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Purdue MEP, Quality and Supply Chain





Manufacturing Extension Partnership

Blueprint for the Future: Accelerating Digital Solutions in Manufacturing and Supply Chain

Cindy Farrar - February 2024

Introduction – Cindy Farrer

Purdue MEP - Quality and Supply Chain

- **Experience:**
 - 35 years of global manufacturing, supply chain and quality leadership, across Automotive, Electronics and Security Solutions industries, companies including General Motors, Delphi Automotive Systems, Ingersoll Rand and Allegion.
- **Education / Certifications:**
 - BS and MS Industrial Engineering Purdue
 - ISO9001:2015 Lead Auditor, IATF 16949 Lead Auditor
 - Board of Directors National Association Manufacturing (2023)
- **Contact Information:** cfarrer@purdue.edu





About Purdue MEP

- **Who we are:** Purdue Manufacturing Extension Partnership (MEP)
 - Division of Purdue Technical Assistance Program.
 - Our staff consists of experts from a wide variety of business and manufacturing sectors.
- **What we do:**
 - We work exclusively with Indiana businesses, **primarily manufacturers**, to maximize performance through **streamlined processes, increased profitability, and increased competitiveness.**
 - We offer public workshops, on-site training, and consulting services.
 - Through these services Purdue MEP clients report **new sales, product and market growth, cost reductions, and job growth.**



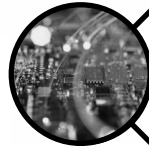
Macro Trends Influencing Change

- Global Labor Constraints
- Supply Chain Complexities
- Increasing Consumer Expectations
- Rise in Industry 4.0 Technologies
- Competitive Landscapes
- Sustainable and Responsible Manufacturing



Technology Advancements Accelerating Transformation

Technology developments in over the next decade will enable advances in human-machine interaction, automation and robotics, and autonomous operation



Electronics – 1 trillion transistors on single chip by 2030



Computing power – increasing processing capability



Software – next gen applications, increasingly AI driven



Communications – 5G networks, greater capability



AI - exponential advancement in machine learning

Source: MLC White Paper, [The Next Phase of Digital Evolution](#)

Tangible Benefits of Digital Transformation



Efficiency and waste reduction



Resiliency, proactive risk management



Improved quality, consistency and predictability



Sustainability



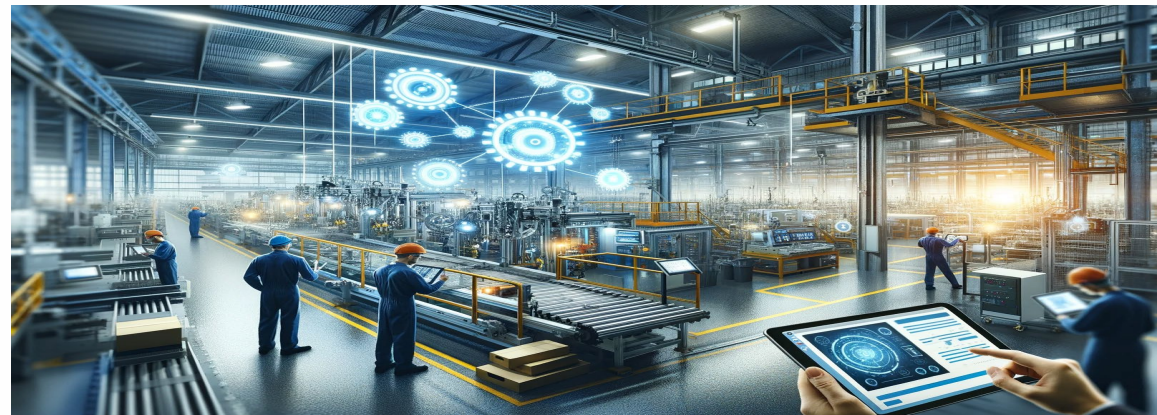
Improved customer service



Employee Experience



Flexibility, faster, better decisions



Transformation in manufacturing and supply chain encompasses a wide range of processes and technologies that can drive efficiency, increase visibility and enable new business models

Manufacturing 4.0

- Connected equipment and systems
 - Real time monitoring/ feedback
 - Advanced sensors
 - Predictive maintenance
- Robotics and automation
- Autonomous vehicles/mobile robots
- Digital performance boards
- Digital, mobile platforms for front line
- Personalization
- Sustainability
- RFID tracking
- Wearable tech
- Voice recognition
- Additive manufacturing
- Augmented reality, virtual reality
- Digital lab system



Supply Chain 4.0

- Customer centric production
 - Demand sensing
 - Customer portal – real time
- No-touch order processing
- End-to-end visibility – suppliers to customers, multi-tiered
- Predictive analytics/forecasting
- Inventory management
- Logistics route optimization
- Smart contracts, spend analytics
- Product traceability, authenticity
- Regulatory compliance tracking
- AGVs, autonomous vehicles
- Digital supplier portal

Advanced analytics, digital twins, machine learning and AI
cloud and edge computing, cybersecurity

The background features a perspective view of a dark road with white dashed lines, receding towards a horizon. The sky and surrounding environment are filled with vibrant blue light rays and patterns, creating a sense of depth and digital connectivity. A large, dark, triangular shape is positioned in the upper center, framing the text.

Digital transformation is a journey, not a destination. Each step you take should be a part of a strategy that seeks to create more value, and a better experience for your customers.

TRANSFORMATION BEST PRACTICES

Top leadership prioritization

- Role of top leadership in setting strategy

Vision and strategy

- Align with business priorities
- Establish clear goals and budget for digital deployment

Think big, find quick wins, scale

- Start small, but start
- Lighthouse plants or pilots

Build digital ready culture and organization

- Be deliberate in talent and upskilling
- Organizational design to drive innovation

Collaborate internally and externally

- Robust IT / data infrastructure
- Customers, suppliers, tech partners

Industry 4.0 Maturity Assessment Tools Can Provide Valuable Insights

Why Use a Maturity Assessment?

- Provide a structured model to assess the maturity level
- Benchmark performance vs industry standards and best practices
- Align on common language
- Understand current state
- Guide focus for transformation journey, considering business objectives and most relevant / highest return
- Accelerate tangible business results

Industry 4.0 Maturity Models *

- SIRI – All Mfg
 - Acatech – All Mfg
 - RAMI – All Mfg
 - DPMM – Biopharm
 - IRAM – Semiconductor
 - DTMA – Small and Med Mfg
- From MLC webinar on maturity models. List is not exhaustive.

The background is a digital, futuristic perspective of a road or tunnel. It features a dark blue and black color palette with bright cyan and light blue glowing lines that create a sense of depth and motion. The lines converge towards a vanishing point in the center, giving the impression of a long, straight path leading into the distance. The overall aesthetic is clean, modern, and high-tech.

Deploying Industry 4.0 is not about chasing the next big thing, but about ensuring it's the right thing for our business goals.

Supply chain/procurement digital solution

➤ Business Need: Improved global supply chain visibility, performance and risk management

■ What

- Digital supplier/spend management tool
 - Global, interfaced to ERPs
 - Spend analytics, RFP process
 - Digital contracts, Automatic workflow
- KPIs and supplier scorecard data
- Supplier portal

■ What Worked

- Business case included in annual plan
- Focused Supply Chain Digital team
- 3rd party solution / partner

■ Benefits

- Global spend visibility and leverage
- Risk management, speed
- Resource efficiency



Agile/collaborative manufacturing

➤ Business Need: Safety/Ergonomics, Labor Supplement, Capacity, Quality

▪ What

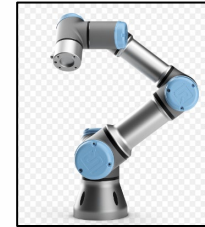
- Collaborative robotics (cobots) deployment
- Autonomous Vehicles
- Point Automation Solutions

▪ What Worked

- Trialing in lighthouse plants, experimentation
- Common equipment platform, playbook to speed scaling
- Deployment targets linked to annual capital plan
- Low hanging fruit – automating repetitive tasks
- COE supporting local teams

▪ Benefits

- Capacity / Efficiency / ROI
- Reduced ergo risk
- Employees can focus on more critical tasks



Talent Upskilling for Industry 4.0

➤ Business Need: Preparing for future; Digital transformation pace hinges on employee upskilling / reskilling

Create Center(s) of Expertise

- Grow Digital skillset through both new hires and upskilling / reskilling current
- Professional / technical affiliations
- Participation in tech conferences and seminars
- External training
- Collaboration with tech partners, suppliers, universities and internally



Expand Skills at the Core

- Technical & Apprenticeship Programs
- Vendor provided training
- E-learning platforms
- Internships and Early Career Programs
- University, college partnerships
- Tuition reimbursement expansion

And the Front Line

- Basic training with tools and platforms
- Participation in deployment activities
- Feedback forums – to provide inputs
- Lunch and Learns
- Labor shortage is growing. Opportunity to attract talent by offering skilled jobs with training

Final Thoughts

- Digital transformation is an inevitable and rapid evolution. Seize the future or be left behind.
- Tailor vision and strategy to unique organizational needs.
- Human-Centric approach: Be deliberate in talent and upskilling.
- Transformation is a journey; innovate, iterate, scale and evolve.

How Purdue MEP can help

Purdue Manufacturing Extension Partnership (MEP) offers support to local manufacturing companies with a variety of services in digital transformation (as well as other topics)

- Manufacturing automation opportunity assessment
 - Consulting/demonstrations on transformative technologies
 - Collaborative and autonomous mobile robotics application assessment
 - Additive manufacturing/3D printing consulting and guidance
 - IoT machine monitoring and dashboards
 - Data automation
 - Virtual and augmented reality technologies
 - Digital twin and 3D physical layouts
 - ERP selection and production scheduling
 - Energy monitoring and management
 - Wearable safety sensors and analytics
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- [Workshops and Events \(purdue.edu\)](https://www.purdue.edu/meep/workshops-events)
 - [Digital Manufacturing Technology Center - Purdue MEP](https://www.purdue.edu/meep/digital-manufacturing-technology-center)

Additional Resources

- **Manufacturing Leadership Council (MLC/NAM)**
- [The Manufacturing Leadership Council](#)

- **Industry 4.0 Maturity Models (Examples)**
 - SIRI – [Smart Industry Readiness Index \(SIRI\) - INCIT](#)
 - DPMM – [BioPhorum Resource - Digital plant maturity model](#)
 - IRAM – [SEMI Industry4.0 Readiness Assessment Model | SEMI](#)
 - RAMI – [RAMI 4.0 - ISA](#)
 - Acatech – [Industrie 4.0 Maturity Index. Managing the Digital Transformation of Companies – UPDATE 2020 - acatech - National Academy of Science and Engineering](#)
 - DTMA – [Digital Transformation for Manufacturers | New Technologies for New Profits \(digital-transformation-mfg.com\)](#)

THANK YOU

for your participation

Purdue MEP offers many more workshops.
Please visit our website at mep.purdue.edu,
then, select **WORKSHOPS AND EVENTS**.