All you Need to Know about Industry 4.0

Part I—Starters

- High Level Overview Frameworks (Birds-eye View)
- Implications for Companies and Plants and ISE Practitioners
- Implications for ISE Manufacturing Systems Research

Session Leaders

D. Scott Sink, Ph.D., P.E., Director, Integrated LeanSigma Certification Program, ISE at OSU

Jack Feng, VP Operational Excellence and CVG Digital

Paul Cohen, Ph.D., Woolard Distinguished Professor, NC State University
Agenda

12:00 Scott Tee-up  
Quick Overview of Purpose and Objectives of Webinar  
High Level Overview of this Abstraction

12:15 Jack Feng—Implications for ISE’s at the Company and Plant Level

12:30 Paul Cohen--ISE Research Implications

12:45 Q&A and tee up the rest of the Series

1:00 pm Adjourn
ISE and IISE for Life—how IISE supports you for your entire Career.....

Council on Industrial and Systems Engineering—Senior Leadership of ISE function

Industry Advisory Board—Mid Career, Mgs in ISE related functions

Young Professionals—Early Career 1-15 years out

Career Path and Timeline

You can get involved in Societies, Divisions and also ‘Affinity Groups’ like Young Professionals, Industry Advisory Board and the Council on Industrial and Systems Engineering
Questions?

How We’ll Handle

Please write your question in the webinar question web form. We will address as many as we can at the end of the webinar and send and email with follow up’s to attendees for those not able to be responded to.
Chapter #1 Highlights—
IISE’s First Chapter (1949)
and also the first Virtual IISE Professional Chapter (2016)

1. **304 Professional Members** in Region IV but also from around the Country/World.

2. **Support and partner with Student Chapters:** Youngstown State, Ohio University, Louisville, Purdue, and Ohio State University Student Chapters.

3. **Partner with IAB—Industry Advisory Board, CISE, and the Young Professionals Group** and a number of **Societies and Divisions**.

4. **Partner with our Sister Chapter #2** in Dayton/Cincinnati on our Annual IISE All Ohio Event and other things

5. **10+ timely, Valuable Webinars** each year; topics developed from Voice of Member

6. **12 Monthly Memo’s** help Members get to know each other and keep members aware of upcoming opportunities AND also provide Self-Help Features on personal and professional mastery

7. quarterly **GoToMeeting small group calls** with members that focus on topics of interest from ‘affinity groups’/segments of our members.
We created and delivered a series of webinars on Operational Analytics in 2017-18

Webinar #1: Foundations 7 Dec 2017 (and GLR Conference)
Share the Framework, the Models, the Abstractions, the Principles
Management Systems Model
Intel “Triangle” Model

Webinar #2: Foundational Data Role--Measurement and Analysis Planning 20 March 2018
Measurement Planning using Value Stream Maps, Data Models derive from refining the Management System Model, The Data Management Role of ISE’s in Process Improvement Projects

Webinar #3: Best in Class ILSS Project Final TG’s 25 April 2018
Showcase best in class projects, shine spotlight on Op Analytics

Webinar #4: Decision Support Role—M&A Execution 12 June 2018
Feature and Knowledge Extraction, Creating Chartbooks and VSM’s, supporting the evaluation phase of DMAIC projects and then also the Control Stage.

Webinar #5: Putting it all together 24 July 2018
Revisiting the Management Systems Model with Case Examples
That has led to the creation of this Industry 4.0 Series

Webinar #1: Starters  **11 Oct 2018** (Jack Feng, Paul Cohen)
Overview the History and Evolution of NNMI and Industry 4.0
Discuss ISE and Corporate/Plant Implications and Strategies
Discuss ISE Mfg Systems Eng Research Implications

Webinar #2: Successful Real Case Examples (Steve Savoie and TBD)
Strategic Planning, Migration Strategies, Leveraging NNMI
Migration Plan Examples

Webinar #3: Smart Factory & Buildings (Rudy Santacroce & TBD)

Webinar #4: Smart Products (TBD)

Webinar #5: Smart Logistics (Jim Tompkins or Ga Tech Physical Internet Center)

Webinar #6: Smart Analytics (Scott Sink, Jared Frederici, and TBD)

Webinar #7: Smart Grids (Elaine Johns)

Webinar #8: Smart Integration (Eric Stebbins)

Webinar #9: Best in class Case Examples (Steve Savoie & TBD)
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:55 am</td>
<td>Scott</td>
<td>Quick Overview of Purpose and Objectives of Webinar</td>
</tr>
<tr>
<td>12:10 pm</td>
<td>Jack Feng</td>
<td>High Level Overview of the Evolution of the Current and Near Future State in Industry</td>
</tr>
<tr>
<td>12:25</td>
<td>Jack Feng</td>
<td>Implications for ISE’s at the Company and Plant Level</td>
</tr>
<tr>
<td>12:40</td>
<td>Paul Cohen</td>
<td>ISE Research Implications</td>
</tr>
<tr>
<td>12:55 pm</td>
<td>Scott</td>
<td>Closing Comments</td>
</tr>
<tr>
<td>1:00 pm</td>
<td></td>
<td>Adjourn</td>
</tr>
</tbody>
</table>
Key Context Points as to why succeeding with “Industry 4.0” is important to the US

▪ the standard of living, quality of life, cost of labor gaps are still significant and a big factor impacting our competitiveness which is why the Trade War is raging and will probably escalate.

▪ Trade wars win battles they don’t win the War.

▪ “Industry 4.0” is just a label we’ve given to the integration of technology and data utilization that reflects a solution/path forward for us. It’s an umbrella term for the confluence of a large number of innovations that are coming to fruition and now being integrated.

▪ We want to help you understand this buzz word, “Industry 4.0” and then think about how you can play a role, as an ISE in making it happen.

▪ We also want to help you understand what the US Government is doing with initiatives like NNMI to facilitate a speedier migration to the future state.

▪ And, for most manufacturers in the US, there are still significant gaps in understanding all this and therefore the migration strategies of often flawed and moving too slowly.

Let’s look at some High Level “Models”/Views of this Abstraction
In the fourth industrial revolution, digital analytics enables a new level of operational productivity.

1st
Mechanization, water power, steam power

2nd
Mass production, assembly line, electricity

3rd
Computer and automation

4th
Cyber physical system

Maturation of new cyber physical technologies (artificial intelligence, 3-D printing, robotics)

Data analytics driving efficacy and effectiveness and new business models

Pervasive sensing and actuation

Ubiquitous connectivity throughout the supply chain

Unprecedented levels of data and increased computing powers

McKinsey&Company | Source: Forbes; World Economic Forum
Industrial Revolution 4.0
“a tsunami of technology headed toward the factory floor”

- Hybrid and autonomous vehicles
- Sensors, Controls and Vision Systems
- Nanotechnology
- Alloys, Composites and Adhesives
- Model Based Enterprise
- Multi-variant Simulations
- Additive Manufacturing/3D Printing
- Collaborative Robots
- Integrated Supply Chain
- Smart Maintenance
- Internet of Things and Real Time Data
- Big Data and Optimization
The **Hype Cycle** is a branded graphical presentation developed and used by IT research and advisory firm Gartner for representing the maturity, adoption and social application of specific technologies. Each **Hype Cycle** drills down into the five key phases of a technology’s life cycle.
We do know that Adoption Rates of “Technology” have dramatically gotten faster—but how does that translate in the world of industry?
The Industry 4.0 Ecosystem

- **Cyber Security**
  - Stronger protection for internet-based manufacturing
  - Technology products with longer life cycle

- **Cloud Computing**
  - CLOUD<br>
  - BIG DATA<br>
  - Cyber Physical Systems (CPS)
  - Numerical command
  - Full automation
  - Totally interconnected systems
  - Machine to machine communication

- **Advanced Manufacturing Systems**
  - Sensor Systems
    - Zero default / deviation
    - Reactivity
    - Traceability
    - Predictability

- **3D Printing/Additive Manufacturing**
  - Scrap elimination
  - Mass customization
  - Rapid prototyping

- **Robot**
  - Real-time Autonomy Productivity
  - Full transparency on data reporting

- **Autonomous Vehicle**
  - Flow optimization
  - Increased security
  - Lower costs

- **Mass Customization**
  - Customer & marketing intimacy
  - Flexibility
  - Perfect match with customer's needs
  - Production mass efficiency
  - On-demand manufacturing

- **Logistics 4.0**
  - Fully integrated supply chain
  - Interconnected systems
  - Perfect coordination

- **Resources of the Future**
  - Wind
  - Solar
  - Geothermal
  - Alternative / non-conventional

- **Internet of Things**
  - Object tagging
  - Internet-object communication via low power radio
  - Real-time data capture
  - Optimized stocks
  - Reduced wastes

- **Plant of the Future A**
  - Clean and renewable energies everywhere
  - Energy Storage
  - Alternative raw materials
Another ‘macro’ picture with a focus on Key Results Areas

The Connected Factory in Action
How are various Nations doing?

INDUSTRY 4.0: THE STATE OF THE NATIONS

Key findings

85% of businesses see the potential of Industry 4.0
Yet only 15% have dedicated strategies in place

Almost 87% see the value of a predictive maintenance strategy - driven by real-time data
Yet 91% of surveyed companies in German speaking countries don’t measure operating efficiency based on real-time data

89% are aware of the potential of information efficiency through the implementation of data standards
Yet only 11% have systematically implemented data security and standards

81% are aware of the potential of monitoring machine status for maintenance purposes
Yet only 17% have put principles into practice

86% consider energy management important
Yet only 15% regularly implement practices into their processes

Towards 2020:
The 5 leadership characteristics to help seize competitive advantage

01 Agree and implement industry-wide data standards
02 Be flexible in sourcing key skills
03 Build strong partnerships in order to innovate quickly
04 Focus on quick wins
05 Build a clear holistic roadmap

About the survey: 400 executives surveyed (online and telephone interviews) between January and March 2016 in China, France, German speaking countries, the United Kingdom, and the United States.
Closing the Gap

- Government investment in private-sector led partnerships
- Addresses the market failure of industry underinvestment in “pre-competitive” applied R&D
- Focus on “de-risking” new technologies and materials to scale-up for U.S. manufacturers

(courtesy of DMDII)
Designing, Building and Growing the NNMI
3) Public Input and the NNMI Design

- 15 Institutes + Pilot
- Full-size Institutes
- Vision of 45 Institutes
- 6 x 2014 Institutes

March 2012

- Additive
- January 2013
- Power Electronics

January 2014

- Digital Mfg
- Lightweight Metals

+ 4 more Inst.

Congressional Authorization
Formation of Network and More New Institutes

PCAST/AMP Call for NNMI

Public Comment

NNMI Framework

Draft Guidelines on Intellectual Property Rights for the National Network for Manufacturing Innovation
And NAE’s Advanced Manufacturing National Program Office has a model for how to accelerate the transformation.
Since Launching in 2012:
- Over $1 billion Federal funding matched by over $2 billion non-Federal funding
- 1,300+ companies, universities, and non-profits involved
- 40+ states participating

Manufacturing USA – 14 Institutes Now

- America Makes
  Additive Manufacturing
  Youngstown, OH
- AIM
  Advanced Robotics
  Manufacturing Institute
  Robots in Manufacturing
  Pittsburgh, PA
- AIM Photonics
  Integrated Photonics
  Albany and Rochester, NY
- REMADE Institute
  Recycling Materials
  Rochester, NY
- ARMI
  Tissue Biofabrication
  Manchester, NH
- Nextflex
  Flexible Hybrid Electronics
  San Jose, CA
- Digital Manufacturing and Design
  Chicago, IL
- Lift
  Lightweight Metals
  Detroit, MI
- iACMI
  Advanced Composites
  Oak Ridge, TN
- PowerAmerica
  Wide Bandgap Semiconductors
  Raleigh, NC
- NIMBL
  Biopharma Manufacturing
  Newark, DE

*States in blue have major participants in Manufacturing USA Institutes

https://www.manufacturingusa.com/institutes
We are entering into another stage of the Industrial Revolution.

Effective implementation of technology will determine the winners.

Systems issues abound.

Industrial and Systems Engineers need to step up.

It starts with a thorough understanding of Industry 4.0.
Agenda

11:55 am  
Scott Tee-up  
Quick Overview of Purpose and Objectives of Webinar

12:10 pm  
High Level Overview of the Evolution of the Current and Near Future State in Industry

12:25  
Jack Feng—Implications for ISE’s at the Company and Plant Level

12:40  
Paul Cohen--ISE Research Implications

12:55 pm  
Scott: Closing Comments

1:00 pm  
Adjourn
Digital Manufacturing Strategy

2018 IISE Seminar

Dr. Jack Feng, IISE Fellow, VP of Operational Excellence and CVG Digital, Commercial Vehicle Group
Outline

• CVG Overview
• Introduction to Industry 4.0
• CVG Digital Manufacturing Strategy
• CVG Plant Level Programs
The Industrial Revolutions

Mechanization, mass production, automation, virtualization

Four Phases of Industrialization

Industry 1.0
- End of 18th century
- Use of water and steam power to run mechanical production facilities

Industry 2.0
- Beginning of 20th century
- Use of electrical power to enable work-sharing mass production

Industry 3.0
- Early 1970s
- Use of electronics and IT to automate production

Industry 4.0
- Today
- Use of cyber-physical systems to monitor, analyze, and automate business

http://saphanatutorial.com/industry-4-0/
Industry 4.0

=  
Industrial Internet of Things (IIoT) 
+  
Digital Design & Manufacturing

Many technologies have been available for a while, why now?
• Increased computing power
• Faster broadband speed
• Much more matured, complete ecosystem
Cost Saving by Sector from Going Digital

Message: Benefit in cost saving could be 3.6% p.a. on average in the next 5 years

Source: PwC 2016 Industry 4.0 Survey. This survey covered 2000+ companies over 29 countries.
The product and service portfolio will grow significantly in future: Numbers refer to growth between 2017 and 2021

Message: Benefits include revenue growth in addition to cost savings

- **47%**: Digitization of the existing product portfolio
- **44%**: Introducing a new digital product portfolio
- **42%**: Other digital services to external customers
- **38%**: Big data analytics services to external customers

Source: PwC 2016 Industry 4.0 Survey
US Department of Defense: By just creating and using the same solid model to integrate design & manufacturing:

Case 1: Lockheed & two major suppliers Honeywell and Rockwell Collins
- Annual recurring saving: $22M
- One time saving: $9M

Case 2: 10 additional US defense contractors
- Annual recurring saving: $48M
- One time: $28M

(Source: Dr. Greg Harris, Auburn University, Former employee at US Army Manufacturing R & D)

Message:
Both one time & recurring benefits could be significant in discrete manufacturing
Blueprint for Digital Success

2017

Map out your Industry 4.0 strategy
Create initial pilot projects
Define the capabilities you need

2018 - 2021

Become a virtuoso in data analytics
Transform into a digital enterprise
Actively plan an ecosystem approach

Source: PwC 2016 Industry 4.0 Survey

PLEX and Siemens PLM will be our backbone
Enterprise Information Systems

Michigan City PLEX enabled
1. EDI publication of CVG demand forecast
2. Digital invoice & payment w/ suppliers

PLEX: CVG ERP / MES / SCM / CRM
Siemens Teamcenter: CVG PLM / MES

Gary Hamberg
CRM

1. KMP / NC State: Condition-Based Maintenance in welding & painting
2. Concord / Chillicothe / Ohio State: Real time inventory tracking / production reporting
3. Northampton: Real time production data report and display
Nine Enabling Technologies of Industry 4.0

Virtual Reality

Artificial Intelligence

3D Printing

Industrial Automation

Security of Industrial Internet

Automation of Knowledge Work: Knowledge-based Service

Internet of Things

Cloud Computing

Big Data

Knowledge-based Service
CVG Digitized Visual Factory Examples

Northampton real time data collection & display

<table>
<thead>
<tr>
<th>200 SERIES</th>
<th>MINUTES LEFT</th>
<th>07/06/2018 11:02</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 SERIES WORKING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHIFT TARGET</td>
<td>LIVE TARGET</td>
<td>LIVE ACTUAL</td>
</tr>
<tr>
<td>83</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>PROD ARREARS</td>
<td>REMAINING ARREARS</td>
<td>ARREARS BUILT TODAY</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Chillicothe electronic delivery of work instructions and updates

<table>
<thead>
<tr>
<th>PRODUCTION SUMMARY</th>
<th>MINUTES LEFT 210</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 SERIES WORKING</td>
<td></td>
</tr>
<tr>
<td>TODAY</td>
<td>248 / 13</td>
</tr>
<tr>
<td>ARREARS</td>
<td>1282 / 334</td>
</tr>
</tbody>
</table>
Digital Design / Product:

1. Align PLM system to Siemens
2. Move from 2D to 3D solid model-based definition
3. Product upgrades/new designs ready for digital factory
4. Concept to finished product logistics processed with corporate-wide uniformity

3D featured or model based models are foundational to enable downstream virtual simulation of products/processes/systems
Digital Factory:

1. Digital simulation of production & process planning
2. Real time data collection and display
3. Automatic / real time data consolidation and data mining
4. Connectivity of devices within each plant and with the enterprise system
Digital Transaction:

1. EDI demand receiving from customers
2. Digital invoice to customer
3. Digital market intelligence
4. EDI publication of CVG demand
5. Digital payment to suppliers

Seamless Data Exchange w/ Suppliers & Customers
Agenda

11:55 am  Scott Tee-up
Quick Overview of Purpose and Objectives of Webinar

12:10 pm  High Level Overview of the Evolution of the Current and Near Future State in Industry

12:25  Jack Feng—Implications for ISE’s at the Company and Plant Level

12:40  Paul Cohen--ISE Research Implications

12:55 pm  Scott: Closing Comments

1:00 pm  Adjourn
SMART MANUFACTURING RESEARCH

Paul H. Cohen
Edgar Woolard Distinguished Professor
Edward P. Fitts Department of Industrial and Systems Engineering
North Carolina State University
Outline

• Drivers
• What are others are doing?
• Research directions
• Are we preparing the industrial engineering workforce.
Digital Intensity measures how advanced digital initiatives are within an organization. This includes investment in customer experience, operational processes, business model transformation, as well as digital capabilities.

Transformation Management Intensity measures senior executives' capability to drive change throughout the organization. This includes creating and communicating a clear vision, establishing governance mechanisms, facilitating cross-silo coordination, and building a digital-ready culture.
Confirm Smart Manufacturing Center (Ireland)
Clean Energy Smart Manufacturing Innovation Institute (US)

Defining CESMII’s R&D Portfolio

To facilitate implementation of new manufacturing solutions and integration of operational technologies and information technologies (OT/IT), CESMII will accelerate early-stage R&D in ways no company or industry can do alone.

The CESMII R&D Portfolio will simultaneously address knowledge gaps and advance innovation in SM technology, processes, and workforce.

Industry driven.

Emphasis on energy savings (funded by DOE).

Emphasis on process industries.
Smart Manufacturing Research

The convergence of the digital and physical worlds

• Smart Products and Design
  • Product traceability
  • Communication and product reliability
  • “Design made simple” and DFM
  • IoT platforms

• Smart Machines
  • Process modeling, reduced order modeling
  • Sensors and control for process optimization and quality monitoring
  • Self-aware machines that predict when maintenance is needed.
  • Process analytics and machine learning
    • Process control and quality
    • Maintenance

Where does data reside?
Interoperability?
How are communications accomplished?
Security?
Smart Manufacturing Research

The convergence of the digital and physical worlds

• Smart Production Systems
  • Real-time scheduling to reduce energy consumption, maximize machine up-time and meet due dates.
  • Reconfiguration of production systems.
  • Predictive anomaly identification and resolution.
  • Can project errors or delays and seamlessly formulate measures to prevent incidents from occurring. (Self-aware)

• Smart Supply Chains
  • Real-time linkage and incorporation of customer demand forecasts.
  • Manufacturing as a Service (Maas)
    • Modeling of trust
    • Architectures and algorithms to ensure fairness and participation.

Where does data reside?
Interoperability?
How are communications accomplished?
Security?
Industry 4.0 – Competence Center (Hanover, Germany)

**Logistics**
- organization of production networks
- decentralized regulation of production in networks
- secure flow of materials
- efficient logistics
- efficient use of resources

**Process Technology**
- forging processes
  (e.g. flashless precision forging)
- hydro forming
- hybrid forging (massive, sheet metal)
- process chain forming technology
- multifunctional tools
- the cost-effectiveness of process chains

**Production Automation**
- industry 4.0
- distributed systems
- wireless communication
- automated guided vehicle systems
- intelligent systems
Confirm SM Competencies

- Data Analytics
- Artificial Intelligence
- Predictive Modeling
- Decision Analytics
- Product and Process Modeling
- Enterprise Modelling & Simulation

- Software Systems
- Human Computer Interface
- Security & Integration
- Networking Systems & IOT
- Sensors
- Robotics & Control
- Material Processing
Skillsets for Industrial Digital Engineers

Core Industrial Engineering Skills with Sensors + Information + Computing Skills

- **CAD/CAM/PLM**
  - Digital Design, Analysis and Simulation Tools; BOM Management

- **Sensors/Controls**
  - Sensor Hardware; Control Algorithms; Communication Standards; Factory Integration; Embedded Systems

- **Process Intelligence**
  - Identifying KPI/KSI; Predictive Maintenance; Process Optimization

- **Manufacturing Processes**
  - Discrete processes, continuous processes

- **Machine Learning**
  - Big Data Manipulation; Statistical Tools; Data Mining; Forecasting; Decision Making

- **Fog and Cloud Computing**
  - SQL/NoSQL; HDFS, MapReduce; Hive; Pig; Building Dashboards;

- **Data Visualization**
  - Charts and Infographics; Data Representation and Transformation

- **Analytics**
  - Data mining, Quality, optimization
Conclusions

• Research
  • Projections of needs are not in harmony.
  • Large centers internationally are not in agreement of needs.
  • However, it is clear that ISE’s should play a large role.

• Education
  • Is ISE education adequate for this challenge....probably not.
  • Organizations are just not organizing to identify the skill sets and these must be translated into courses and programs.
National Network for Manufacturing Innovation (NNMI)
President Obama’s 2013 and 2014 State of the Union Addresses

- **America Makes**
  - Additive Manufacturing 3D Printing
  - Youngstown, OH - 2012

- **Digital Manufacturing**
  - Chicago, IL - 2014

- **Composites**
  - Knoxville, TN - 2015

- **PowerAmerica**
  - WBG Semiconductors
  - NCSU - Raleigh, NC - 2014

- **LIFT**
  - Lightweight Metals
  - Detroit, MI - 2014
12:00  Scott Tee-up  
Quick Overview of Purpose and Objectives of Webinar  
High Level Overview of this Abstraction  

12:15  Jack Feng—Implications for ISE’s at the Company and Plant Level  

12:30  Paul Cohen--ISE Research Implications  

12:45  Q&A and tee up the rest of the Series  

1:00 pm  Adjourn
Questions
Nov. 6, 2018  **Service Systems “4.0”—Service Systems Engineering and ISE**

- Penn State IME Dept. Service Enterprise Engineering Advisory Board—overview of Service Systems Engineering and the new IISE Award

- Michael Caesar, Executive Director, Data and Implementation Science, University Health Network, Toronto, Canada—Healthcare 4.0

- David Poirier, CEO, The Poirier Group, Toronto, Canada—Enterprise Shared Services 4.0
We have built a mini-conference specifically designed for Young Professionals, Seasoned ISE Practitioners, Leaders and Managers of the ISE Function in Business and Industry.

Four Focus Areas with 6 great presentations in each of the four areas:

1. **Soft Skills Development**: improving your change leadership and management knowledge and skills
2. **Career Development**: Trends and Emerging Opportunities in our Field
3. Continuing to **broaden and deepen** your ISE Foundational Knowledge and Skills
4. How to **create more Value** for your Organization and in doing so advance your career faster

All Invited Speakers will ensure every session is outstanding.

**Jim Tompkins** is our Industry Track Keynote Speaker—
if you haven’t heard Jim speak you are in for a treat!!

Balanced presentations across Industry Segments (services, Healthcare, Manufacturing, Supply Chain and Logistics)

Goal is to make it efficient and fun for you to do some Personal and Professional Development in 2019
And, in addition to those 24 Practical, Pragmatic Presentations by hand-picked presenters on topics ranging from habits of highly effective Young Professionals to Smart Manufacturing and Physical Internet we’ll wrap around some Networking opportunities:

- the Annual CISE Leadership Mixer
- the Annual Industry Advisory Board Mixer
- Industry Track Kick-off and Capstone Plenary Sessions
- The Executive Roundtable
- Townhalls for IAB and Young Professionals
- Huge opportunity to build your network and mentor and get mentored
So, First things First, take some time out and invest in yourself.

It Pays Off—I’ve attended 45 IISE Conferences and the Return on Investment has been 25+:1 !!!