Industry 4.0
Are you & your businesses ready?

Purpose of the Workshop:

To strengthen economic development BR&E visits and follow up by educating BR&E practitioners about the basics and language of Industry 4.0, how to recognize industry adoption, gauge a businesses’ readiness for transformation, and share useful resources that can help your businesses prepare for disruption and opportunities.
Agenda:

1. Welcome!
2. Industry 4.0
   a. Why should you care?
   b. What is it?
   c. What are the benefits?
3. Industry 4.0 Technologies – an Overview
4. Break
5. Industry 4.0 Technologies – in Practice
6. The Economic Developer’s Role
7. Business Resources

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Key References
International Economic Development Council

Industry 4.0
Why should you care?
Impact of Inaction – On Businesses & Communities

• Job losses or gains
• Adopting these technologies will become critical to competitiveness.
• Large firms will begin to require their use among their suppliers and partners
• Seamless integration will become key – customers will begin to expect more than just the part, item or service

How the Future is Impacting Community College Workforce Development

• Automation: Training and retraining. Economic development practitioners need to evaluate their economies’ potential for automation.
• The GIG Economy: defined as short-term jobs brokered via an internet platform – has several implications for economic development.
• Changing Reward Mechanisms: As automation proceeds and the gig economy disrupts how jobs are created (or even what constitutes a job), economic incentives that traditionally rewarded job creation may need to be rethought.
Lomont’s consolidation in Iowa, Frank said, is also practical for its ongoing move toward Industry 4.0.

“We are moving in the direction of a 4.0 strategy,” he said. “We’re not completely integrated on that by any means; however, we understand how important it is first and foremost to our customers because our customers are heading in that direction as well.”

The company’s primary focus is on integrating automation and robotics throughout its facilities within the next few years, he said.

“We can save ourselves money and, at the same time, gear ourselves for the future,” Frank said of the 4.0 strategy. “Within the next 10 years, I feel 4.0 will be required by all of us in the business.”
Three Broad Buckets of Industry 4.0

Designing & Testing
- Augmented Reality/ Virtual Reality
- Simulation

Producing & Performing
- Robotic & Automation
- 3D Printing – Prototyping

Managing Information
- Big Data
- Cloud Computing
- System Integration
- Internet of Things
- Cyber Security
How did we get here?

Industry 1.0
End of 18th century
Mechanization
(Steam...)

Industry 2.0
1870s onwards
Automation
(Electricity...)

Industry 3.0
Beginning of 1950s Digital
(Computing...)

Industry 4.0
~ 2000- Today AI & ML
(Connectionedness...)

Industry 4.0
Everything is Changing!
Every Industry – Not Just Manufacturing!

- Health care
- Construction
- Agriculture
- Any industry that relies on/needs/uses technology, data, supply chain integrations, customer relations, cyber security
Industry 4.0
Everything is Changing!

- What we make – electric drives, autonomous vehicles and imbedded systems
- What we make it out of – new age materials
- How we make it – 3D Printing, flexible automation and collaborative robots
- How we manage – shop floor decision making, supply chain visibility and big data

“Convergence” Disrupts

- Fewer Parts
- Fewer Operations
- Less Tooling
- 50% Reduction in Fabrication
Technologies and Trends Drive Industry 4.0

Technologies:
- Advanced Sensors
- 5G
- Blockchain
- Vision systems

Socio-economic trends:
- Mass customization
- Globalization
- Taxes and trade policy
- Uberization
What are the Business Benefits of Industry 4.0?

- Helps collaboration with customers and suppliers
- Increases productivity
- Strengthens capacity to deal with disruptions
- Provides strategies for working through workforce shortages

Supply Chain Visibility – sensors, integrated systems and tracking technologies provide workers real time data to optimize outputs

Customer Value – customer data and visibility to market trends helps the supply chain adjust to demand

Mass Customization – integrated systems produce customer designed products with 3D Printing close to the customer

Waste Elimination – Supply chain data helps solve non-intuitive problems. Shop floor sensors can enable better process control

Labor efficiency – flexible automation and collaborative robots enable workers to focus on value add
Why businesses will move to Industry 4.0

Customers demand integration
- Mass customization, flexibility, visibility, speed

Workforce availability
- Automation of direct labor, reduction of bureaucracy and paperwork, appeal to new talent

Quality
- Process control, documentation and traceability

Reduced cost of 4.0 technologies
- Cloud computing, intuitive programming, IoT ready equipment, remote support

Where can businesses begin?
Start with a Phased Approach

| Optimize | Business challenges drive data collection and optimization |
| Connect | Integrate data across systems and functions |
| Digitize | Convert manual systems with software and apps |
| Managing Information | Designing & Testing | Producing & Performing |

4.0 Check In
- Digitize, Connect then Optimize
- Take product specifications and order data straight into your system
- Reduce data reentry and paper over time

Steps to Optimization
1 – Data Collection
First step towards a digital transformation is to collect data from your equipment.

2 – Digital Modeling
Second step is to develop performance models for your equipment.

4 – Self Adjusting
Adjust the operating parameters to get the best performance.

3 – Predicting the Performance
Predict the performance of the model based on parameter values.
Invest where the customer will see or feel it

Marketing
3D printed samples
CRM systems and
digital marketing

Design
Seamlessly import
specifications
On-Line Presence
Fast Paperless Quotes

Supply Chain
Integrated order
management
Back office
automation

Manufacture
Process control and
monitoring
Advanced robotics
and automation

Service
Customer use data
Traceability

✓ Become easy to find and a valued design partner
✓ Create systems that can readily react to order changes
✓ Increase process control and automation to reduce costs
✓ Use customer data to improve product and process design

Understanding Industry 4.0 Technologies
Three Broad Buckets of Industry 4.0

- Designing & Testing
- Producing & Performing
- Managing Information

Designing & Testing

- Augmented Reality/Virtual Reality
- Simulation
Producing & Performing

- Robotics & Automation
- 3D Printing – Prototyping & Tooling

Managing Information

- Big Data
- Cloud Computing
- System Integration
- Cyber Security
- Internet of Things
Internet of Things (IoT)

“A global infrastructure for the information society that provides advanced services by interconnecting objects (physical or virtual) with existing or evolving interoperable information and communication technologies.”

Internet of Things (IoT)

- The IoT refers to the self-configuring wireless network of identifiers such as sensors, RFID tags, and IP addresses for the networked interconnection of all the everyday objects – from the sophisticated to the mundane
Pros and Cons of IoT

- Accessing information is easy and you can control a device that is miles apart in real time.
- Communication between the connected devices becomes more transparent and easier.
- Transferring data packets over a network reduces both time and money.
- Reduces human intervention and increases efficiency of services.

- Risk of leakage of confidential data when sent over network.
- Due to its complex network, a single loophole can put the entire system down, affecting everyone.

Sensors & Connectedness

a.k.a. Where the data comes from

- Pressure
- Vibration/Sound
- Torque
- Flow
- Proximity
- Ion/Smoke
- Position
- RFID

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Cost of Sensors Decreasing from 2010 to 2020
• Gateway
• Cloud gateway
• Data lake
• Big data warehouse
• Data analytics
• Machine learning (ML)
• Model building
• User application

https://www.scnsoft.com/blog/iot-architecture-in-a-nutshell-and-how-it-works

Can A Cow be an IoT Platform?

https://www.iotcentral.io/blog/can-a-cow-be-an-iot-platform
Product Quality Control based on Condition Monitoring

Drivers for IoT adoption in Manufacturing

- Cost reduction.
- Shorter time-to-market.
- Mass customization.
- Improved safety.
- IoT-driven manufacturing operations
  - According to an IDC research, in 2016, IoT-enabled manufacturing operations accounted for a total spend of $102.5 billion, being the largest use case area across all industries.
  - The researchers estimate that by 2025, the improvements in operations driven by IoT applications could be worth more than $470 billion per year.
Questions?

*** Quick Break ***

What Industry 4.0 looks like in practice
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Industry 4.0 in Action
The Role of the Economic Developer

Where are your businesses now?

• What will be the impact of innovators, early adopters and laggards on clusters and regional economies?

What is your role? Do you have a role?
BRE & Industry 4.0 Requires Economic Developers to be inquisitive but not judgmental or easily impressed

Level One Questions

4.0 Check In
Level Two Questions

Follow up:
What to do with observations?
What can economic developers do?

1. Work with your large companies to provide direction to the supply chain, but also work to educate all types of companies on the capabilities of new technologies.

2. Identify the expertise of the dozens of agencies, services and providers tasked to support manufacturers – and make referrals.

3. Provide career awareness and guidance to students, parents and educators.

4. Form local User Groups, Meetups or Tech Town Halls around key technologies – Ask early adopters to lead.

Resources for your Businesses

- Sharing of available technical assistance resources from various service providers
  - Public Institutions
    - Students – projects, internships, apprenticeships
    - Faculty/staff
    - Programs
    - Equipment
  - Private
- State/Regional funding support of R&D, innovation investments
Expanding Your Network of Private Service Providers

Cobots
Automation
Robotics
Machine Learning
Connecting with Suppliers

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 ✓ Machine Learning
 ✓ Connecting with Suppliers
Is your brain overflowing yet?

The Future has Arrived: Successful & Impactful Economic Developers must be Proactive & Engaged Related to the Impact, Influence & Opportunities Created by Technology

Key Action Items

1. Have a learning strategy – identify courses, magazines, webinars, media channels, events, key people (business leaders, academic experts) etc. to follow to keep abreast of emerging and projected issues.

2. Educate yourself on the terms and jargon. Whenever possible try to see these emerging technologies ‘in action’ and talk to those businesses involved for their insights.
3. Keep abreast of technology that you can use in the EDO. This has the added advantage that use of technology also displays EDOs’ tech. literacy to business that EDOs wish to work with, e.g. drones.

4. Engage with your community to discuss the future – be proactive to examine possible future scenarios through dedicated staff, events, advisory groups and research reports.

5. Realize as communities grapple with more complex issues, economic developers will likely need to expand their scope beyond traditional economic development activities.

4.0 Check In

Keeping up with Trends

• Where to get information:
  • Trustbelt Conference
  • FABTECH
  • Industrial Exchange
  • Integr8 Conference
  • 3DExperience World Conference
  • MxD (Manufacturing times Digital)
  • Manufacturing Tomorrow
  • Connected Manufacturing Forum
  • Iowa Association of Business & Industry
Industry 4.0  Thank You for Your Work!
Are you & your businesses ready?

Self Educate & Share

https://youtu.be/4xRyg5Fittu?list=RDWMUCWstLTaT61QUcTvfxOjNPfw