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• Be responsive to at least 75% of the participation pop-ups.
• Please refer the CPE & Support Handout by clicking Handout icon for more information about group participation and CPE certificates.

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• Submit all questions by clicking the Q&A window on the right of your screen. The presenter(s) will review and answer questions as time permits.

*Please note that questions and answers submitted/provided via the Q&A feature are visible to all presenters as well as the participants.

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Today’s Presenters

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The Manufacturing Leadership Council
Manufacturing Leadership Council | Overview

- Established 2008
- Now a Division of the NAM
- 1,000+ Members
- Senior-Level Executive Membership
- Cross-Sector
- Cross-Functional
- Large, Medium, & Small Enterprises
- Member-Driven ‘Critical Issues’ Content Agenda
- Thought-Leading Focus on Manufacturing 4.0
- Enterprise-wide Scope
- Industry-wide Ecosystem

Manufacturing Leadership Council | Membership

[Image showing a grid of company logos, including Ford, IBM, P&G, GE, and others, representing member companies of the Manufacturing Leadership Council.]
Manufacturing 4.0: A 3-Dimensional Undertaking

Manufacturing 4.0 is the next stage of industrial progress, enabling mass customization on a global scale by factories and plants that are extensively networked, software-driven, intelligent, autonomous, and information-intensive.

M4.0 will disrupt existing business models and enable the creation of new ones, requiring manufacturing companies to rethink the fundamentals of their business, and adopt new IT and automation technologies, organizational models, and leadership approaches in an orchestrated manner.

2018/2019 Critical Issues Agenda

The Journey to Manufacturing 4.0

Factories of the Future
- M4.0 Roadmaps
- End-to-end digital production models
- Legacy migration
- Plant floor cybersecurity

Transformative Technologies in Manufacturing
- AI, machine learning, advanced analytics
- IoT, AR/VR, Cobots, 5G, 3D Printing, Blockchain etc.
- latest developments
- Business cases - selection/ROI/deployment
- Open standards and architectures

M4.0 Cultures: Collaborative, Innovative, and Integrated
- Cross-functional processes and structures
- Collaborative innovation cultures and platforms
- Digital threads

Next-Generation Manufacturing Leadership and the Changing Workforce
- M4.0 leadership role models, behaviors, and mindsets
- Employee transition, development, and engagement
- Attracting & retaining next-generation talent and skills
- M4.0 Leaders of the Future profiles

Manufacturing 4.0 Sustainability
- Designing for reuse, remanufacture, refurbishment, or recycling at end of life.
- Streamlining production processes to increase efficiency, reduce costs, energy, and waste
- Sustainable business models for a M4.0 circular economy
Imagine a Better Future for Manufacturing

The Next Industrial Revolution
Manufacturing’s evolution

18th Century
- **Mechanization**
  - Machine tools
  - Steam & water power
  - Rise of factory systems
  - Textiles
  - Ironmaking

19th Century
- **Mass production**
- **Electrical power**
- **Rise of factory systems**
- **Steel**
- **Mechanization**

20th Century
- **Computer/Internet**
  - Mass production
  - Assembly line
  - Electrical power
  - Globalization
  - Engines/turbines
- **Technological**
- **Automation**
- **Electronics**
- **World Wide Web**

Now
- **Cyber-Physical Systems**
  - Cloud computing
  - Data analytics
  - Internet of Things
  - Intelligent production
  - 3D printing

The Internet of Things vs. Industry 4.0

**THE INTERNET OF THINGS**
- The inter-networking of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators and network connectivity which enable these objects to collect and exchange data.

**INDUSTRY 4.0**
- Includes the Internet of Things and takes it a step further with cyber-physical systems (human-machine interfaces & digital-to-physical transfer) enabled by additional innovations, such as AR/VR, advanced robotics and cobots, 3D printing and more.
Why now?

$65 billion of legacy automation systems are reaching end of life

Legacy control and power systems cost an estimated $20 billion in annual unscheduled downtime

Only 7% of manufacturers have real-time monitoring capabilities across the entire manufacturing process

Sources: ARC Advisory Group, Zebra Technologies

Activating the digital thread

The lifeblood of Industry 4.0

Industry 4.0 is predicated on a new level of transparency and information sharing, including constant, bidirectional communication and inter-company visibility.
The Road to Industry 4.0

Six dimensions of Industry 4.0 maturity
Industry 4.0 technology enablers

- Data Analytics
- 3D Printing
- Wireless
- Cloud Computing
- Augmented / Virtual Reality
- Artificial Intelligence
- Sensors / Internet of Things
- Automation
Aligning information technology with operational technology

Information Technology (IT)
- Information Management (Enterprise-wide Computing)
  - Issues Commands to OT systems

Operational Technology (OT)
- Asset Performance (Monitoring or Controlling Physical Devices, Processes & Events)
  - Relays Environmental Data

Data
All about data quality
ENSURE DATA IS CLEAN, ACCURATE & EASY TO ACCESS AS PART OF AN OVERALL INFORMATION GOVERNANCE STRATEGY

Industry 4.0 is primarily about the smarter use of data.
If the underlying data or data analysis has errors, the automated decision-making based on that data will be riddled with errors too.

Case study: Artificial Intelligence

Problem
Anomalies in the amounts of fuel being consumed by the same types of shipping assets traveling on the same route

Solution
Cleaned the data to train and run AI algorithms to pinpoint outlier behaviors

Results
Saved millions of dollars from addressing operational efficiencies

Industry: Shipping
Process evolution
Customer expectations drive process improvement considerations

**EXPECTATION ELEMENTS**
- Experiences that are engaging
- Experiences that are differentiated
- Value-driven - Alignment with customer values
- "Relationship" vs. transaction
- Selling solutions not products
- Co-innovation and collaboration
- Deep customer insights
- Deep technical competence (end use)
- Quality built-in
- Seamless end-to-end processes
- Consistent cross-channel
- Consistent cross-division
- Responsive & helpful
- Competent
- Efficient/clear
- Right first time

**PROCESS ELEMENTS**
- Supply Chain
- Fulfillment
- Product Development
- Operations
- Marketing
- Customer Service
- Sales
- Product Development
- Engineering
- Operations
- Marketing
- Technology/Analytics
- Customer Services
- Sales
- Operations
- Marketing
- Technology/Analytics
- Finance/Accounting
- Customer Services
- Sales
- Customer Service
- Sales
### Functional connections

<table>
<thead>
<tr>
<th>Planning &amp; Procurement</th>
<th>Inbound Logistics</th>
<th>Operations/ Fulfillment</th>
<th>Outbound Logistics</th>
<th>Sales &amp; Marketing</th>
<th>Customer Support / Field Service</th>
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<tbody>
<tr>
<td><strong>VALUE CREATED</strong></td>
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<td><strong>ENABLER</strong></td>
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**Within Function**
- Faster, more accurate shipping
- Accommodate short notice/critical orders

**Bottom Line Impact**
- Improved inventory management
- Reduced staffing

**Risk Mitigation**
- More reliable deliveries

**Across Enterprise**
- Exceed customer expectations
- Respond to opportunistic orders
- Increased sales

**Bottom Line Impact**
- Lower inventory costs
- Reduced transportation costs

**Risk Mitigation**
- Prevent fraud and counterfeit

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### Case study: Supply Chain

**Problem**
Excessive production lead times and poor customer delivery schedule attainment

**Solution**
Integrated key supply chain elements into the production schedules through ERP/EDI enhancements

**Results**
Supplier delivery frequency increased from weekly to daily while maintaining the target supplier budget prices

*Industry: Manufacturing*
Organization

Industry 4.0 Operating Model Maturity

Stovepipe
Organizational Islands
Autonomy Command & control
Breaking Down Silos
Collaboration by Exception
Integrated Enterprise
Collaborative Planning
Integrated Value Chain
Organizational Collaboration & Cooperation
Adaptable Ecosystem
Collaboration internally and externally
Elimination of organizational silos
End-to-end accountability
Sales & operations planning
Departmental middle management visibility
Evolving
Transforming
Accelerated Growth
Organizational Maturity Phase
Industry 4.0 Maturity
Assembly model evolution

**Made-to-Stock**
Finished goods created and stocked before receipt of customer order.

**Configure-to-Order**
Components created and stocked before receipt of customer order, with predefined configurations. Assembled after receipt of order.

**Make-to-Order**
Products are made after receipt of order, including a combination of standardized and customized components.

**Engineer-to-Order**
Highly customizable products are designed, engineered and produced after receipt of order.

Governance
Project Governance 4.0

- **Vision**: Assess readiness and feasibility; define strategy with short and long-term goals
- **Flexibility**: Account for unpredictability with a flexible, iterative approach
- **Performance Monitoring & Measurement**: Determine performance metrics and facilitate real-time progress updates
- **Collaboration**: Break down cross-functional barriers and co-create with customers and suppliers
- **Accountability**: Set objectives and deadlines and assign ownership; communicate constantly and determine cadence of reporting
- **Data**: Make decisions based on data and real-time outcomes

Business model transformation

- **Product-as-a-Service**
- **Information-as-a-Service**
- **Pay-Per-Use**
- **Made-to-Order**
Case study: Business Model Transformation

Problem
Manufacturer of emergency vehicle preemption devices for traffic lights wants to provide data to its customers, fire and police chiefs, year round, not just when it’s time for an upgrade.

Solution
Working with manufacturer to create an analytics platform so they can aggregate all of the data collected from their devices to derive actionable insights.

Results
Provided client real-time routing information for emergency vehicles, allowing them to reach the site of emergency as quickly as possible.

Industry: Manufacturing

Sensors - subway doors

Data Points Captured
- # of times open/close
- Force used to close
- Temperature
- Humidity
- Indoors/Outdoors
- Weather
- Time of day

Data Usage
- Replace parts
- Schedule technicians
- Purchase inventory
- Sell data back to manufacturing engineering team for improvements
The new cyber threat landscape

Industrial control systems are enabling automation—but also opening the door to attacks on operating technology.

Hackers are using botnets to infiltrate and corral Internet-connected devices into an IoT “army” to overwhelm a target’s servers with malicious traffic.

Any security gaps in manufacturers’ supplier networks can serve as ingress points for hackers.

Denial of Service attacks can result in supply chain disruption—even if your organization isn’t directly targeted.

Without adequate security measures and data backup, information in the cloud can be lost or stolen.

Bring Your Own Device policies and remote access are enabling a mobile workforce—but more connectivity means more exposure.

Smart devices like wearables can be hacked to compromise customers’ personal data—creating new product liabilities.

Any security gaps in manufacturers’ supplier networks can serve as ingress points for hackers.
### Industry 4.0 Cyber Maturity Spectrum

<table>
<thead>
<tr>
<th>PREVENTION</th>
<th>PROTECTION</th>
<th>REACTION</th>
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</thead>
<tbody>
<tr>
<td>Focus on perimeter controls and inbound and outbound traffic</td>
<td>Focus on the security of most critical and vulnerable assets</td>
<td>Focus on rapid detection and response</td>
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<thead>
<tr>
<th>LEVEL 1</th>
<th>LEVEL 2</th>
<th>LEVEL 3</th>
<th>LEVEL 4</th>
<th>LEVEL 5</th>
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</thead>
<tbody>
<tr>
<td>Network Firewall Protection</td>
<td>Application-Specific Controls</td>
<td>Privacy by Design</td>
<td>Security Analytics</td>
<td>Network Threat Intelligence</td>
</tr>
<tr>
<td>Patch Management</td>
<td>Network Segmentation</td>
<td>Real-Time Threat Monitoring</td>
<td>Threat Information Sharing</td>
<td>Automated Incident Response</td>
</tr>
<tr>
<td>Antivirus Software</td>
<td>Third-Party Cyber Risk Management</td>
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</tr>
<tr>
<td>Basic IT Security</td>
<td>Risk-Based Cybersecurity</td>
<td>Threat-Based Cybersecurity</td>
<td>Adaptive Cybersecurity</td>
<td>Inter-Organizational Security</td>
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</tbody>
</table>

### What’s the right strategy for you?

- **Prevention**: Focus on perimeter controls and inbound and outbound traffic.
- **Protection**: Focus on the security of most critical and vulnerable assets.
- **Reaction**: Focus on rapid detection and response.

- **Level 1**: Basic IT Security (Network Firewall Protection, Patch Management, Antivirus Software, Incident Response Plan).
- **Level 2**: Application-Specific Controls (Network Segmentation, Third-Party Cyber Risk Management).
- **Level 3**: Privacy by Design (Real-Time Threat Monitoring).
- **Level 4**: Security Analytics (Threat Information Sharing).
- **Level 5**: Network Threat Intelligence (Automated Incident Response, Inter-Organizational Security).
Middle market Industry 4.0 implementation roadmap

- Assess Your Industry 4.0 Maturity
- Define Your Vision
- Figure Out Financing
- Set Up Your Pilot
- Map Cross-Functional Processes
- Engage External Stakeholders
- Prepare Your People

Assess where your business is on the continuum of Industry 4.0 implementation readiness

- Explore
- Crawl
- Walk
- Run
- Fly

- Stovepipe
- Breaking Down Silos
- Integrated Enterprise
- Integrated Value Chain
- Adaptive Ecosystem
Define your vision
TECHNOLOGY IS JUST THE ENABLER

Figure out financing

Industry 4.0 pilots—even if you anticipate significant ROI in the long-term—may require reallocating budget or raising additional capital.

Internal Sources
- Retained Profits
- Working Capital Management
- Sale of Assets

Tax Credits & Incentives
- Federal R&D Credit
- State R&D Credits & Incentives
- International R&D Credits & Incentives
- FDII Deduction

External Financing
- Debt Financing
- Stock Market Financing
- Government Grants & Subsidies
- Crowdfunding

Partnering
- Joint Ventures
- M&A
- Private-Public Partnerships
Set up your pilot

Iterative, incremental innovation in small pilots enables faster decision-making and implementation.

Map cross-functional processes
Engage external stakeholders

You need your people to understand why they need to leave the status quo behind, believe in the strategic vision and feel engaged in the process.

Most importantly, they need to understand what’s expected of them and have the resources and training in place to get there.
Conclusion

Thank you for your participation!

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After 48 hours your certificate will also be available under your profile on BDO.com*.

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