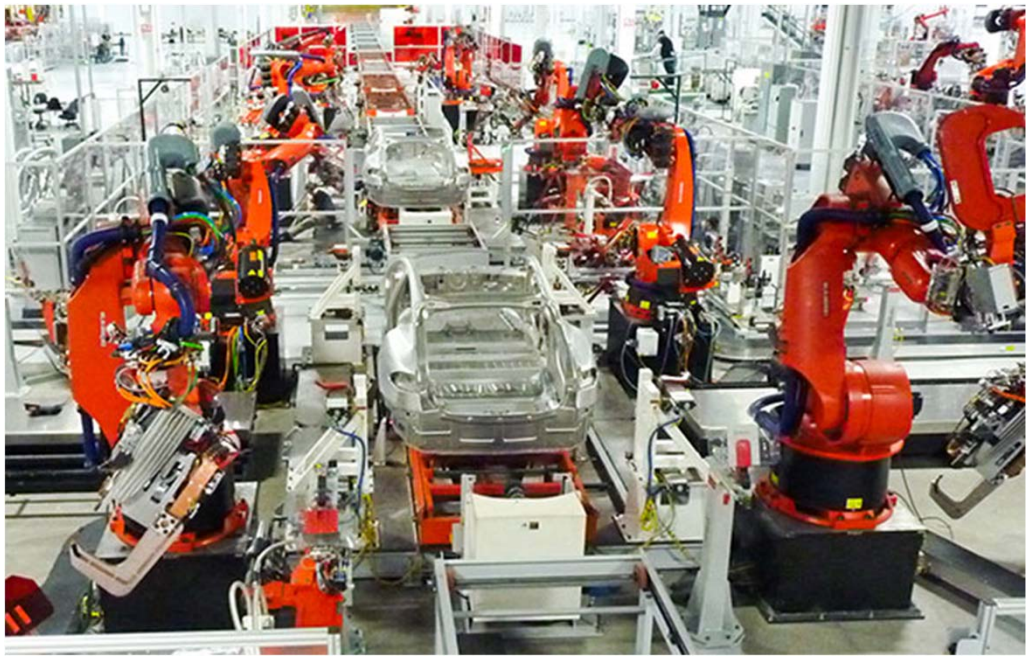
Factory's of the Future

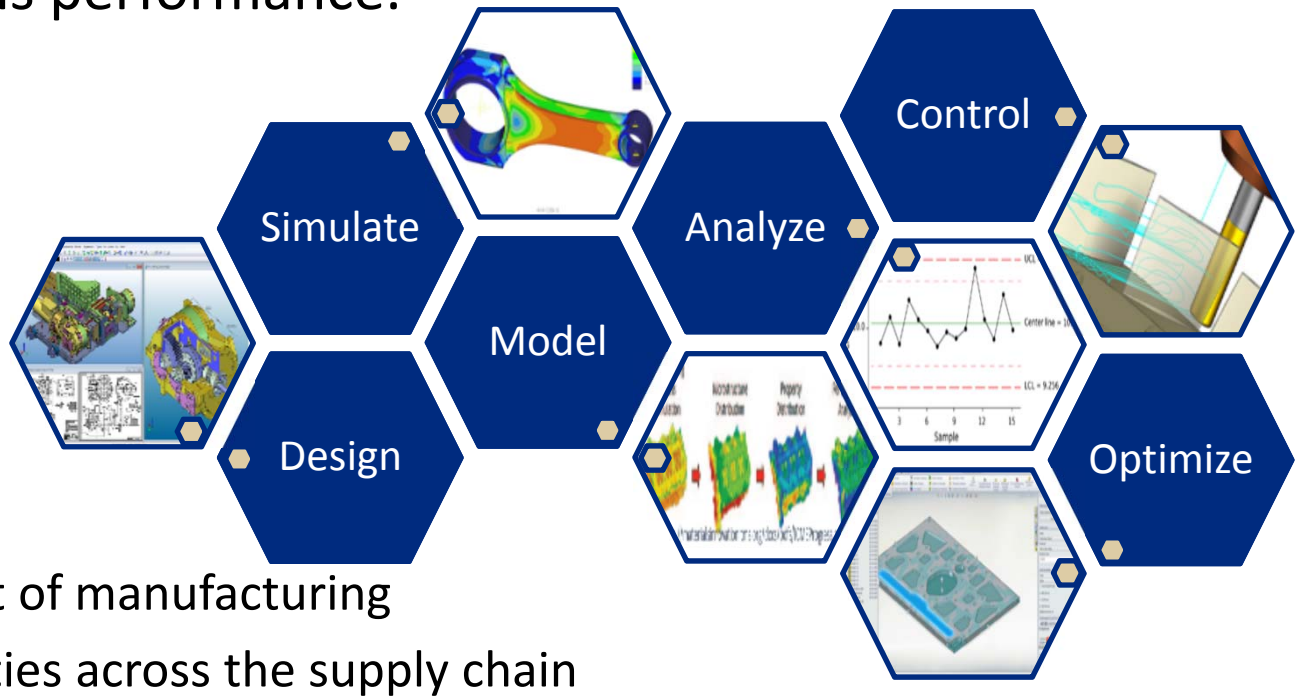
Tesla Automobile(Circa 2016)



Extended Digital Enterprise and Robotic Assembly

Digital Manufacturing & Design

Digital Manufacturing and Design (DM&D) is an integrated approach that brings together software, data, and control systems to model, simulate, analyze, control, and optimize both a product and its manufacturing systems performance.



- ✓ Reduced time and cost of manufacturing
- ✓ Strengthened capabilities across the supply chain
- ✓ Eliminate waste from extended Value Chain

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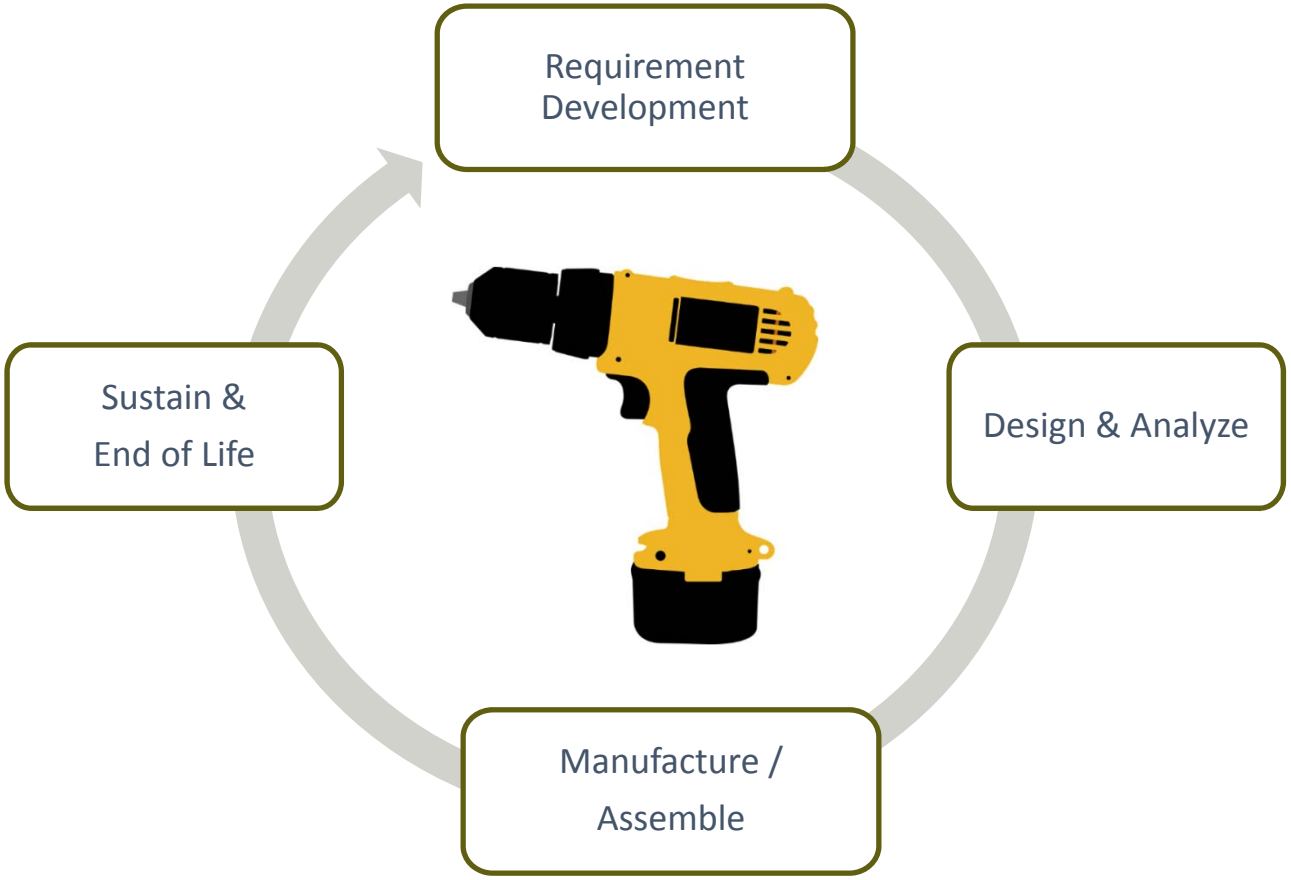
Digital Manufacturing & Design

Digital Product Lifecycle



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Digital Manufacturing & Design

The Digital Twin is a real-time, virtual representation of an asset or system across its lifecycle.

Asset

System

Digital Manufacturing & Design

The Digital Thread enables information flow between all elements of the product lifecycle creating the channel for real-time collaboration between product stakeholders, Sales to Service.

Ref: Epicor – Digital Thread Infographic

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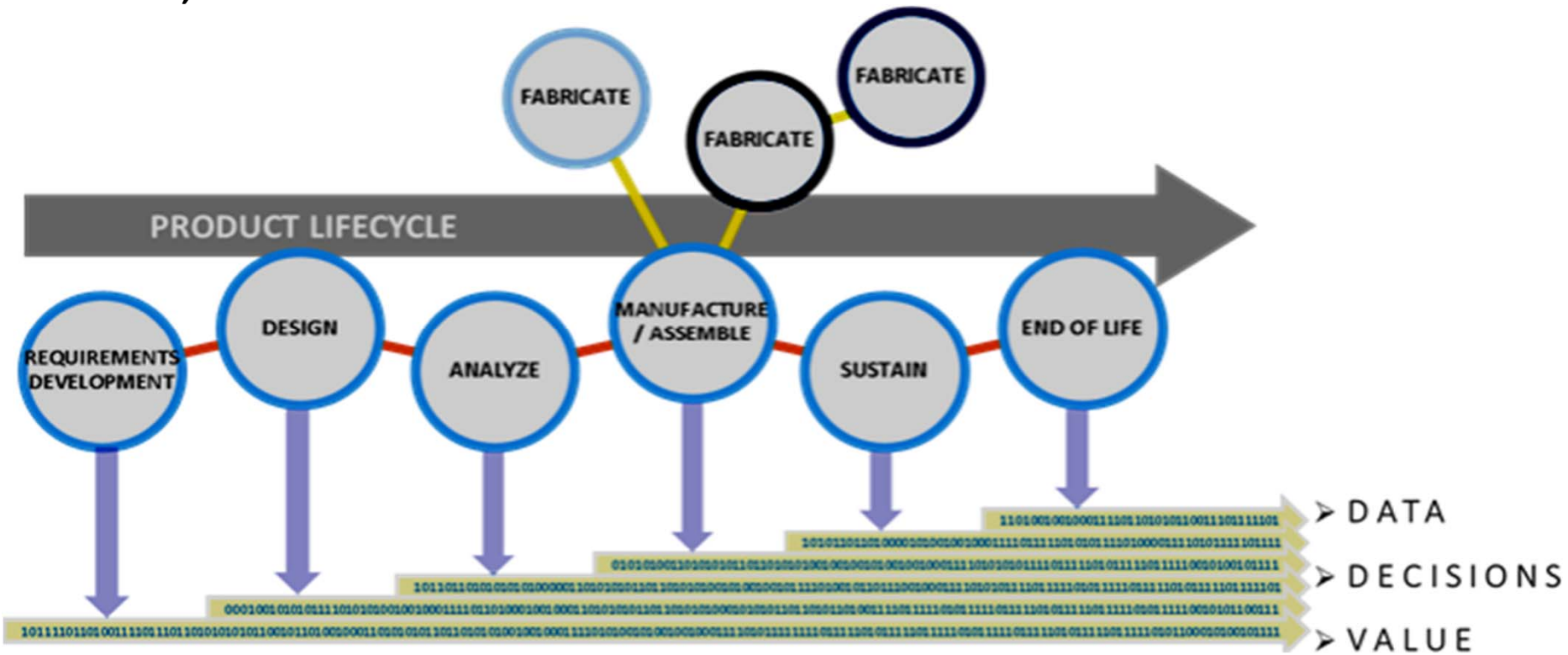
DM&D Solution Process

Digital Manufacturing and Design, DM&D, solutions use digital technology to connect internal machines and processes with each other, with customers, and with the enterprise value chain by transferring necessary product and process data in a seamless, secure manner.



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DM&D Solution Process

- Do you want to improve productivity, Do More with Less?
- Do you want to optimize your extended value chain?
- Do you have a Value Stream Map (VSM) of your operations?
- Have you aligned DM&D information flows with the VSM?

A discussion with MOC is a good place to start!

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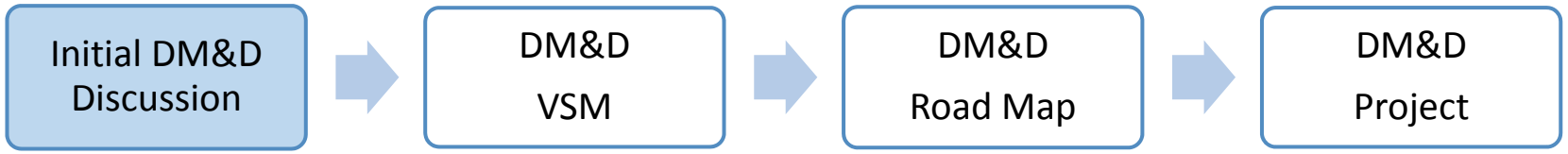
DM&D Solution Process



1. Initial DM&D Discussion:

   Challenges? Is DM&D the right solution path for you?

2. DM&D Value Stream Map (VSM):

   Map Current State, Draft Ideal State, Select Future State, Gaps

3. DM&D Road Map:

   Opportunities? Business Cases, Determine Priorities, Scope.

4. DM&D Project:

   You select the opportunity, MOC scouts the technology solution.

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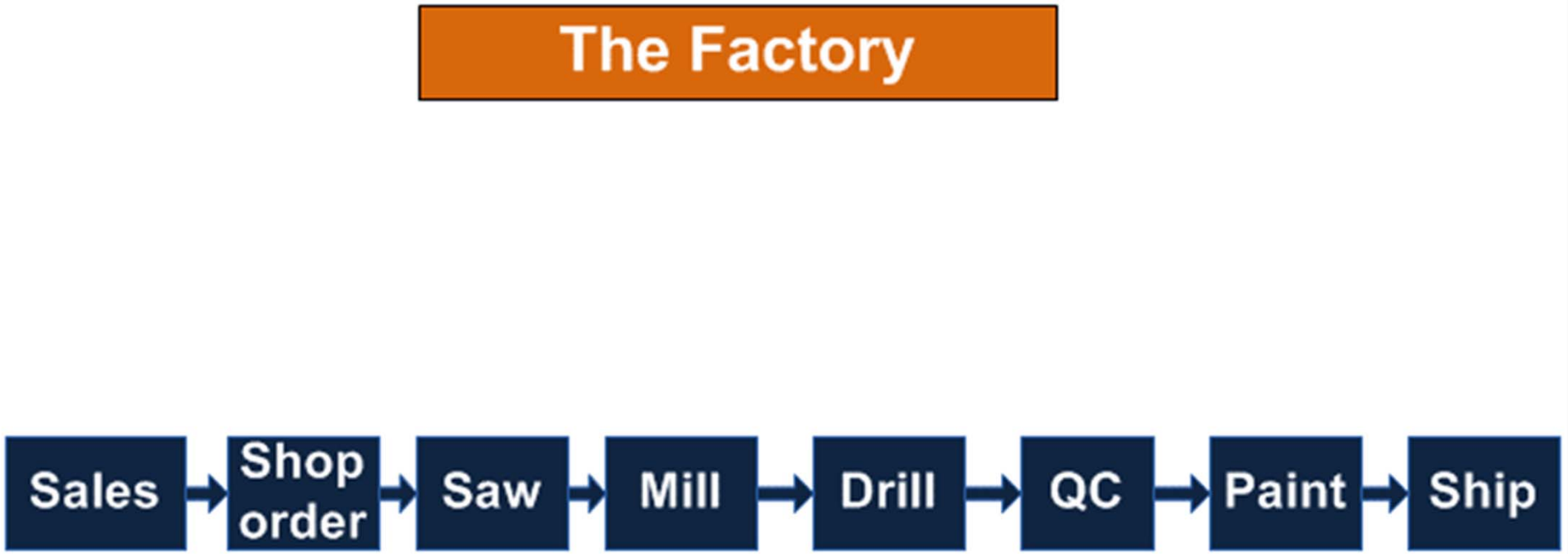
DM&D Solution Process



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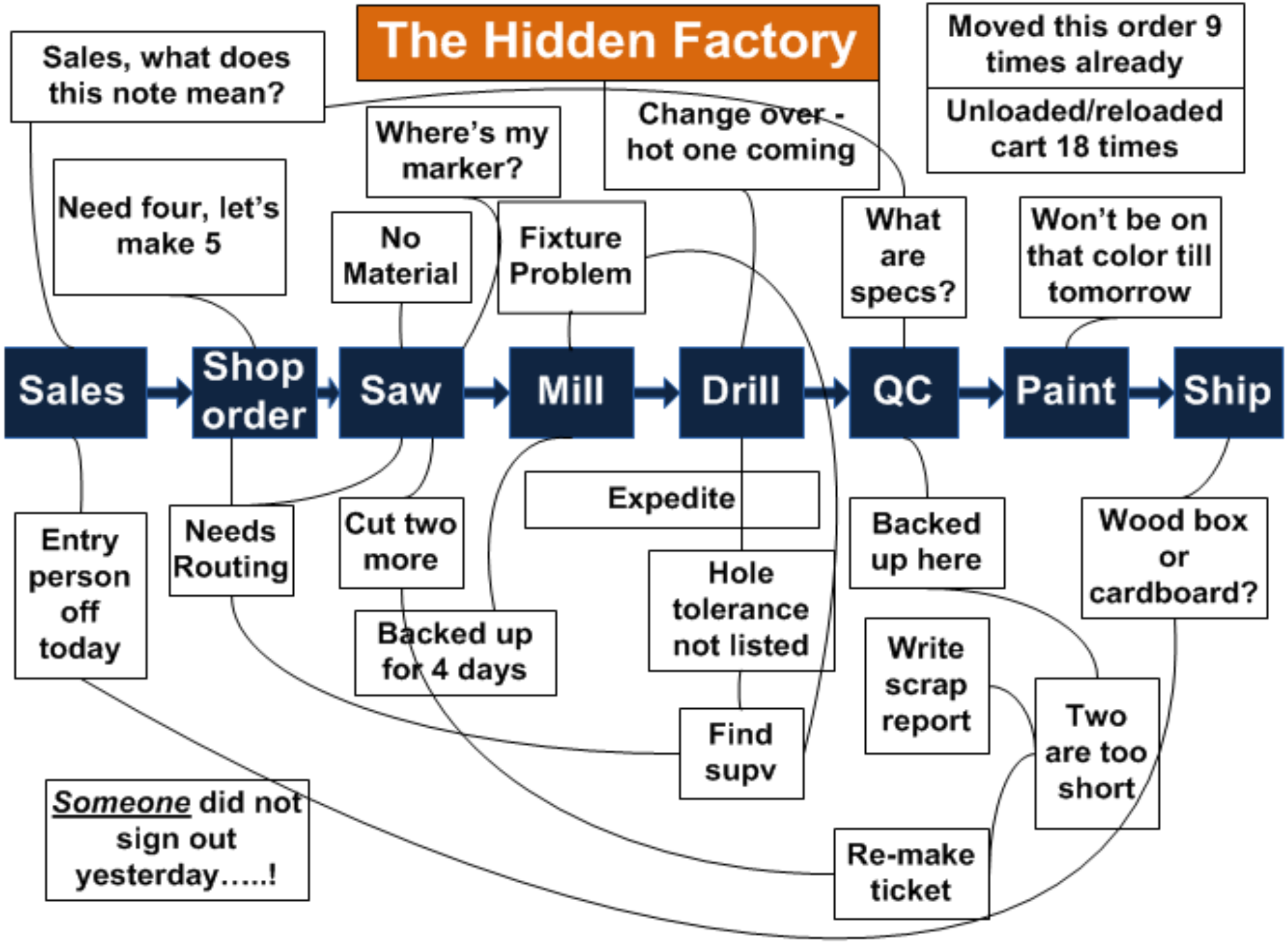
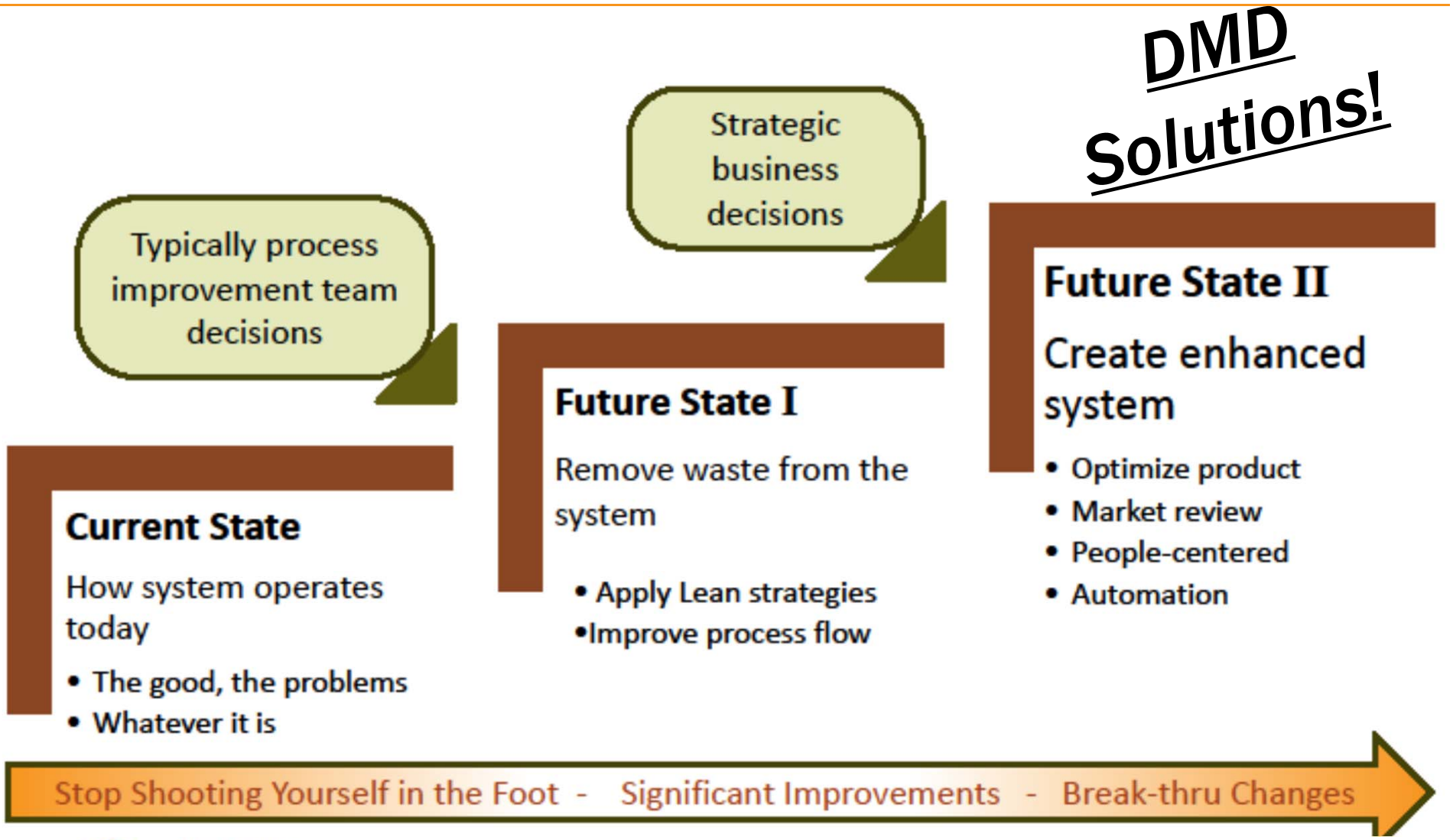

The Hidden Factory
Sales, what does this note mean?
Moved this order 9 times already
Unloaded/reloaded cart 18 times
Where's my marker?
Change over - hot one coming
Need four, let's make 5
No Material
Fixture Problem
What are specs?
Won't be on that color till tomorrow
Sales
Shop order
Saw
Mill
Drill
QC
Paint
Ship
Entry person off today
Needs Routing
Cut two more
Expedite
Backed up here
Wood box or cardboard?
Backed up for 4 days
Hole tolerance not listed
Write scrap report
Two are too short
Find supv
Someone did not sign out yesterday…..!
Re-make ticket

DM&D Solution Process



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DM&D Solution Process

Technology Scouting (TS)

Conduct Technical Searches to:

1. **Identify technologies that can meet the need**
2. **Identify companies skilled in applying them**

DM&D Solution Example

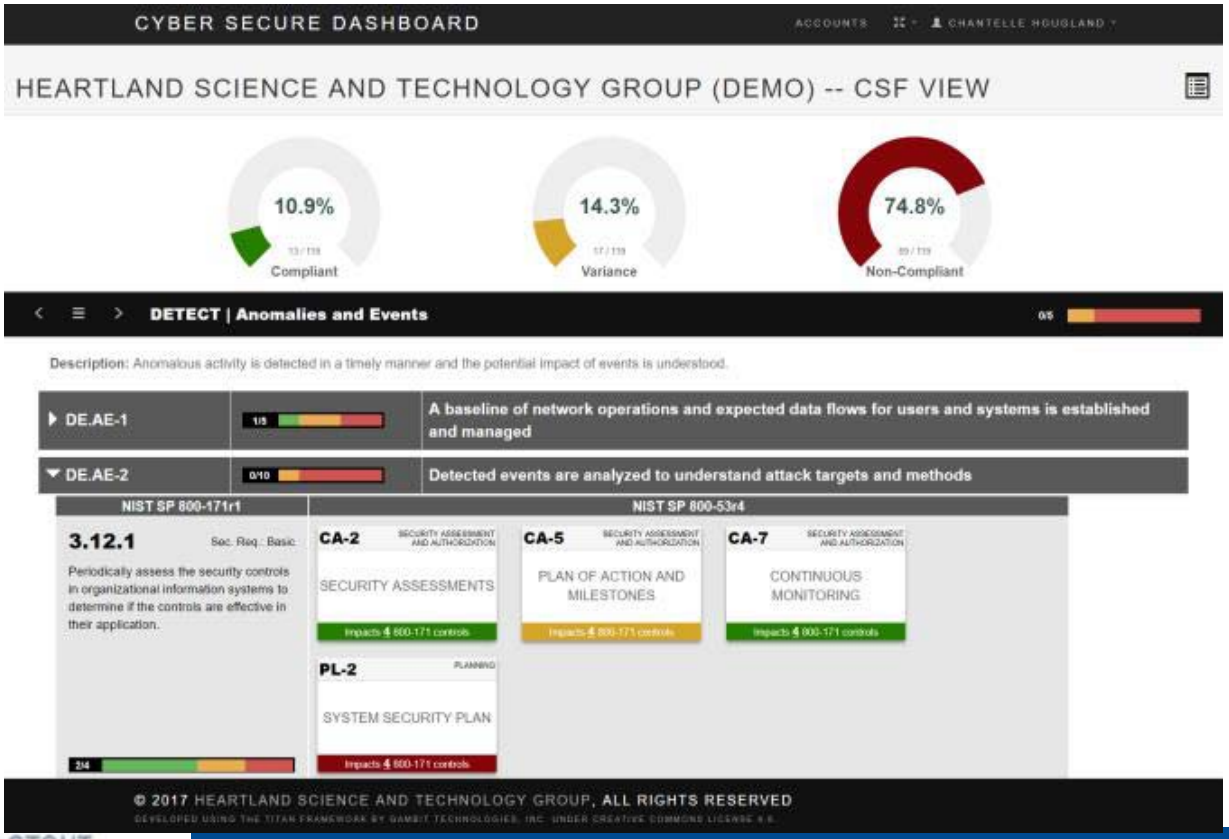
Need: NIST 800-171 DFARS

www.cybersecuredashboard.com

DM&D Solution: Cyber Security Dashboard

Cybersecurity for Digital Manufacturing

Guiding Small & Mid-Sized Manufacturers Through Complex Federal Cybersecurity Regulations



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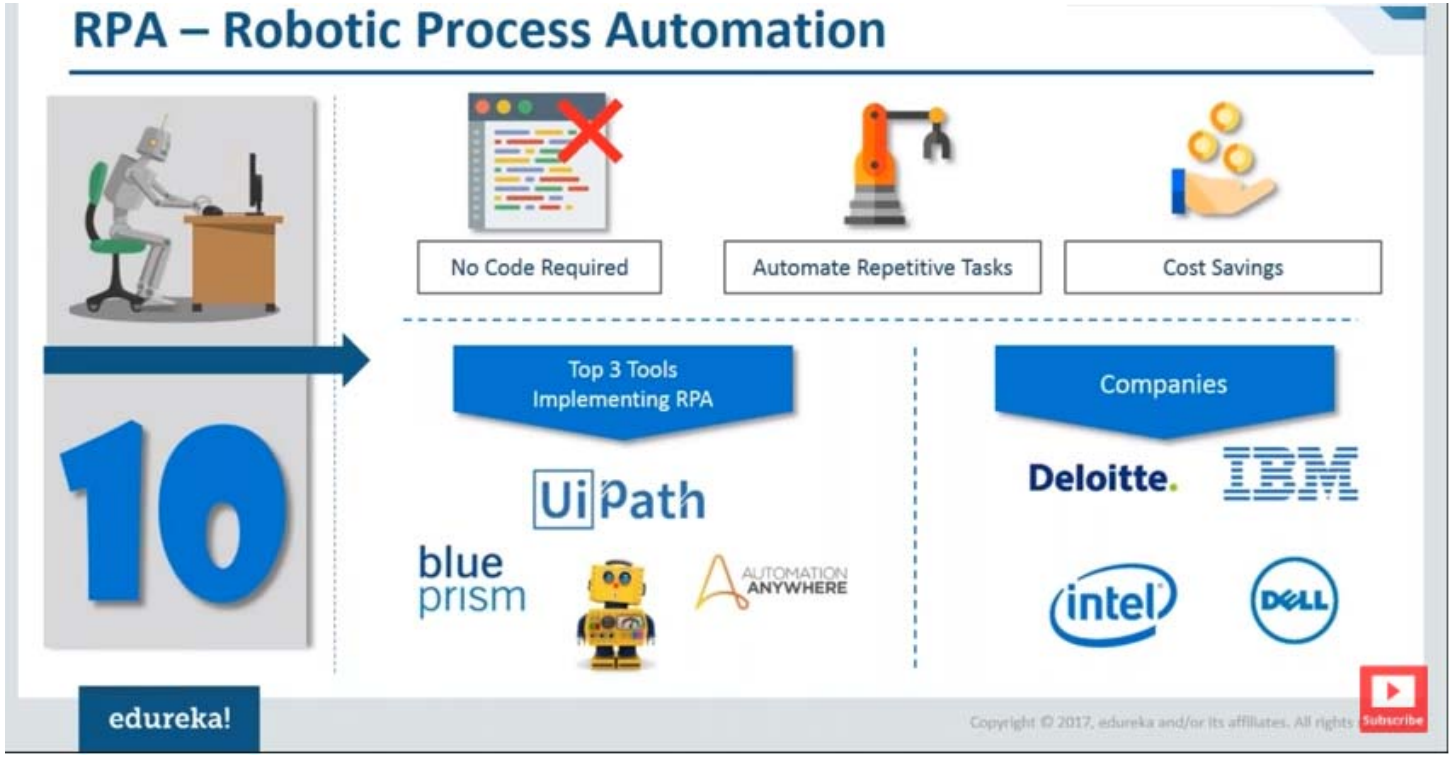
DM&D Solution Example

Need: Automate Repetitive Office Tasks

DM&D Solution: RPA Software



https://www.youtube.com/watch?v=evU3TzbraQM

DM&D Solution Example

Need: Paperless shopfloor connected to ERP

DM&D Solution: Manufacturing Execution System (MES)

Helping Manufacturers Succeed!

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Open for Questions…

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