



Industry 4.0 and Digital Transformation

A path to profitability



A new image for manufacturing.. Perhaps...

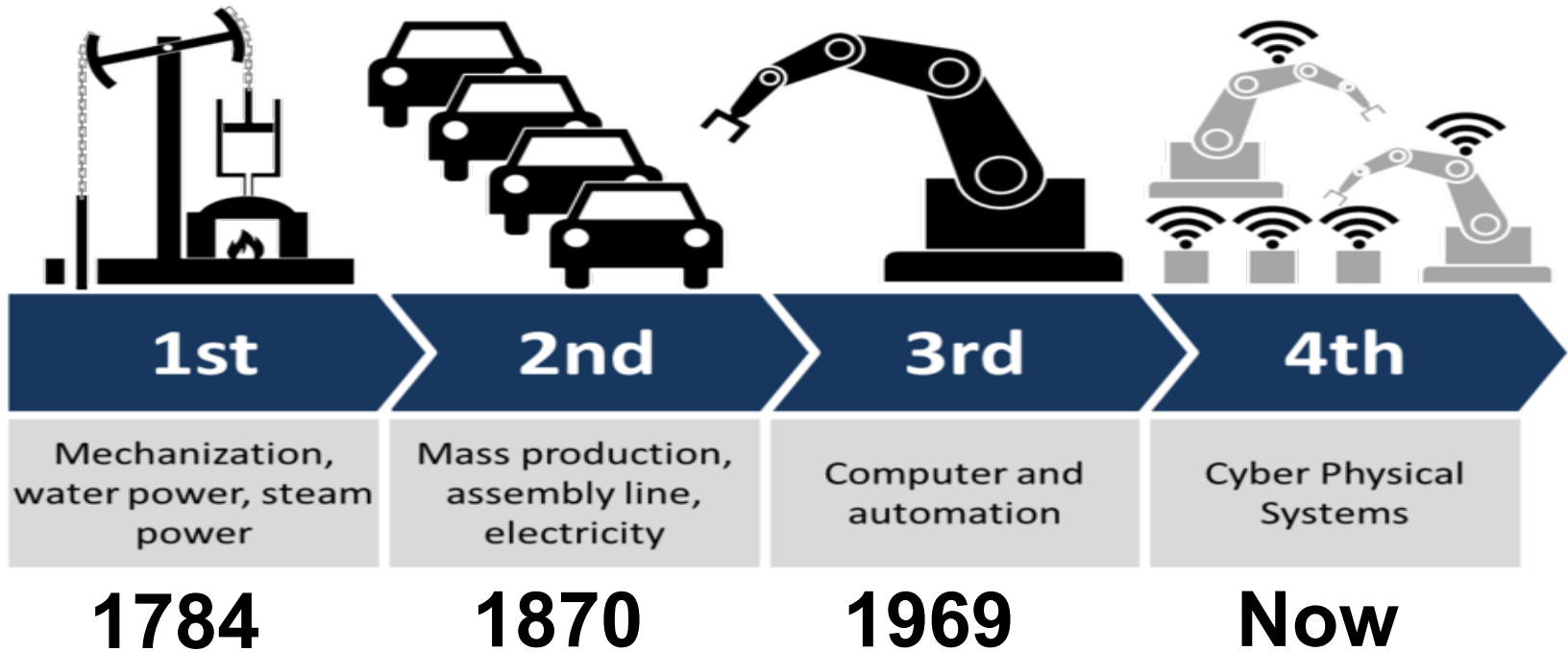


“I designed a program that allows me to run the entire plant from my computer. By the way, how’s the weather back there?”



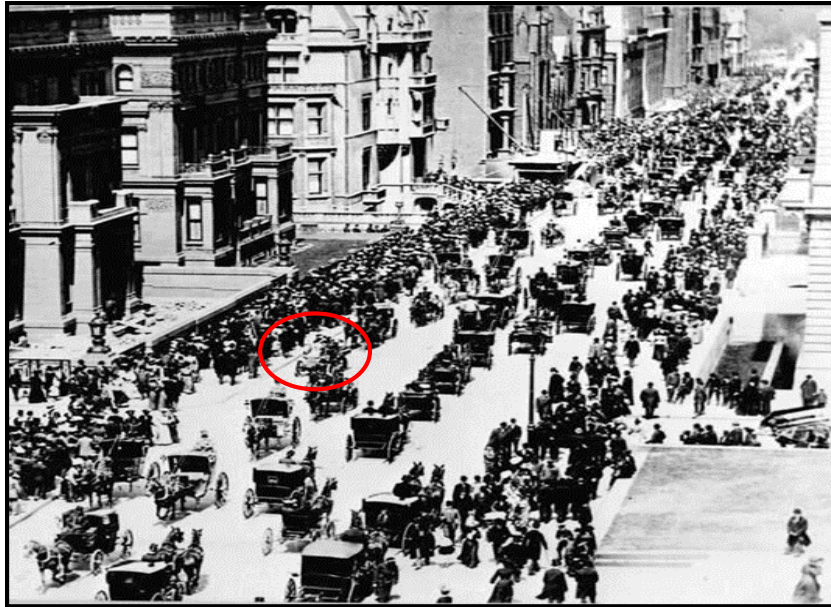
Is this journey ever a straight line?...Not even close



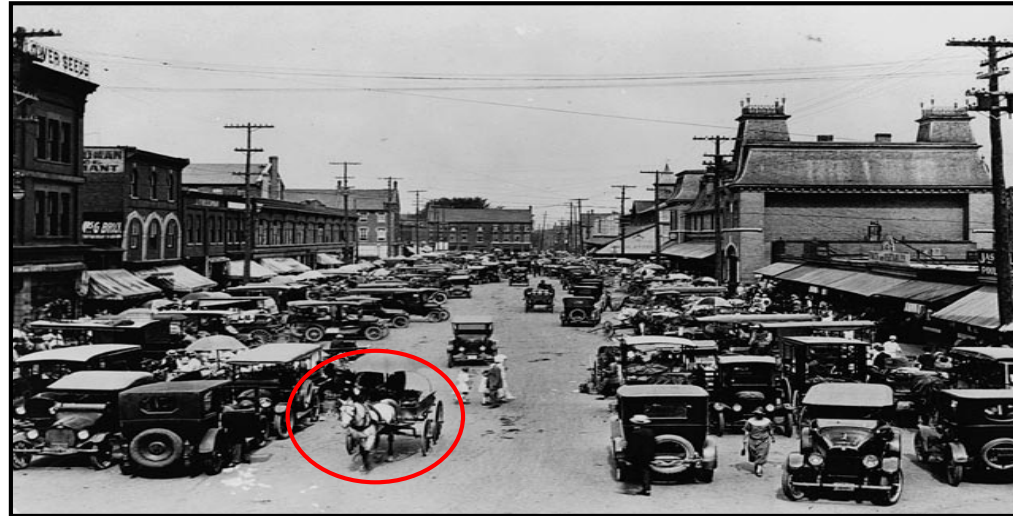


Societal Change by Technology Disruption

In just a decade...



One automobile, 1900

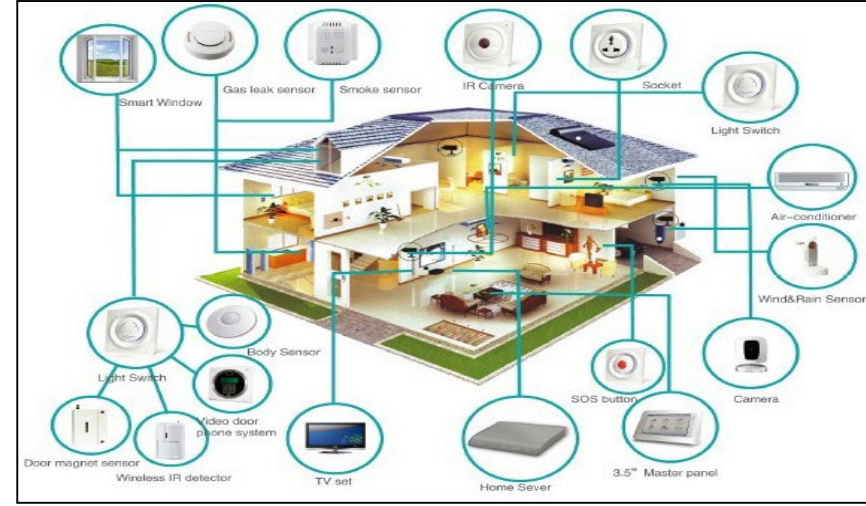


One horse carriage, 1910





Yesterday: The Internet of People
Most data generated by/for humans



Today: The Internet of Things
Most data generated by/for things



Times are Changing



**Tomorrow:
The Internet of Services and Value**



The art of possible.. General Mills



Story

- Address movement to sugar-free, organic, and gluten-free products prevent cross-contamination between different types of oats.
- Digitizing many aspects of their processes and connecting disparate data sources.

Results:

- \$20 million in ingredients savings and \$1 million in energy savings.
- Improved safety, reduced manufacturing cost, and improved service



The art of possible.. Harley Davidson

Story

- Implement a flexible manufacturing strategy for greater responsiveness to consumer demand.

Results:

- 21-day fixed plan to a six-hour horizon and ability to achieve a 50% swing in production annually
- 91% reduction in injury rate over five years



What is Industry 4.0?

Advanced Sensors, Controls, Platforms and Modeling

- Industry 4.0 is framework that enables the delivery of information about the production/ manufacturing process across the entire value chain:
 - When it is needed, Where it is needed, and In the form it is needed

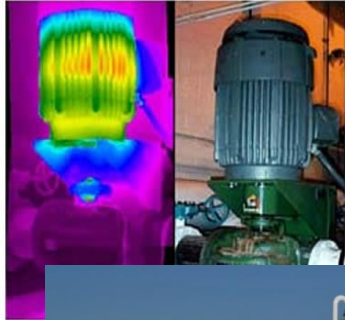


“Make Data a Key Asset”

*Industry 4.0 is about:
Right Data, Right People, Right Time, Right Decisions*

Industry 4.0 solutions can be applied today

Thermal Imaging of pumps and motors



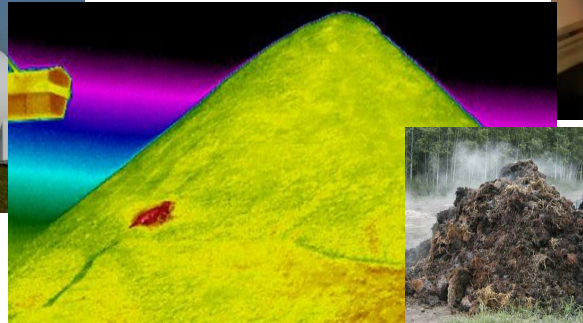
Connects customers with manufacturing



Preventive Maintenance and Condition monitoring



Measuring Liquid levels

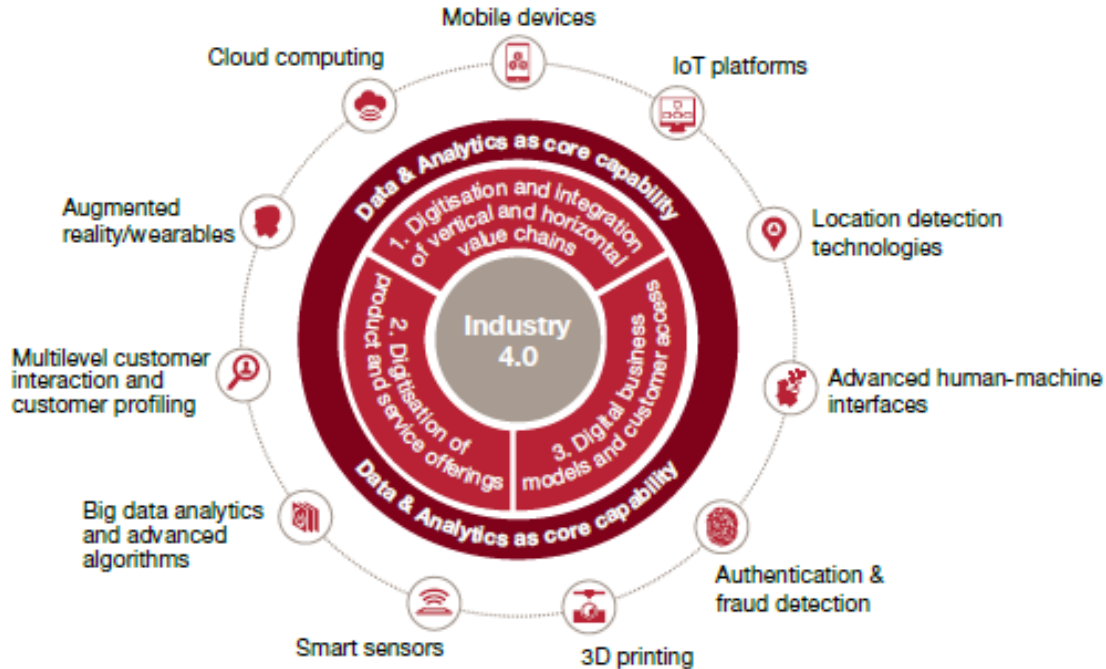


Monitor Temperature of Compost Piles



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Industry 4.0 framework – contributing technologies



Industrial companies have been early adaptors of Industry 4.0... However today

- Cost of adding sensors to equipment falling
- Cloud computing capacity to handle data from a large number of sensors available
- Enterprise software evolving
 - To operationalize data from these networked devices
 - To use data as a source of information for decision support.



Impact of deploying Industry 4.0

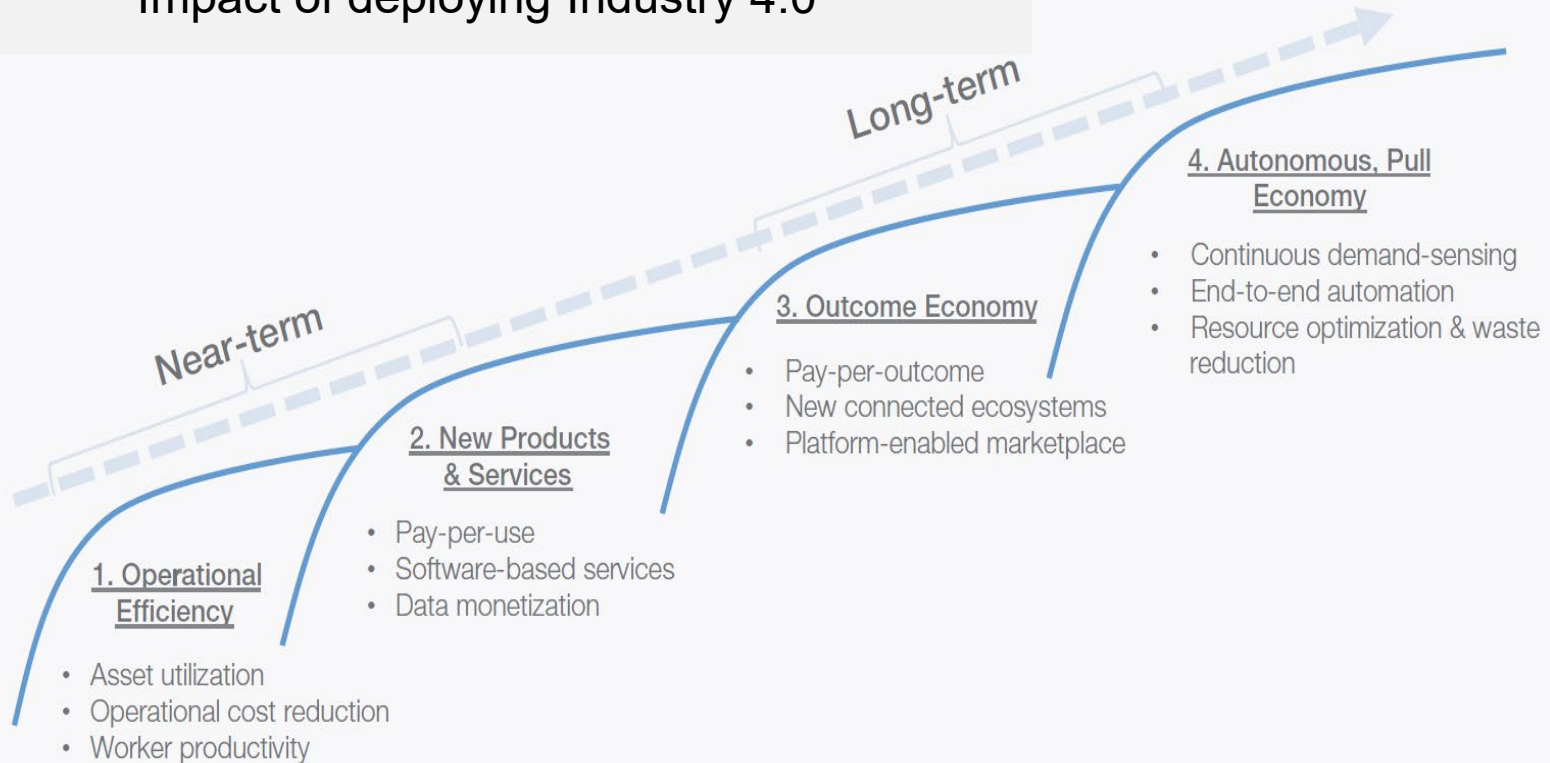
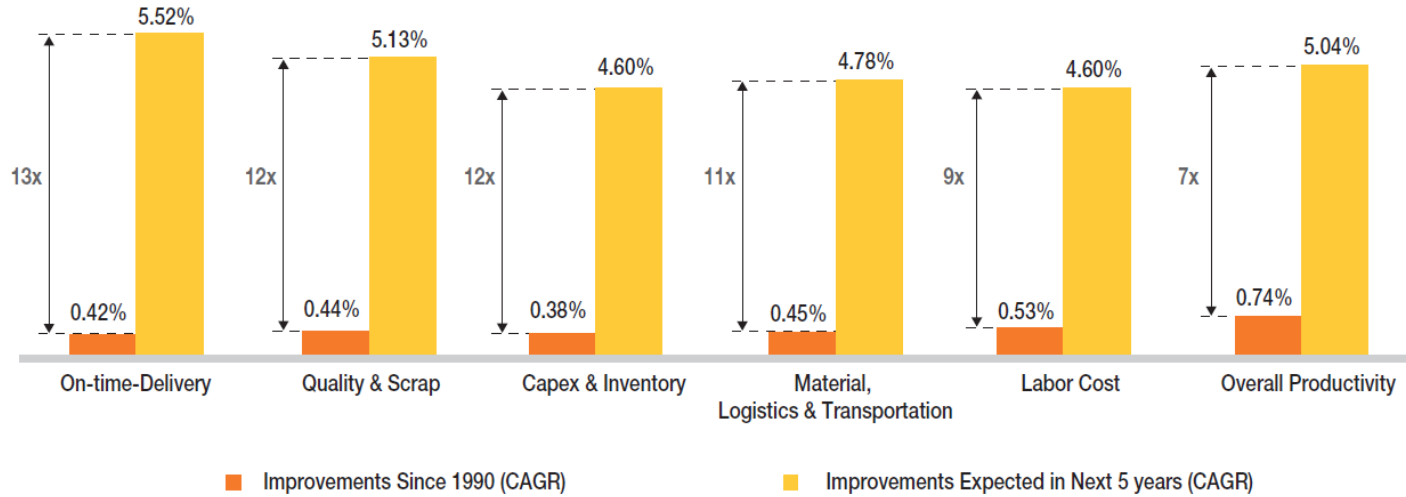


Figure 1: Manufacturers are expecting big gains from smart factories

Annual gains since 1990 vs. expected annual gains in smart factories in next 5 years



Source: Capgemini Digital Transformation Institute, smart factory survey, February-March 2017



Industry 4.0 can be applied in the woodworking and furnishing world

The image shows a side-by-side comparison of two web pages. The left page is an article from Woodworking.com titled "Industry 4.0 will enable individuality on a large scale". The right page is a HOMAG website showing a production control system diagram. The diagram illustrates a workflow from Sale to Packaging, with a central Production control system box. Below the workflow, a 3D cutaway view of a factory floor shows various production stages: Storage, Cutting, Separating, Edge, Sorting, Drilling, Assembly, and Packaging.

Woodworking.com Article:
Title: Industry 4.0 will enable individuality on a large scale
URL: http://www.woodworkingcanada.com/51/shovkovsk.asp?listing_id=5161342

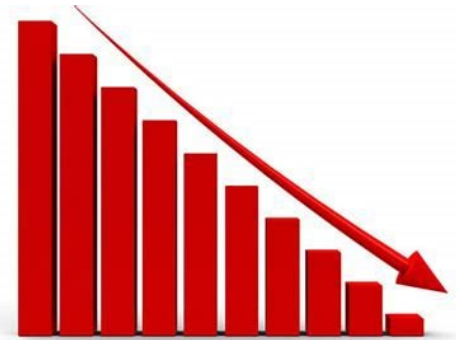
HOMAG Production Control System:
URL: <https://www.homag.com/en/your-solution/networked-production-industry-40/>
Flow: Sale → Order → Data → Planning → Production control system → Storage → Cutting → Separating → Edge → Sorting → Drilling → Assembly → Packaging



Before we get into the application of industry 4.0.. Let us look at where the market is headed...



OR



A data point about the furniture industry to consider ...

Woodworking market share is more than 60% in the global furniture industry having market value of more than US\$ 400 Bn.



Some details about the wood product manufacturing in the US...

Industry at a Glance

Key Statistics Snapshot

Revenue

\$7.7bn

Profit

\$306.3m

Annual Growth 13–18

4.5%

Exports

\$1.0bn

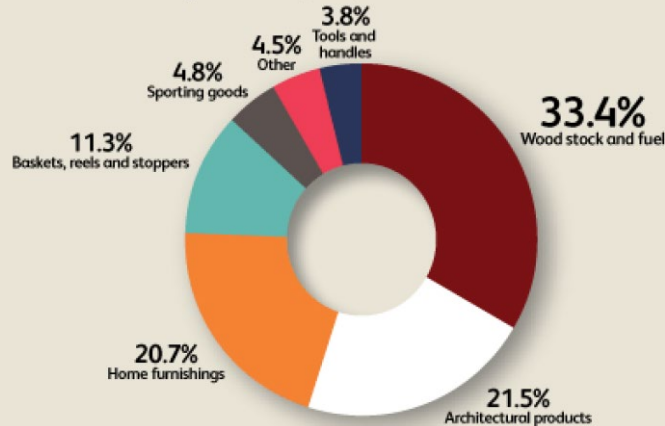
Annual Growth 18–23

0.8%

Businesses

7,240

Products and services segmentation (2018)

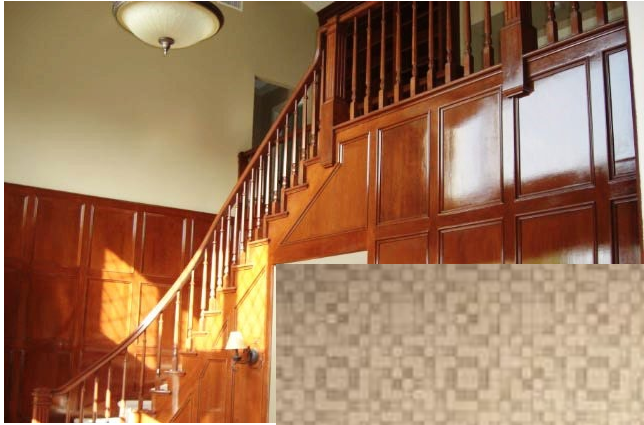


SOURCE: WWW.IBISWORLD.COM



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Some triggers for growth...



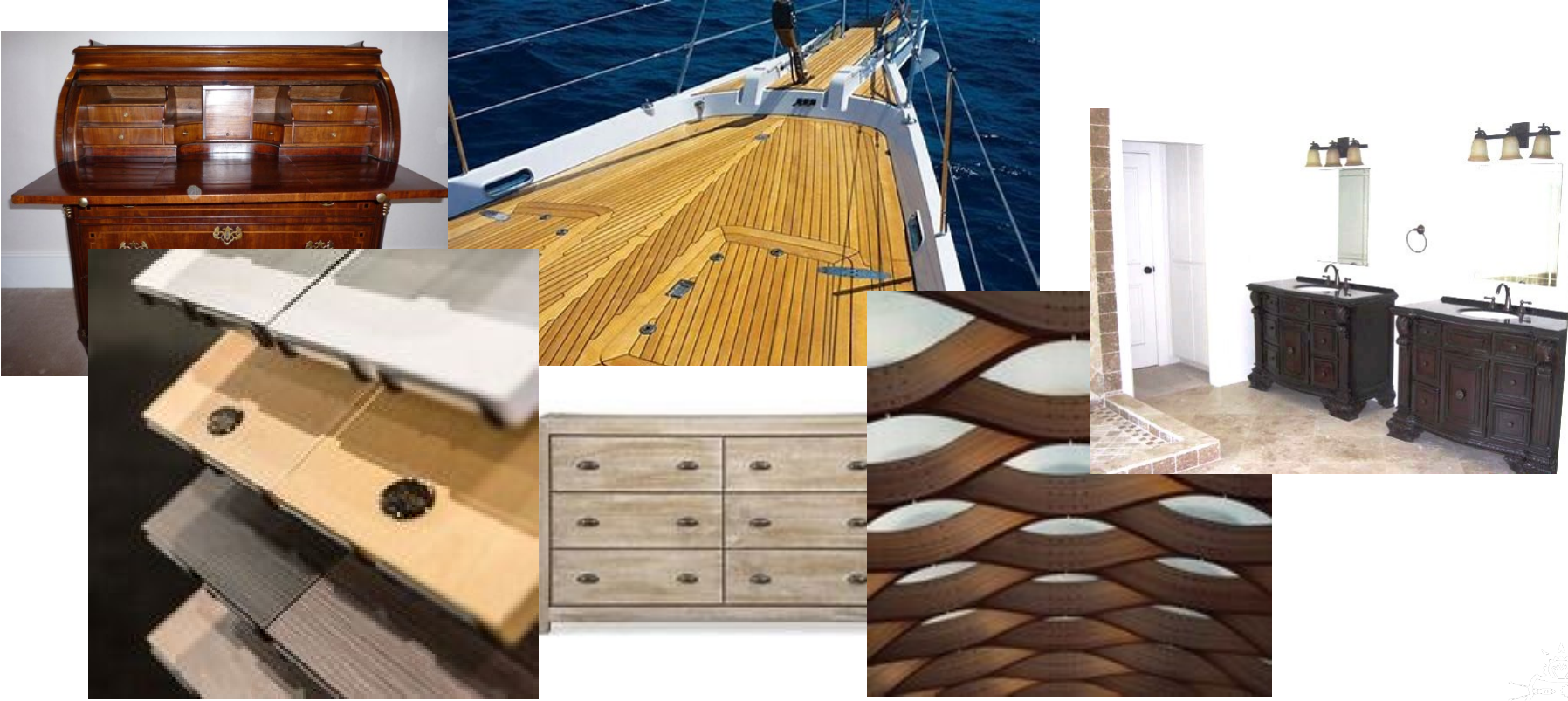
Wood in making cabinetry and housing materials



Wood in making boats, yachts, and marine docks



Some key market segments that use wood...



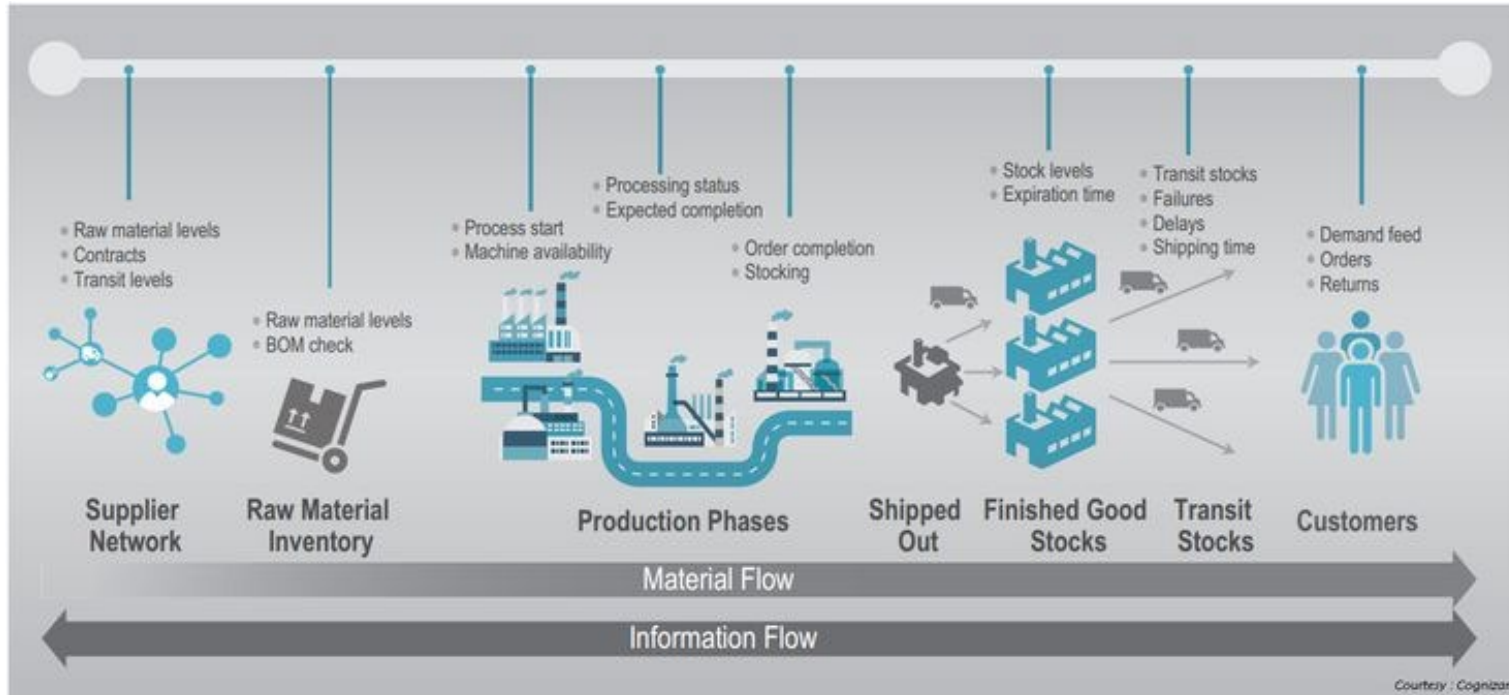
Given that the woodworking and furnishing market is a ...



The supply chain and the manufacturing community has to ready and flexible..



Industry 4.0 is the great enabler...



Business objectives in woodworking to support the dynamic needs of the market place...

- To manufacture more customized, more flexible, faster and more reliable.
- To continuously enhance the entire process chain

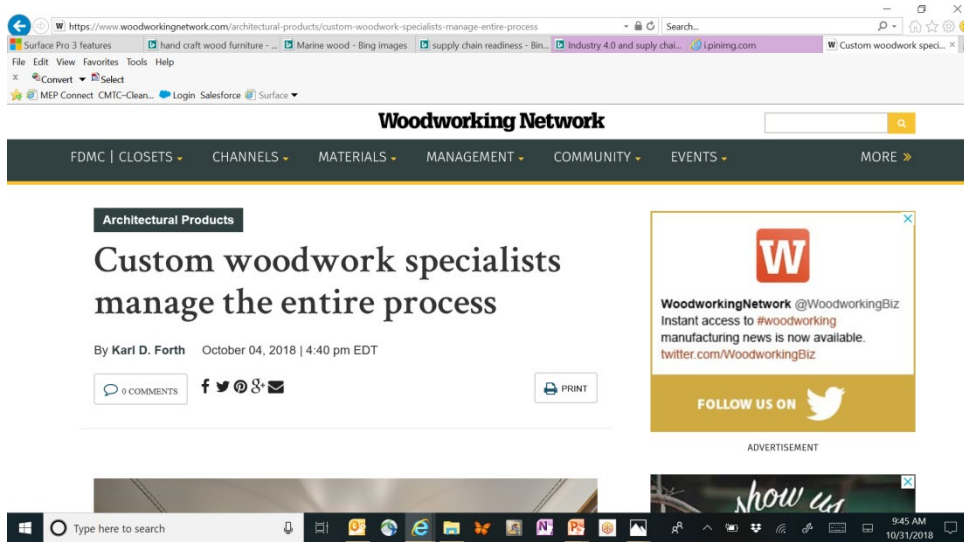


Some points to keep in mind about Industry 4.0 ...

- Industry 4.0 is connectivity of manufacturing technologies
 - Connected processes along the value chain include links between suppliers and sales, inbound logistics, production, outbound logistics, installation and services
- Create execution systems with real-time manufacturing information, material provision logistic train system, RFID and barcode part identification, material flow synchronization, and machine availability and maintenance



An example of industry 4.0 in the wood working industry...



Merritt

Locations: Mentor, Ohio, Lodi, California

Type: High-end woodwork and millwork

Total employees: 300

Plant size: 150,000 square feet

Focus - Woodworking and joinery for residential estates and superyachts



Some of the industry 4.0 tools they Merritt uses..

- Visual manufacturing for ERP and plant scheduling;
- Microsoft Projects
- Microsoft Office Suite
- AutoCAD, Revit, Solid Works,
- Solid Manufacturing Ultimate,
- Rhino, Alpha CAM, and Inventor



Merritt's business success – 10X growth in 10 years...

- \$5 million in sales in 2001
- \$50 million in 2017
- Growing



So why, where, when how, and what should the start be?



Begin with an end in mind...... Articulate business goals and “flexible plans to get there..”

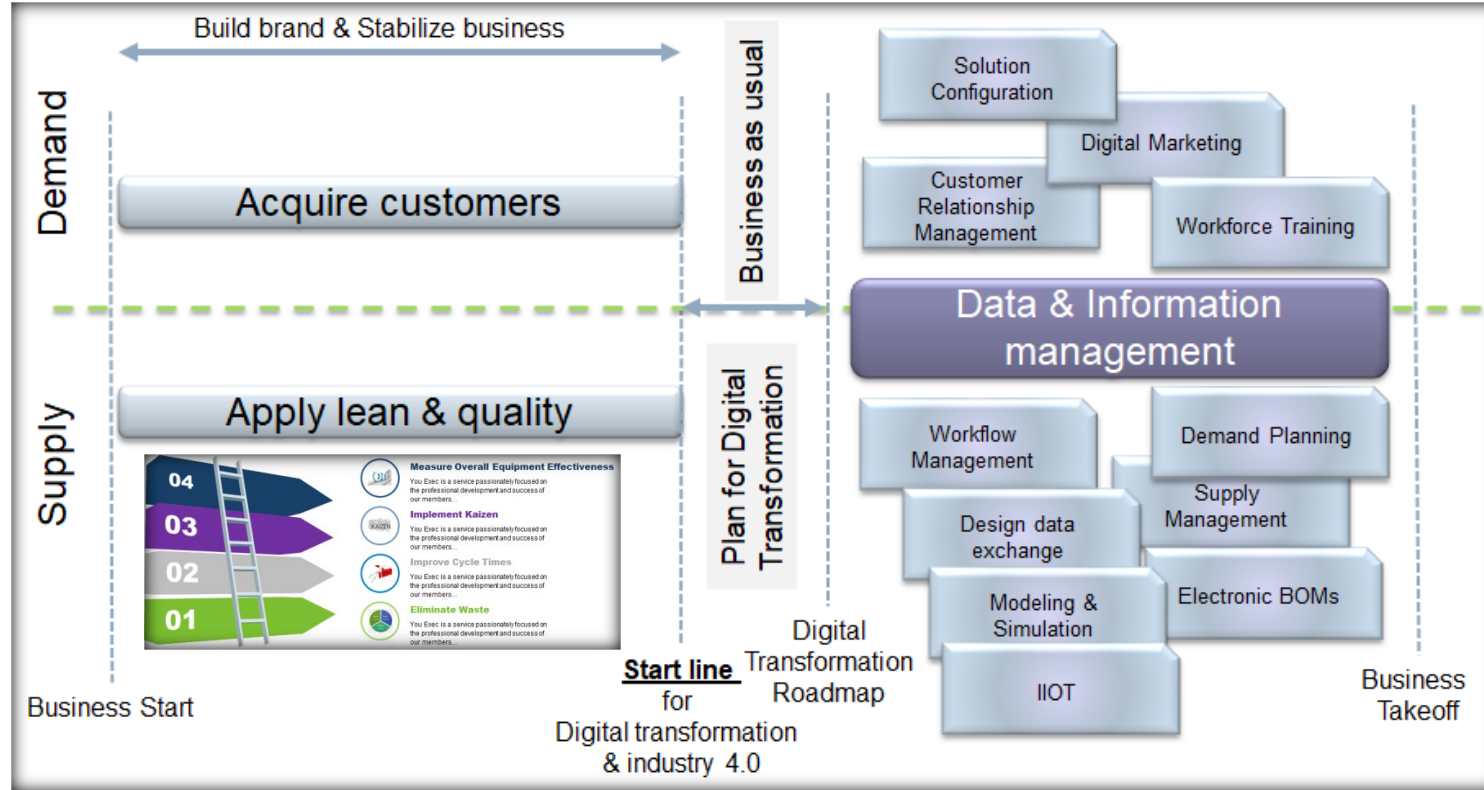
- Increase revenue?
- Grow market share?
- Acquire new customers?
- Penetrate new markets?
- Reduce OPEX?
- Increase CAGR?
- Retain Workforce? (Reduce cost of turnover)



Align Market demand & needs with business capability...



Ensure that the digital transformation journey has to staged and thought through ...



A simple checklist to start the digital transformation journey...

- Identified 3-5 year business goals
- Architected a strategic plan
- Formulated an annual operating plan
- Implemented lean & quality principles
- Built a customer base for sustenance
- Have a workforce retention plan



It is all about business strategy and culture change...



Some pitfalls to avoid to during a digital transformation...



Some pitfalls to avoid to during a digital transformation...

- An incorrect perspective of digital transformation
- Lack of clear articulation of what success looks like
- Not having a strategy
- Creation of silos
- Not getting commitment from top
- Not investing in culture change



The key to successful digital transformation is ...

- Build a high-performance digital team
- Digital should be everyone's job
- Don't do digital for the sake of digital
- Do fewer things better
- Create an atmosphere of collaboration
- Bake data-informed thinking into the culture
- Think from the outside-in
- Need to be agile –Launch, learn, refine, re-launch.



Remember a well thought through roadmap enables us to leverage the power of industry 4.0....



www.pwc.com/industry40



Who is CMTC and how they help you in this transformational/evolution journey?





Serving Manufacturers Statewide

Who We Are

- CMTC is California's Manufacturing Extension Partnership (MEP) Center and is affiliated with the National Institute of Standards and Technology (NIST)
- CMTC is part of the MEP National Network that acts collectively on a national and regional basis to provide solutions to current and future needs of manufacturing
- CMTC has formed California's Manufacturing Network to serve small and medium-sized manufacturers statewide to generate profitable growth



NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



MEP
**National
Network™**
*The Go-To Experts for Advancing
U.S. Manufacturing*



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Manufacturing Extension Partnership



Our Impact

- In 2017, clients reported the following benefits from working with CMTC:



\$306 Million
Total Investments



\$101 Million
Cost Savings



\$751 Million
Total Sales



11,345 Jobs
Created/Retained



1,148 Mfgs
Served



Our Services: Growth



Innovation
Market Diversification
Exporting
Sales
Marketing Strategies



IT Strategy Development
Enterprise Selection
Cybersecurity
Systems Integration
IT Architecture



CEO Peer Councils
Family Business Advisor
Strategic & Financial Planning



Additive Manufacturing
Smart Manufacturing
Flexible Hybrid Electronics
Robotics and Automation



Our Services: Continuous Improvement



Lean Management
Energy Efficiency
Business Process Optimization



ISO / AS Standards
Six Sigma
Quality Implementation
Quality Improvement
Compliance



Workforce Training
Management Development
Compliance
Health & Safety
Recruiting



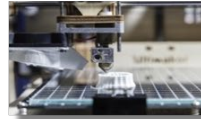
Optimize Supply Chain
Supplier Quality Systems
Sourcing & Logistics
Develop Effective Value Chain



CMTC Technology Practices and Collaboration Initiatives

Advanced Manufacturing Service Practices in Development

- Additive Manufacturing Practice



- Advanced Robotics & Automation



- Smart Manufacturing



- Digital Manufacturing



- Flexible Hybrid Electronics



Participation in the USA Institutes

- America Makes



- Advanced Robotics for Manufacturing Institute



- Clean Energy Smart Manufacturing Innovation Institute



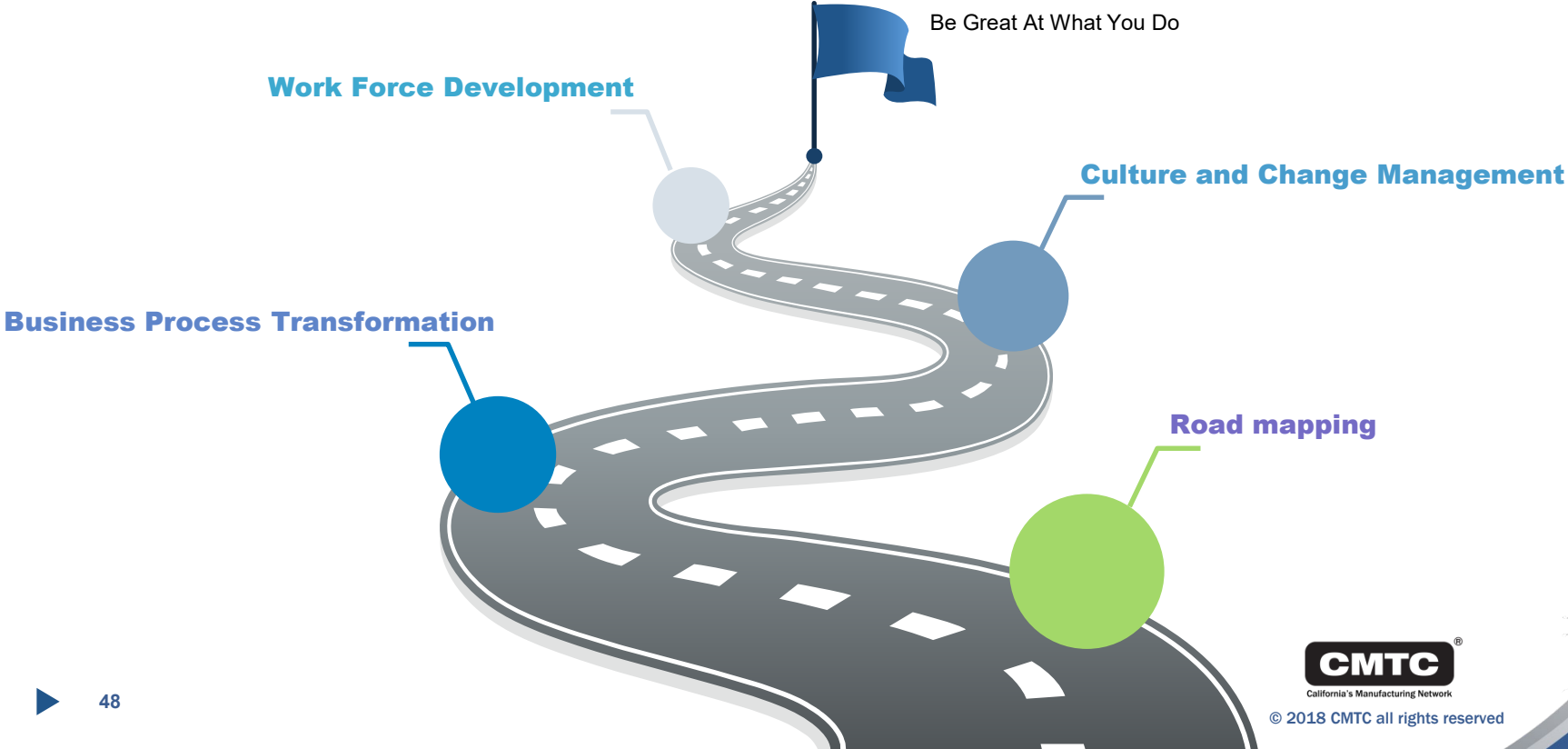
- Digital Manufacturing Design Innovation Institute



- NextFlex Flexible Hybrid Electronics



The portfolio of services that will take SMMs on a Smart Manufacturing Journey



There are two great places to start..

- Take the smart manufacturing assessment at
 - <https://www.surveymonkey.com/r/Smart-Manufacturing-Assessment-and-Readiness-Questionnaire?>
- Reach out to me at schandrashekhar@cmtc.com





QUESTIONS?

