


*Reminder to Mute Your Phone/Mic/Camera*

# ADVANCED MANUFACTURING EXPLAINED.

What Does Industry 4.0 REALLY Mean for Me?

Presenter: Ken Wunderlich, IMEC

September 15, 2021



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## About IMEC

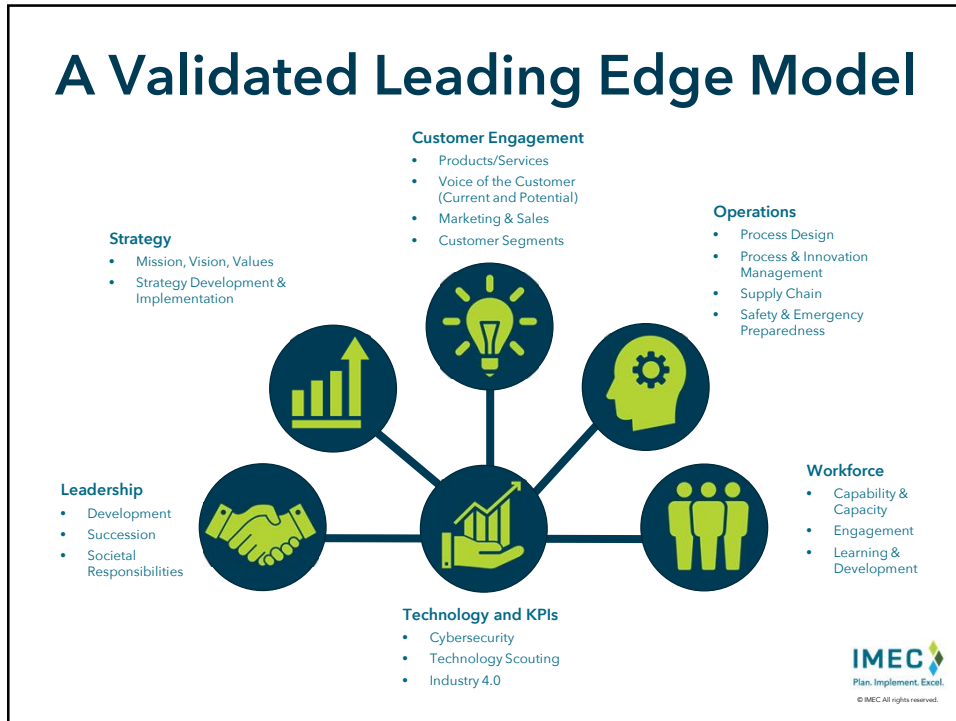
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**Mission**  
Committed to Driving Growth through Enterprise Excellence

**Vision**  
Leading the way for organizations to create their competitive future



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## PLAN. IMPLEMENT. EXCEL.

How do you develop and implement your organizational strategy?

How do you engage customers by serving their needs and building relationships?

How do you build an effective and supportive workforce and workforce environment?

How do you ensure effective management of your operations?

**What are your results telling you?**

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## Igniting Illinois Manufacturing Excellence and Global Competitiveness

With more than 50 full-time staff and partners positioned statewide, IMEC assists more than 1100 companies each year with successful improvement and innovation projects.














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## 2020 Client-Reported Impacts




**\$1,565,873**  
Average New & Retained Sales



**6,176**  
Jobs Created & Retained



**1,144**  
Companies Assisted




**\$79,640**  
Average Cost Savings



**\$19:1**  
Return on Investment

**\$646,455,900**  
Aggregate Impact to Illinois Economy



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\*Reported on annual NIST-MEP manufacturing survey

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# Begin with Industry 3.0

Industry 3.0 initiated the beginning of automation. Normally focused on hardware and proprietary software.

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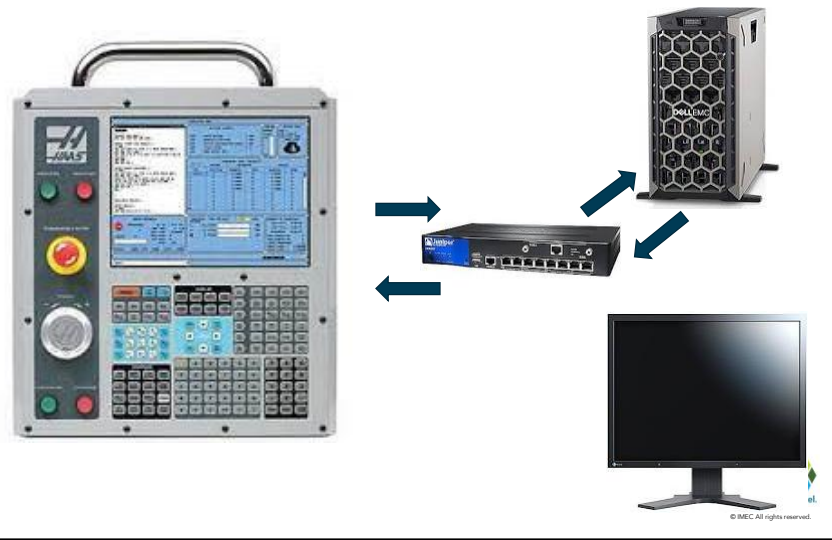
## Understanding Industry 3.0

- Computers to replace manual recording
- Automation was integrated to replace manual
- Introduction of Integrated Circuits (IC)
- Programmable Logic Controllers (PLC)
- Introduction of robotics for task
- Focus on operation
- Data was in silos specific to application

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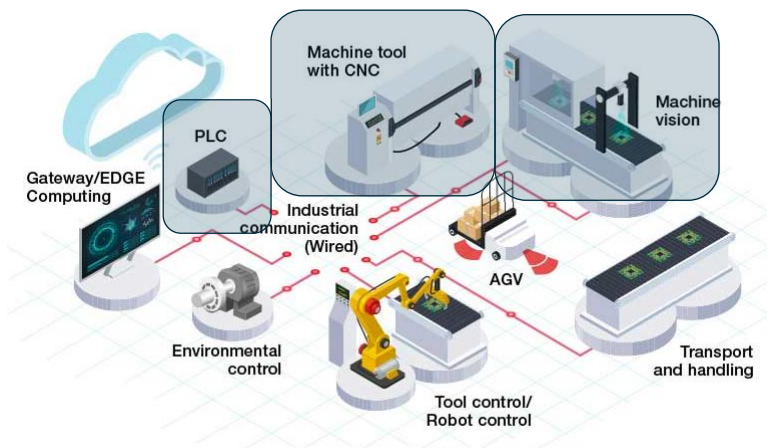
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## Examples for Industry 3.0 to Industry 4.0



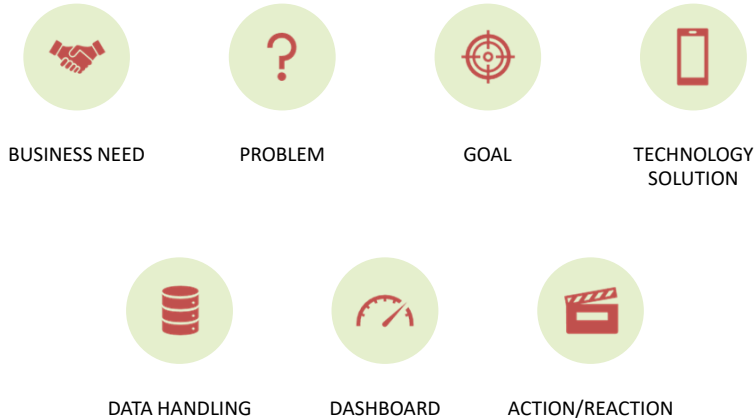
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## Industry 3.0 Systems



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## Industry 4.0: What does it mean?



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## Transition to Industry 4.0

- Business Problem
- Unable to attract workforce
- High Scrap
- Unacceptable Machine Performance
- Degree of Improvement (5%, 200%?)
- Technology Plan
- Pulling together solutions

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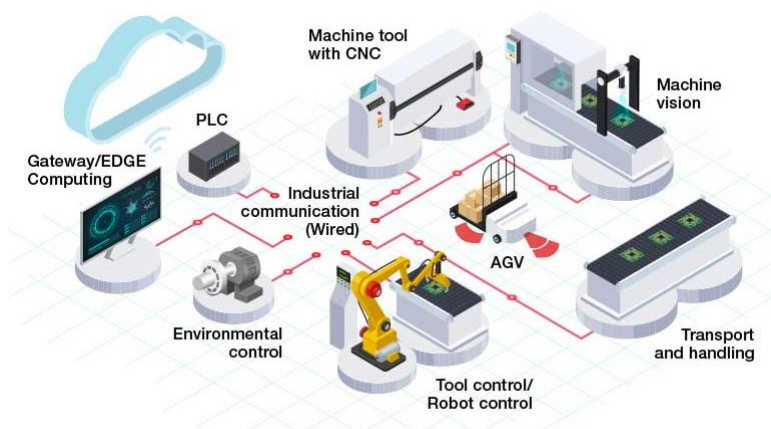
## Transition to Industry 4.0

- Identification of technology
  - Hardware, Software, Storage Locations, Access
- Second, Review Data
  - Raw Data, Calculated, Dashboard (AI)
- Third, Instill Controls
  - Metrics
  - Actions based on data



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## Industry 4.0



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## Introduction of Industry 4.0

- Data becomes a significant focus....
- Focus more on the exchange of this data
- Humans may not be required for functionality
- Massive amount of data/ metadata
  - System to System communication
  - Artificial Intelligence
  - Digital Risk Management
- Data is coming from many sources



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## 13.0 to 4.0 Example - Maintenance

Company A is in looking to improve the performance of their equipment. Machine performance(uptime) has reduced 10% over the last 3 years, and maintenance has become a reaction rather than a planned proactive event.

**Goal:** Improve uptime in equipment by 25% over the next 24 months

**Possible Solution:** Improve early warning signals / data in maintenance through a predictive maintenance system. This often includes Internet of Things(IOT) wifi-connected devices, and an edge system that communicates with controllers. Start with uptime % as well as key data points on machine (temp, pressure, speeds, etc) monitoring through a dashboard. Based on the results incorporate new systems based on data...evaluate ROI.



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## 13.0 to 4.0 Example - Standard Work

Company B has 10% of their workforce that will be retiring in the next 5 years paired with challenges in attracting talent

**Goal:** Improve capture and knowledge transfer measured by running machine hours/ manufacturing employee. Improve 10%.

**Possible Solution:** Start with a standard method to capture standard work such as TWI - Job Instruction. Creation of a series of applications to 1) Capture still / video 2) Add still / video with text instructions/ warnings 3) Providing a controlled training session for new folks. This solution is applied to those with technical knowledge and provides tools to build standardized work with employees responsible for pursuing training and taking ownership.



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## 13.0 to 4.0 Example - Automation / Palletizing

Company C is burdened with using resources to stack boxes of product onto a pallet.

**Goal:** Remove 10% resources from palletizing and divert these positions to more value-added activities such as setup. Cross-training will take place over 3-6 months.

**Possible Solution:** Identification of product line, cell or pack-out area. Incorporate a proven combination of conveyors that position product with automation that can lift the box and place onto a pallet in the correct configuration (e.g. chimney stack). Box can be placed on pallet at ground level for material handling or incorporated with autonomous mobile robots with pre-guided paths to move the material to the next location.



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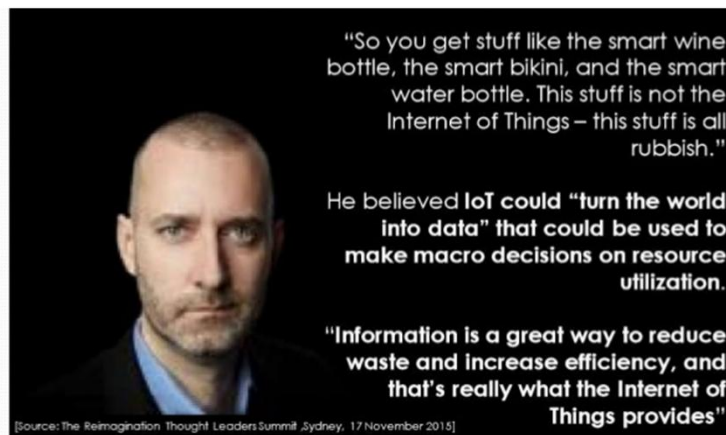
# How to capture this data...

Methods using Internet of Things (IOT) sensors to capture the specific data. Consideration for where this data will be stored and access.

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## Internet of Things (IOT)



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## The Internet of Things (IoT)



### Definition

The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.



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## How does IoT work?

The Internet of Things (IoT) consist of a web-enabled device that collects, send and analyze data from the surrounding environments.





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# Collection

Devices and Sensors are collecting data everywhere.

- At your home
- In your car
- At the office
- At your manufacturing plant





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# Communication

Sending data and events through networks to some destination.

- Home network
- A cloud platform
- Private data center



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## Analysis

Analyze

Creating information from the data

- Visualizing the data
- Building reports
- Filtering data



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## Action

Act

Creating an action plan based on the data and information provided

- Communication with CNC machines (m2m)
- Sending notifications to ERP / MES
- Action on rules



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## Where can IoT be applied?

### Facility Management

- Predictive Maintenance

### Digital/Connected Factory

- Controlling an Operation Remotely

### Production Flow Monitoring

- Real-time process monitoring

### Inventory Management

- Cross-channel visibility of available material

### Plant Safety and Security

- Number of injuries, frequent rates of illness, vehicle incidents, property damage etc.



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## Data Storage, Access & Handling

### Storage: Industry 4.0 is all about data

- Massive increase in data drives need for storage and access.
- Cloud-based storage

### Access: Industry 4.0 is all about data

- Internet Access
- Universal platform (not specific to make/model\_

### Handling: Industry 4.0 is all about data

- Massive data needs presentation level format



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## Predictions with data

### Significant increase in data.

- Challenging to review
- Presentation of data is key
  - Think Pivot Table on steroids
  - Think Pivot Charts on steroids
- Digital Twin
  - Significant data (including metadata about data)
  - Physical representation in digital world
  - Data about artifact (machine)
- Artificial intelligence
  - Initial logic ruleset that allows for decision making such as machine down – automatically move to another machine



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# Thank You!

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## YOUR NEXT STEP: ADVANCE WITH AUTOMATION

### Start the conversation!

Complete the short information form at [www.imec.org/showcasemanufacturer/](http://www.imec.org/showcasemanufacturer/)

### Questions?

Contact Ken Wunderlich at [kwunderlich@imec.org](mailto:kwunderlich@imec.org)



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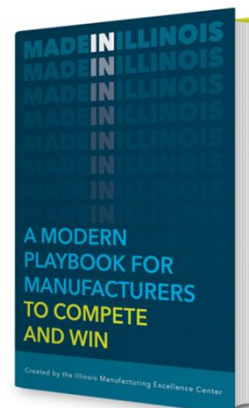
## *MADE IN ILLINOIS: A Modern Playbook for Manufacturers to Compete and Win*

### Chapter 6: Integrating Technology for Greater Process Innovation

- Page 192: The Great Robots vs. Jobs Debate and the 10 Pillars of Industry 4.0

[www.imec.org/made-in-illinois-playbook/](http://www.imec.org/made-in-illinois-playbook/)

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- Strategy Guide
- Book Discussion Guide



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## MANDATORY VACCINE POLICIES: Legal Considerations for Employers Webinar

September 21 | 11:30am - 1:30pm

- Legal and practical considerations of instituting a mandatory vaccine policy
- Who pays for the vaccine: the employer or the employee?
- Addressing confidentiality concerns
- Responding to requests for accommodations, engaging in the interactive process, and undue hardship

Register at:

<https://bit.ly/IMEC-Mandatory-Vaccine-Webinar>



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## TECHNOLOGY & OPERATIONS EVENTS

Date	Session	Presenter
September 22	Artificial Intelligence in Manufacturing: Real World Success Stories and Lessons Learned Webinar	MEPNN speakers
October 4	DEMYSTIFY CYBER INSURANCE: How Controls Can Save Manufacturers Money and Increase Protection Webinar	Mission Critical Global Alliance + Willis Towers Watson
October 6 First Wednesday of the month through October 2022	MAKE STEADY PROGRESS: CMMC Cybersecurity 15-Part Training Series for Manufacturers	IMEC & Cerberus Sentinel
October 11	AUTOMATION WORKFORCE PRODUCTIVITY: How Illinois Manufacturers are Adopting Advanced Technologies	IMEC + Partners
Postponed: November TBD	MAXIMIZE YOUR MACHINES: Total Predictive Maintenance for Equipment Effectiveness Virtual Training Series	Fuss & O'Neill

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