

# Managing your Supply Chain During Chaos

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# Welcome



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## **CIRAS Mission:**

*Enhance the performance of industry through applied research, education, and technical assistance.*



### **GROWTH**

- B2B Networking**
- Exporting**
- Government Contracting**
- Marketing Strategy**

### **LEADERSHIP**

- Culture**
- Innovation**
- Management Systems**
- Strategy**

### **PRODUCTIVITY**

- Lean**
- Operational Excellence**
- Operations Management**
- Quality**

### **TECHNOLOGY**

- Digital Manufacturing**
- Emerging Technologies**
- Engineering**
- Testing**

### **WORKFORCE**

- Economic Development**
- Hire a Student**
- K-12**
- Workforce Strategies**

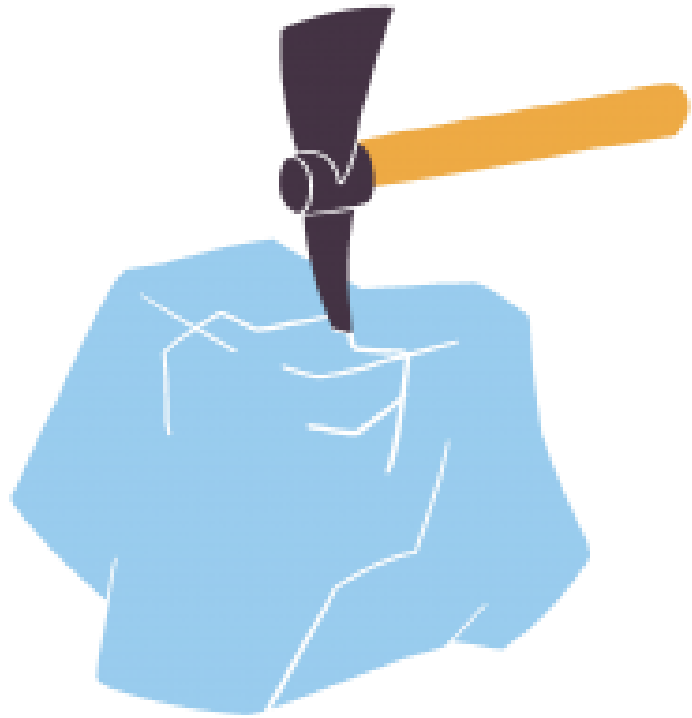
# Today's Topics

## Morning Session

- Supply Chain Disruption Ice Breaker
- Keynote Address: Supply Chain Operations Outlook
- OEM Panel: Supply Chain Challenges & Opportunities
- Supply Chain Resiliency
- Introduction to Industry 4.0

## Afternoon Session

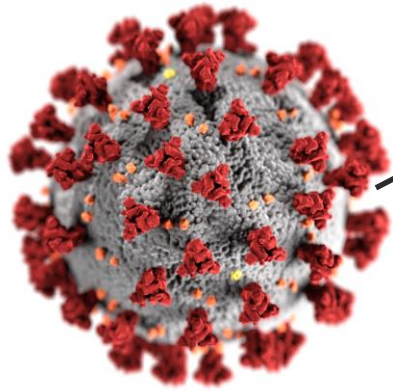
- Utilizing Total Cost of Ownership
- Finding New Suppliers: Supplier Scouting
- Supply Chain Risk Management
- Supply Chain Project Opportunities
- Wrap-Up



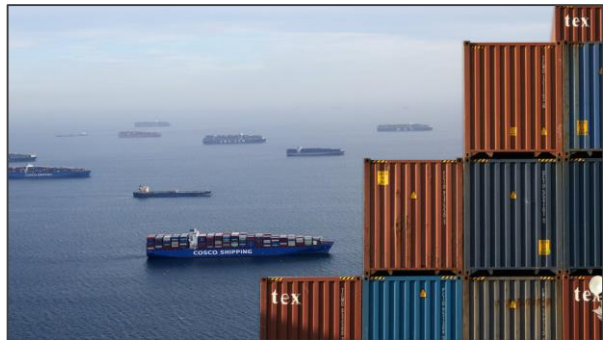
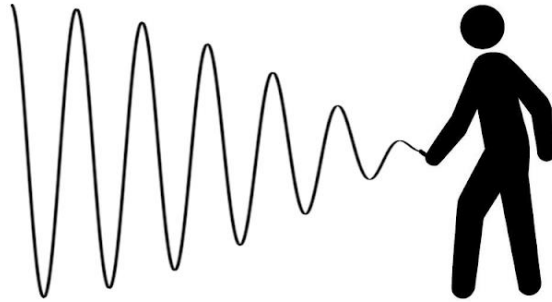
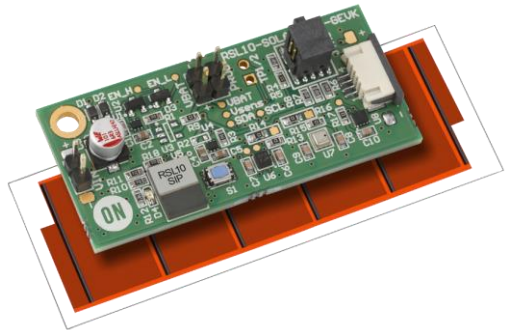
***Supply Chain  
Ice Breaker***

# Supply Chain Disruptions





Lockdowns  
Port Shutdowns  
Labor Shortages  
Shipping Delays  
Uncertainty



# How Has Your Company Been Affected?



- Supplier Issues
  - Lost supplier
  - Alternative suppliers
  - Uncertain / Long lead times
  - Pricing impacts
- Distribution Issues
  - Transit time issues
  - Access to transport capacity
- Labor Issues
  - Driver shortages
  - Employee shortages
- Demand Issues



Keynote Address:

Supply Chain  
Operations Outlook



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# SUPPLY CHAIN FORUM

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## Supply Chain Operations Outlook

Trends and reactions to today's challenges

# SUPPLY CHAIN FORUM

## State of the Supply Chain

- Over 75% of supply chain leaders believe we are still well over a year away from normal operations.
- Supply chain leaders' key priorities include:
  - Labor availability
    - Operations
    - Office professionals
  - Wage pressures
  - Consistency & predictability
  - Cost containment

# SUPPLY CHAIN FORUM

## Connections have changed

- When do you expect to be fully back to the office?
  - 54% making permanent changes to allow remote work
  - 23% in early 2022
  - 15% by the end of the year
  - 8% already back in the office
- Are you meeting your suppliers in person?
  - 70% Sometimes, but widely using video conferencing
  - 30% back to primarily in-person meetings

# SUPPLY CHAIN FORUM

## Labor Concerns

- Wages
  - Service industry is pushing wages up
  - Salary demands
  - Turnover costs
- Availability
  - Supply-side risks
  - Production work is especially challenging
  - Drivers
- Mobility
- Vaccine Mandates
- Employee Stress & Burnout

# SUPPLY CHAIN FORUM

## International Concerns

- Re-shoring to USA or Mexico
- Increased safety stock for material from overseas suppliers
- Container capacity was mixed
  - Some have plenty of access, but worry about on-time shipments
  - Some cannot get container capacity
- Costs – Lack of predictability and higher transportation costs have erased cost savings
- Overseas labor capacity concerns
- Quality is a concern – worried that companies are giving up quality to get product

# SUPPLY CHAIN FORUM

## Moving Forward...

What has happened to the big supply chain topics from the past decade?

# Technology

- Blockchain
- Electrification
- Drones
- Autonomous vehicles
- Who is leading the charge? Who is paying?
- The “wants” of shippers, consumers, and 3PLs are not aligned – which direction should you go?



## Data Analytics

- Supply chain optimization
- Data-driven decision-making
- Data sources?
- Data sharing?
- Consider all flows in the supply chain – which is the most important?
- Do you trust your data? Do you trust your suppliers' data? What about the decisions that come from that data?

# SUPPLY CHAIN FORUM

## Collaboration

- Relationships rule the supply chain
- 2 examples
- What examples do you have?

# SUPPLY CHAIN FORUM

## Supply Chain Sustainability\*

\*From 2021 CSCMP Supply Chain Sustainability Report

- Commitment to sustainability has remained the same or increased in 80% of firms since the start of the pandemic
- Government & executive sponsors apply the greatest pressure
- Social sustainability goals continue to grow
  - Employee welfare & safety (+10%)
  - Human rights protections (+2%)
  - Local community impact (+2%)
  - Fair pay/fair trade (+2%)
- End-of-Life and supply chain circularity efforts have seen the greatest reduction in focus (-5%)

## Risk Assessment

- Sourcing decisions
- Inventory decisions
  - How does your customer use inventory?
  - Are your customers changing their inventory strategies based on the past 2 years of operations?
  - Build the right supply chain for each product!
- Sustainability decisions

# SUPPLY CHAIN FORUM

## Action Items

- Business partners play a key role right now:
  - Expertise in complicated part of the supply chain
  - Access to assets
  - Professional labor to fill shipper gaps
- The primary role of the logistics manager has not changed:
  - Move the product while minimizing TOTAL LANDED COSTS!
- Cultivate your relationships!
  - This is the single-most-important action you can take to keep the supply chain moving



# OEM Panel

## *Supply Chain Challenges & Opportunities*

- Panelist
  - Christian Edmiston, VP – Procurement at Land O’ Lakes
  - Perry Littlejohn, VP of Import Operations at HNI
  - Paul Jensen, Ruan
- Panel Format
  - Overview of supply chain challenges & opportunities each company has faced and how they were overcome
  - Questions & Answers

# Building a Resilient Supply Chain



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# Building a Resilient Supply Chain

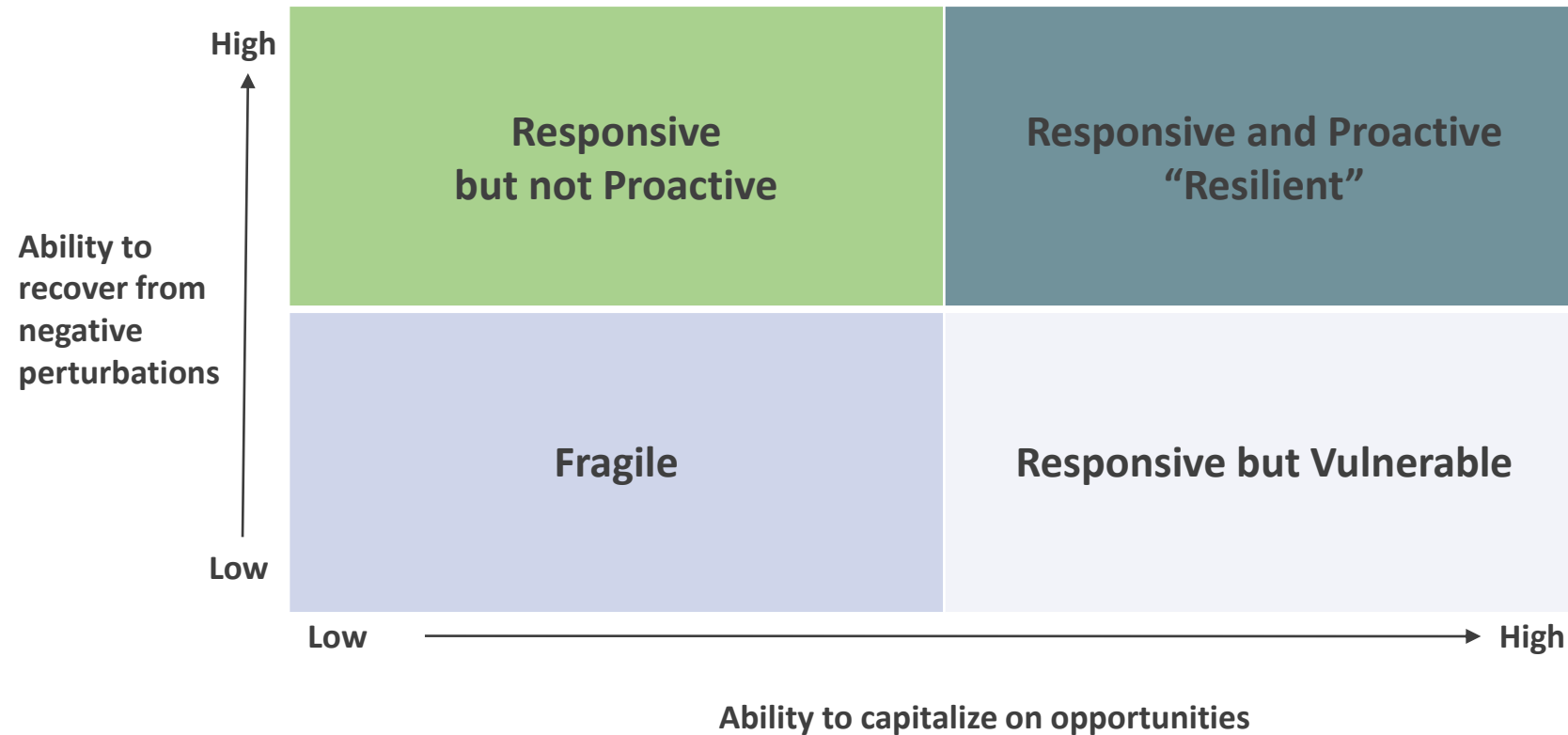
- What is Business Resiliency
- Why is Resiliency Important
- Where to Focus on Building a Resilient Business
- How to Start

# What is Manufacturing Resilience?

- **Resilience:** *an ability to adjust easily to, and / or recover from, change or misfortune*
- **Manufacturer Resilience:** an organizational state enabling a manufacturer to
  - capitalize on positive opportunities caused by changes in the business climate, and/or
  - bounce back from negative perturbations.



# Business Resilience Matrix \*



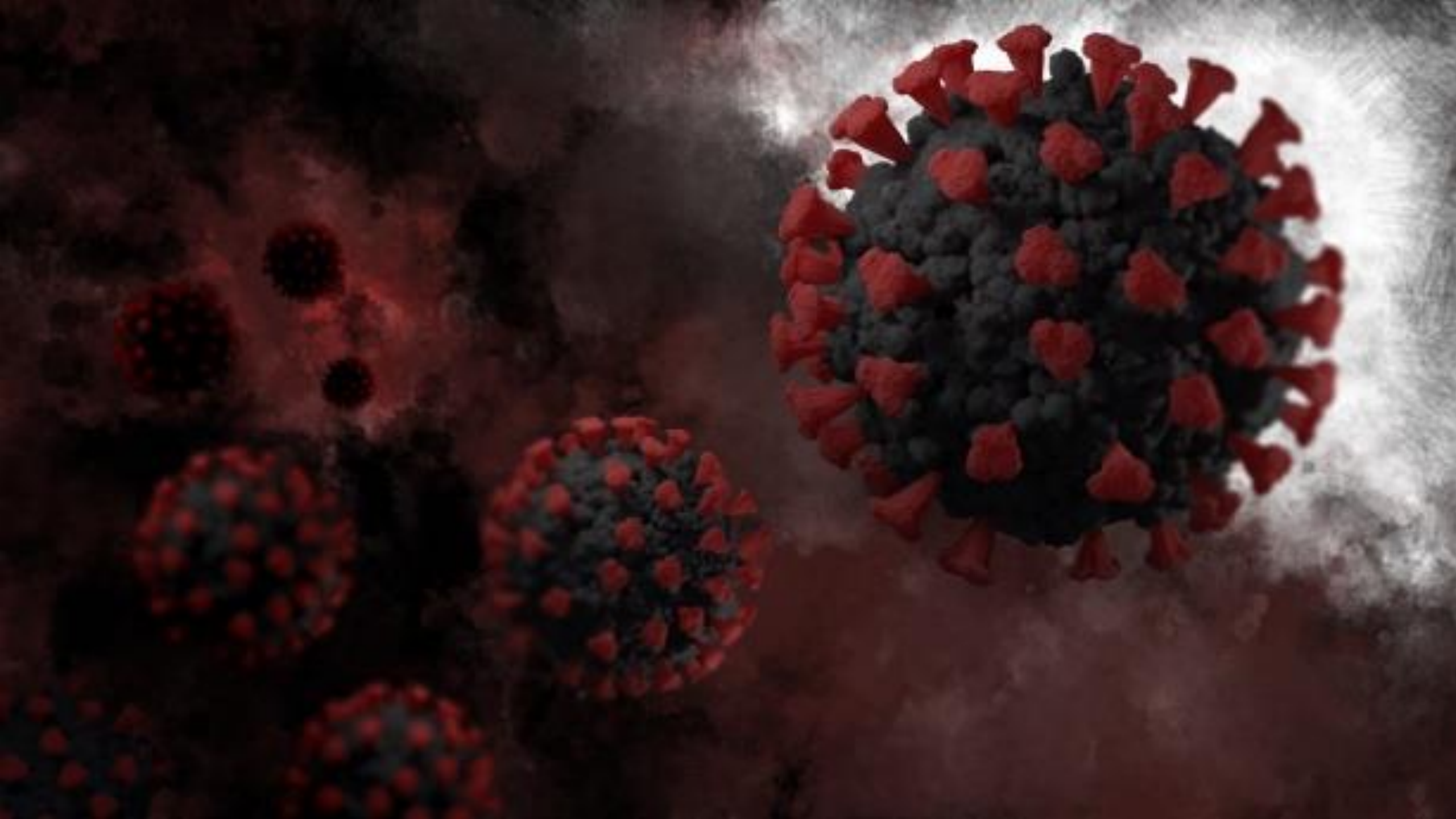
\* Refers to the capabilities and capacities of the manufacturer as a functioning business entity, specific operating practices should likewise reflect these attributes

# Manufacturing Resilience Objective

- Resilient Manufacturers operate based upon data-driven business decision-making across their environment of inputs, processes, and outputs via:
  - Supply Chain Robustness (inputs)
  - In-Factory Agility (process)
  - Diversified Customers and Markets (outputs)
- Continuous improvement moving towards upper-right quadrant on the Business Resilience Matrix.

# Building a Resilient Supply Chain

- What is Business Resiliency
- Why is Resiliency Important
- Where to Focus on Building a Resilient Business
- How to Start





**2010 Iceland  
Volcano Eruption**



# Black Swan Events

A “Black Swan” event is an unpredictable event that is beyond what is normally expected...and has potentially severe consequences.

Black swan events are characterized by their extreme rarity, severe impact, and widespread insistence they **were obvious in hindsight**.

*Source: Investopedia*





# Examples of Major Global Disruptions

Timeframe	Type	Disruption Event	Timeframe	Type	Disruption Event
2022	War	Ukraine-Russia Conflict	2008	Recession	Great Recession (Dec 07 to Jun 09)
2021	Supply Chain	Multiple weather, congestion & other events.	2005	Nat. Disaster	Hurricane Katrina
2020	Pandemic	COVID-19 Pandemic	2003	Pandemic	SARS (2002-2004)
2020	Trade	Brexit	2001	Recession	Early 2000's Recession
2020	Trade	USMCA	1994	Trade	NAFTA (1994-2020)
2018	Trade	China-US Trade War (2018-2020)	1991	Nat. Disaster	Mt. Pinatubo
2015	Pandemic	Zika Virus	1990	Recession	Early 1990's Recession (Jul-90 to Mar 91)
2013	Pandemic	China Bird Flu (2013-2019)	1982	Nat. Disaster	Galunggung Volcanic Eruption
2012	Nat. Disaster	Hurricane Sandy	1981	Recession	1981-1982 Recession (Jul-81 to Nov-82)
2012	Pandemic	MERS (Middle East Respiratory Syndrome)	1980	Recession	1980 Recession (Jan-80 to Jul-80)
2011	Supply Chain	Fukushima Nuclear Reactor Meltdown/Tsunami	1973	Recession	1973-75 Recession, Oil Crisis (Nov-73 to Mar 75)
2010	Nat. Disaster	Eyjafjallajokull Volcanic Eruption	1969	Pandemic	Hong Kong Flu
2009	Pandemic	Swine Flu	1957	Pandemic	Asian Flu

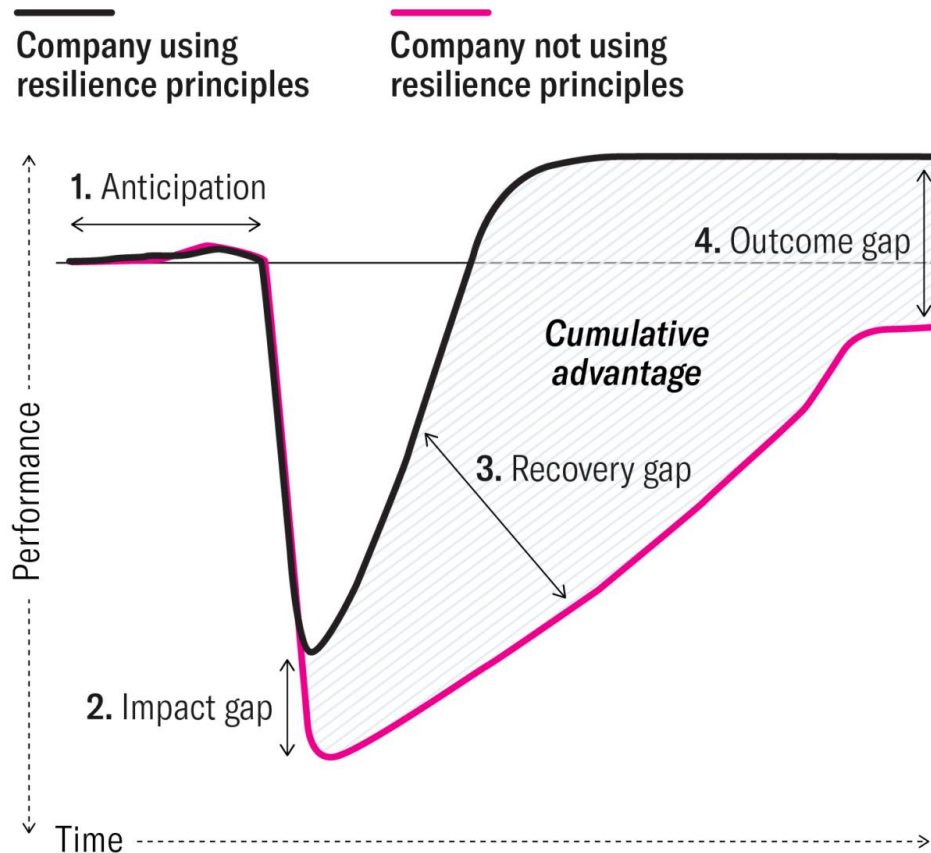
*Unpredictable? Can we plan for them?*

# Why Resilience Is Important

Today's business environment is becoming more dynamic and unpredictable, due to:

- Accelerated technological evolution
- Greater connectivity of the global economy
- Extended supply chains (single-sourcing, low-cost suppliers, minimal inventories)
- Manufacturing optimized for low cost (in a stable environment)
- Focus on short-term returns.

# Why Be Resilient



- Companies that are more resilient tend to:
  - have less of a negative impact during a major disruption.
  - recover faster from the disruption.
  - turn unanticipated stress into opportunities.
  - emerge stronger from shocks to their business.

Source: Martin Reeves

HBR

**Supply chains are too long, too complicated, and too often exposed to tier 2 and tier 3 supplier vulnerabilities in a single source supply. (Kearney)**

**Organizations that deal with fast-evolving situations—think SWAT teams—know that it pays to practice and prepare for the unexpected. (HBR)**

**“The one thing I’ve personally learned is you’ve got to get ahead of the curve, don’t try to deny it or put your head in the sand, and wish for the best. These are the times when a culture and an organization gets tested.”  
Michael Hansen – CEO of Cengage**

**If 2020 has taught us anything, it’s that everyone needs to prepare for higher levels of volatility, uncertainty, complexity, and ambiguity. (HBR)**

**“With the current health crisis changing norms, work-life balance is no longer a binary concept, but one that has evolved into a challenging confluence of needs between work, home, and family, all under one roof.” ~  
James Parker, CEO, Masergy**

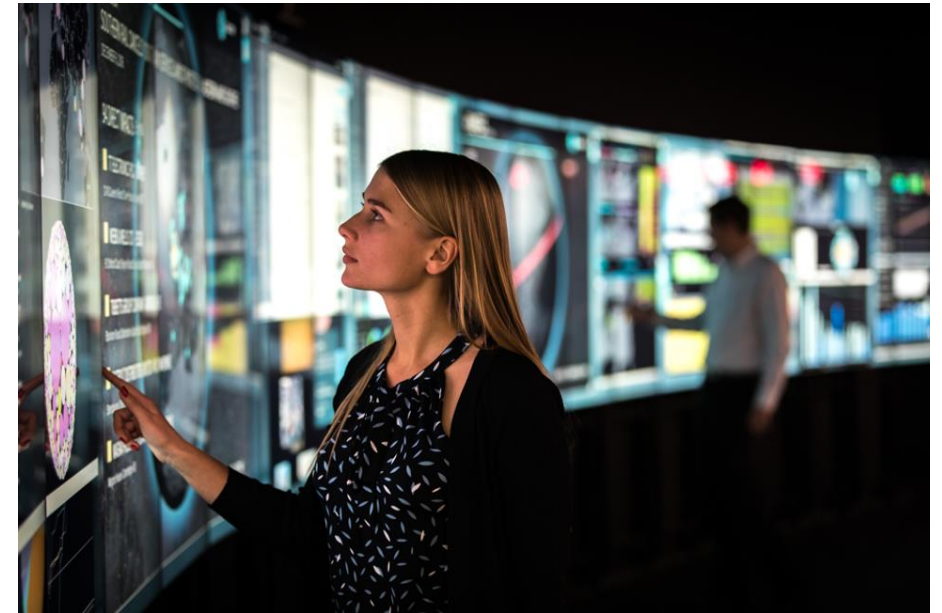
**“In a crisis, it’s easy to panic and throw out your game plan. My advice is to avoid that temptation.” ~ Kevin Bazner, President & CEO, A&W Restaurants**

# Building a Resilient Business

- What is Business Resiliency
- Why is Resiliency Important
- Where to Focus on Building a Resilient Business
- How to Start

# Where to Build Resilience

- Supply Chain Robustness
  - Strategic management and sourcing strategy
  - Market information
  - Equipment acquisition and deployment
  - Materials and supplies
  - Workforce acquisition
  - Access to capital



## Dual sourcing, reduced complexity, and localizing are the three key changes executives are evaluating

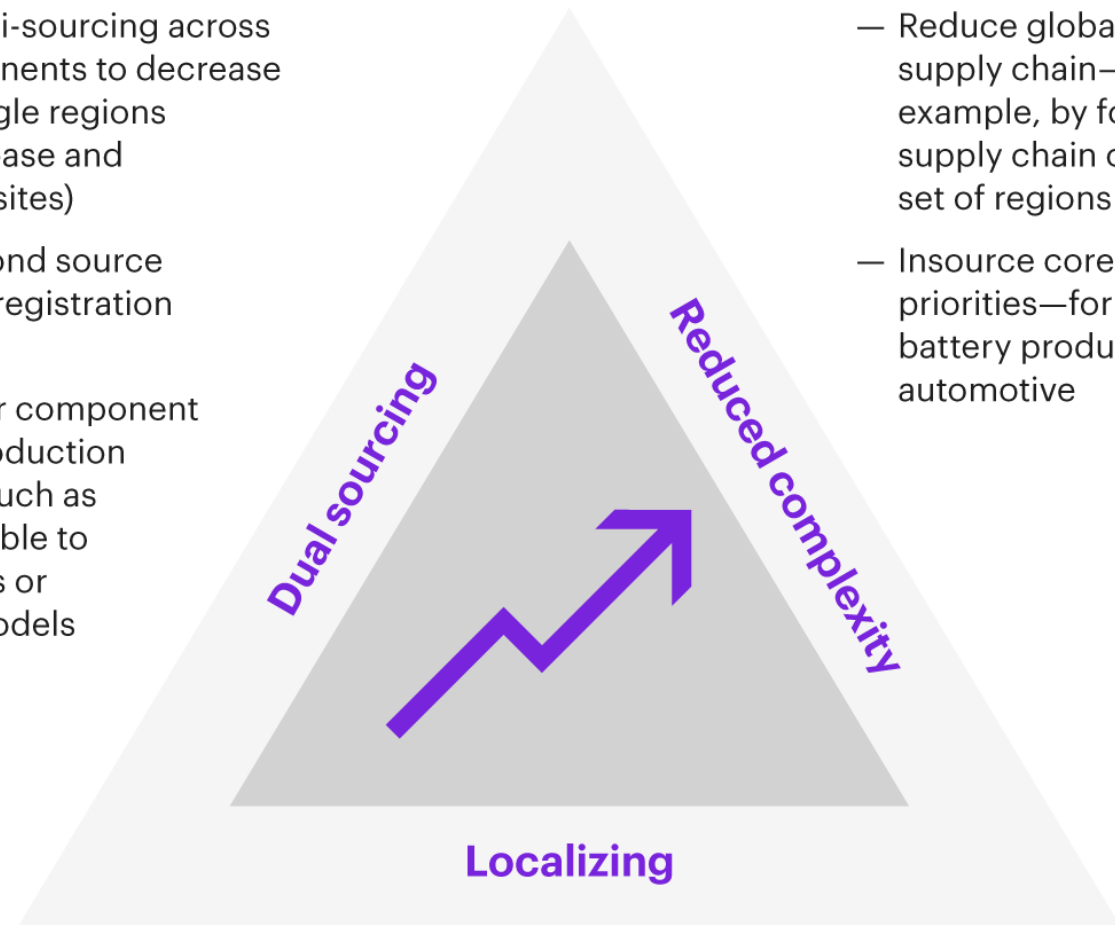
### Supply chain setup

- There is a shift from cost-to risk-competitiveness.
- Three key levers are highly interdependent—for example, dual sourcing often implies an increased complexity.
- Safety stocks will increase and resources in supply chain departments will be ramped up.

### Key changes to supply chain setup

- Consistent multi-sourcing across regions or continents to decrease exposure to single regions (both supplier base and manufacturing sites)
- Consistent second source qualification in registration dossiers
- IP ownership for component designs and production processes as much as possible to be able to switch suppliers or shift to CMO models

- Reduce global span of supply chain—for example, by focusing supply chain on a select set of regions
- Insource core business priorities—for example, battery production in automotive



### Increase use of local suppliers and manufacturing capacities to

- Decrease exposure to global trade flow disruptions triggered by, for example, trade tensions or crises such as COVID-19
- Permit lower safety stocks, allowing for quicker pivoting in times of disruptions
- Decrease exposure to increasing transportation costs in case of disruption

Resiliency Area	Assessment Areas	Potential Initiatives
<p><b>Supply Chain Robustness (inputs)</b></p> <p>General Examples:</p> <p>Strategic management and sourcing strategy</p> <p>Market information</p> <p>Equipment acquisition and deployment</p> <p>Materials and supplies</p> <p>Workforce acquisition</p> <p>Access to capital</p>	<p>Robust sourcing – redundant sourcing, reduction in long lead times and cost sensitivity</p> <p>Supply chain visibility at all tiers</p> <p>Risk management and innovative culture to support sustained value, profitability and business continuity</p> <p>Robust information systems used to strengthen and sustain situational awareness</p> <p>Sound strategic and operational planning</p> <p>Overhead management to maintain optimal balance of fixed and variable costs</p> <p>Managed cost of materials</p> <p>Incoming materials within specifications</p> <p>Ability to accommodate variations of subcomponents from suppliers within costs</p> <p>Active supplier relationship management (including terms of payment)</p> <p>Cybersecurity practices that protect supply chain interactions</p> <p>Workforce robustness to handle special needs and everyday tasks</p> <p>Employee commitment</p> <p>Employee satisfaction</p> <p>Accommodation of demand sensitive capital needs</p>	<p>Business assessments</p> <p>Change management</p> <p>Improving leadership decision making</p> <p>Supply chain performance optimization</p> <p>Supplier scouting</p> <p>Reshoring/total cost of ownership</p> <p>Supplier relations management</p> <p>Design for 6 Sigma</p> <p>Talent and skills acquisition and retention practices</p> <p>Improving worker productivity through TWI</p> <p>COOP, succession planning</p> <p>Risk management</p> <p>Others</p>



# Where to Build Resilience



- In-Factory Agility
  - Maintaining just-in-time inventory levels
  - Flexible/reconfigurable plant layout
  - Adaptable manufacturing software systems
  - Flexible automation
  - Sustainable manufacturing practices
  - Workforce utilization

# Where to Build Resilience

- Diversified Customers and Markets
  - Products in multiple and adjacent markets
  - Exports
  - Balanced customer portfolio
  - Demand/market driven product and sales strategies



Resiliency Area	Assessment Areas	Potential Initiatives
<p><b>Diverse/Diversified Customers and Markets (Outputs)</b></p> <p>General Examples:</p> <p>Products in multiple and adjacent markets</p> <p>Exports</p> <p>Balanced customer portfolio</p> <p>Demand/market driven product and sales strategies</p>	<p>Robustness and innovativeness of product</p> <p>Active development of diversified customer and market base</p> <p>Robust and flexible customer relationships</p> <p>Maintaining profitability over the business cycle</p> <p>Overall marketing effectiveness</p> <p>Dynamic payment solutions and discounting</p> <p>Innovative business models relating to products and services</p>	ExporTech
		Tech Scouting/TDMI
		Introduction of and assistance with market diversification opportunities, including pivoting
		Supplier Scouting
		Marketing assistance
		Assistance with customer terms and flexibility
		Others

# Building a Resilient Supply Chain

- What is Business Resiliency
- Why is Resiliency Important
- Where to Focus on Building a Resilient Business
- How to Start

# How to Build a Resilient Structure

- Build Redundancy – capacity, inventory, processes
- Ensure Diversity – systems, people, culture, customers & markets
- Have a Modular Structure – impact in one area isn't fatal
- Become Adaptable – flexibility and tolerance for change
- Exercise Prudence – contingency plans, stress tests
- Embed Goals and Activities – across broader systems

# How to Become More Resilient

## Strategic

- Not only mitigate risk, but seek to take advantage of adversity.
- Take a longer view or perspective.
- Encourage and develop collaboration (between employees, business units, and external partners).
- Make change the default operating practice.

## Tactical

- Conduct a Business Resiliency Assessment
- Review Business Risk, Develop Mitigation Plans, and Test Them
- Stress Test your Business
- Educate Yourself (e.g. CIRAS Business Resiliency Webinar Series)

# Your Journey towards Industry 4.0



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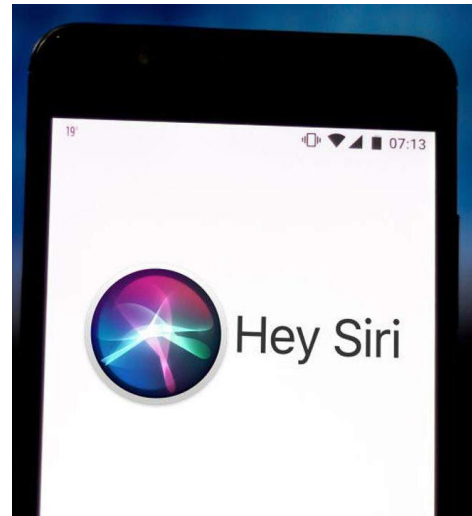
What is Industry 4.0?








# New(er) digital business concepts are pushing out old models



Why can't these models be applied to manufacturing?



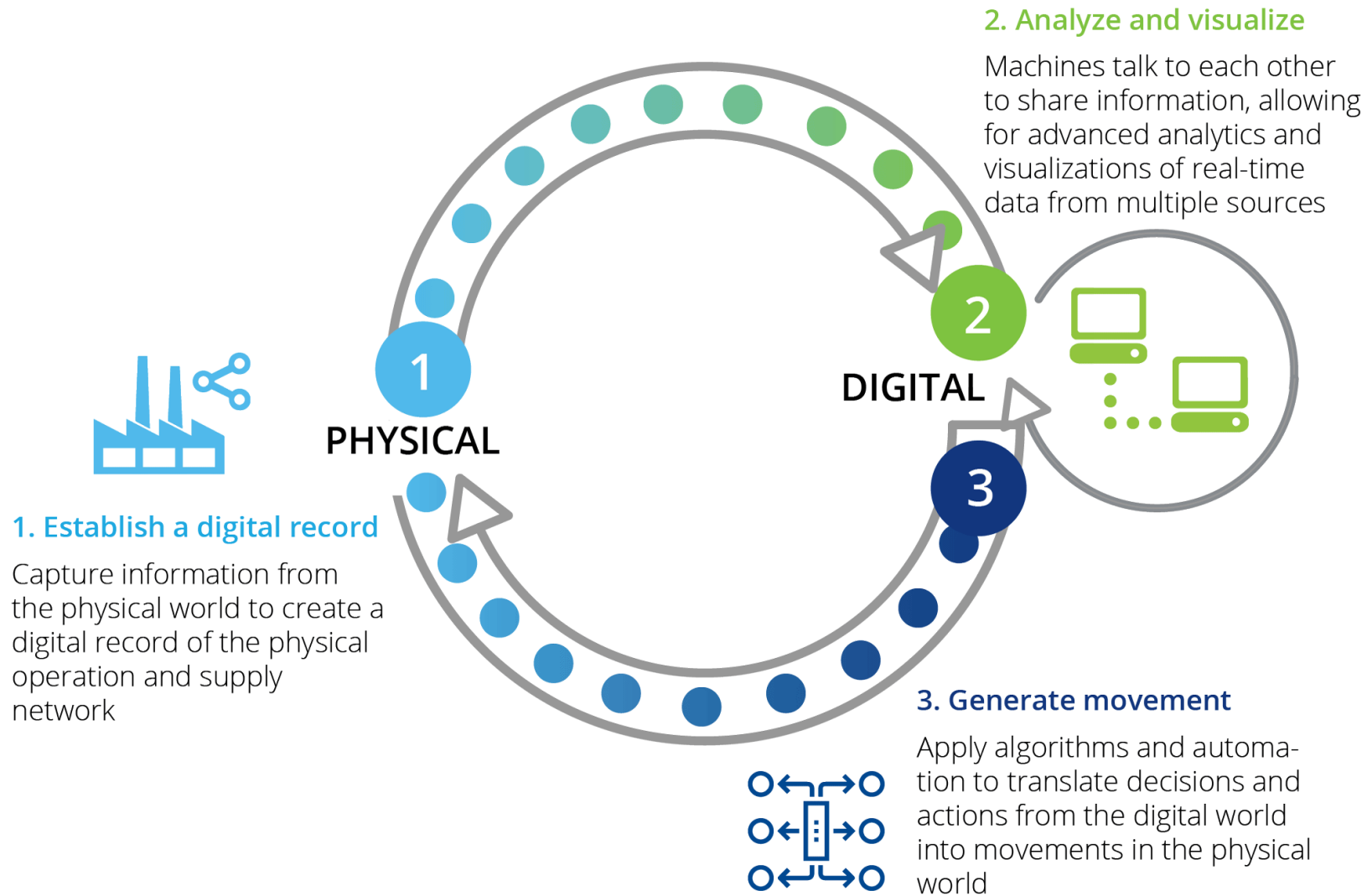
**INDUSTRY**



A stylized graphic design featuring the letters 'i' and 'O'. The 'i' is composed of a black dot and a stem that is split into a top black section and a bottom blue section. The 'O' is a large, rounded letter with a black outline and a blue interior. The word 'INDUSTRY' is written in a bold, black, sans-serif font to the left of the 'i'. The entire composition is overlaid with a complex network of thin, colorful lines (pink, blue, yellow, green) forming various geometric shapes like rectangles and circles, suggesting a technical or industrial theme.



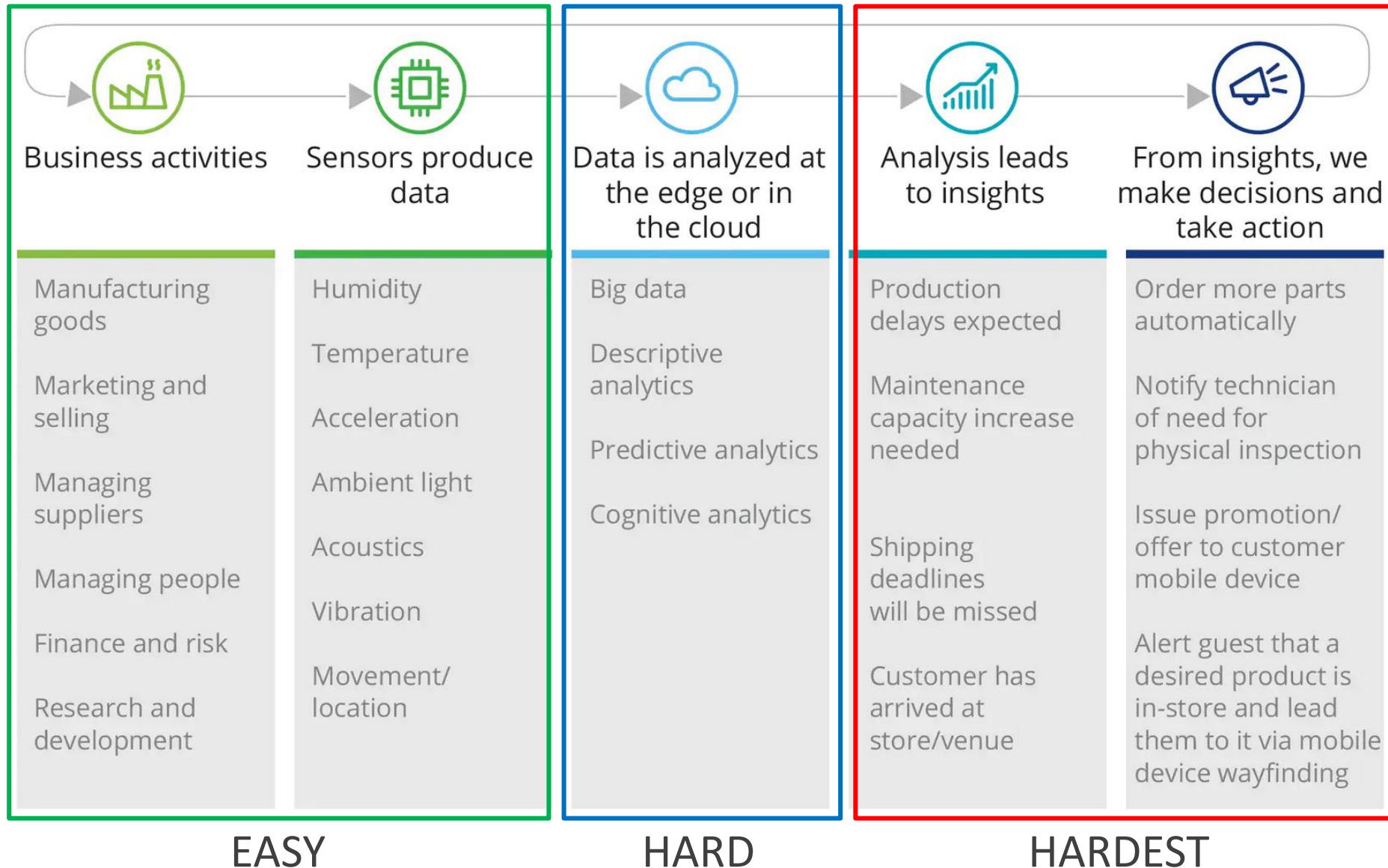
# I4.0 in Manufacturing: Yet Another View



What is the value proposition for I4.0?

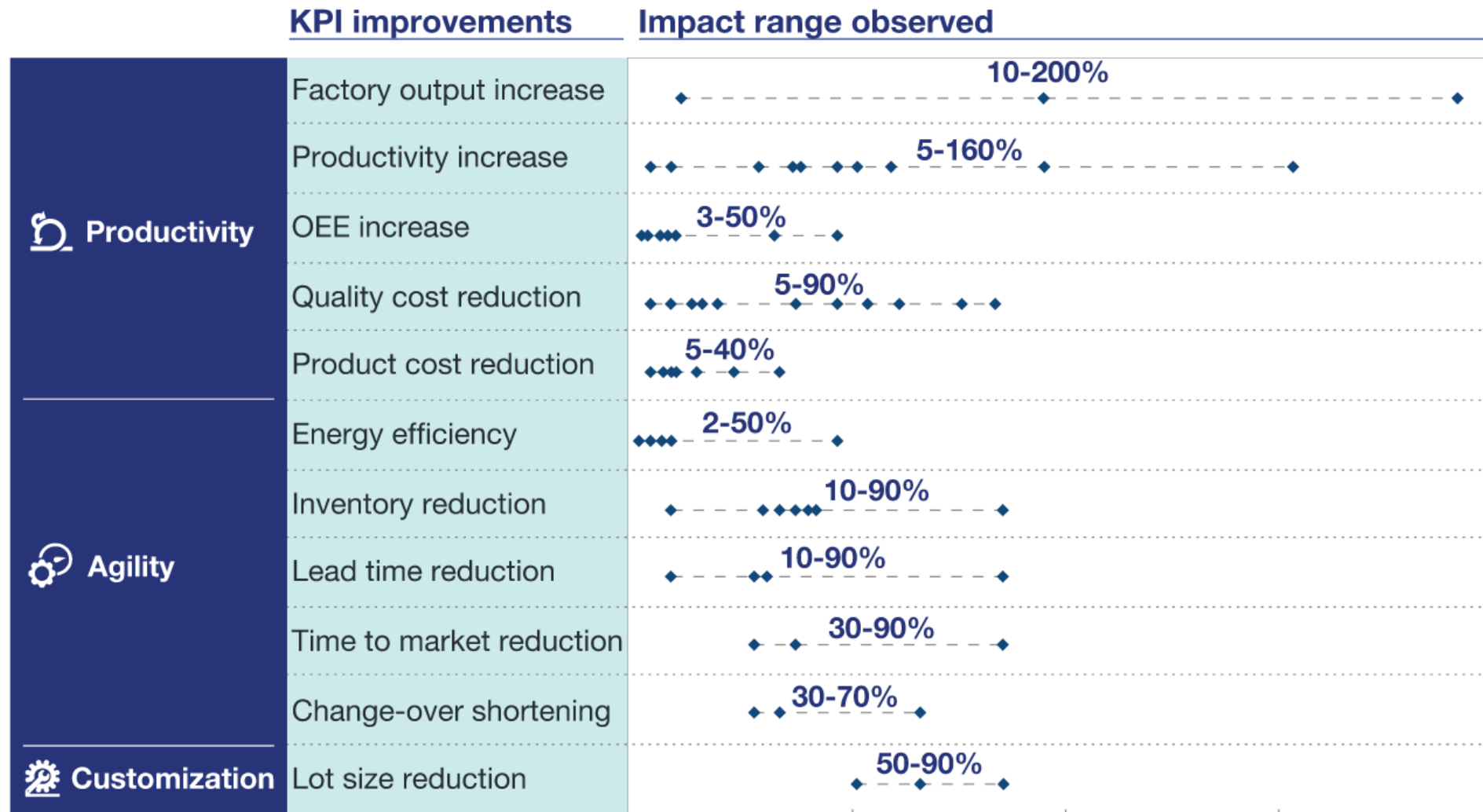


# Creating and capturing value with I4.0



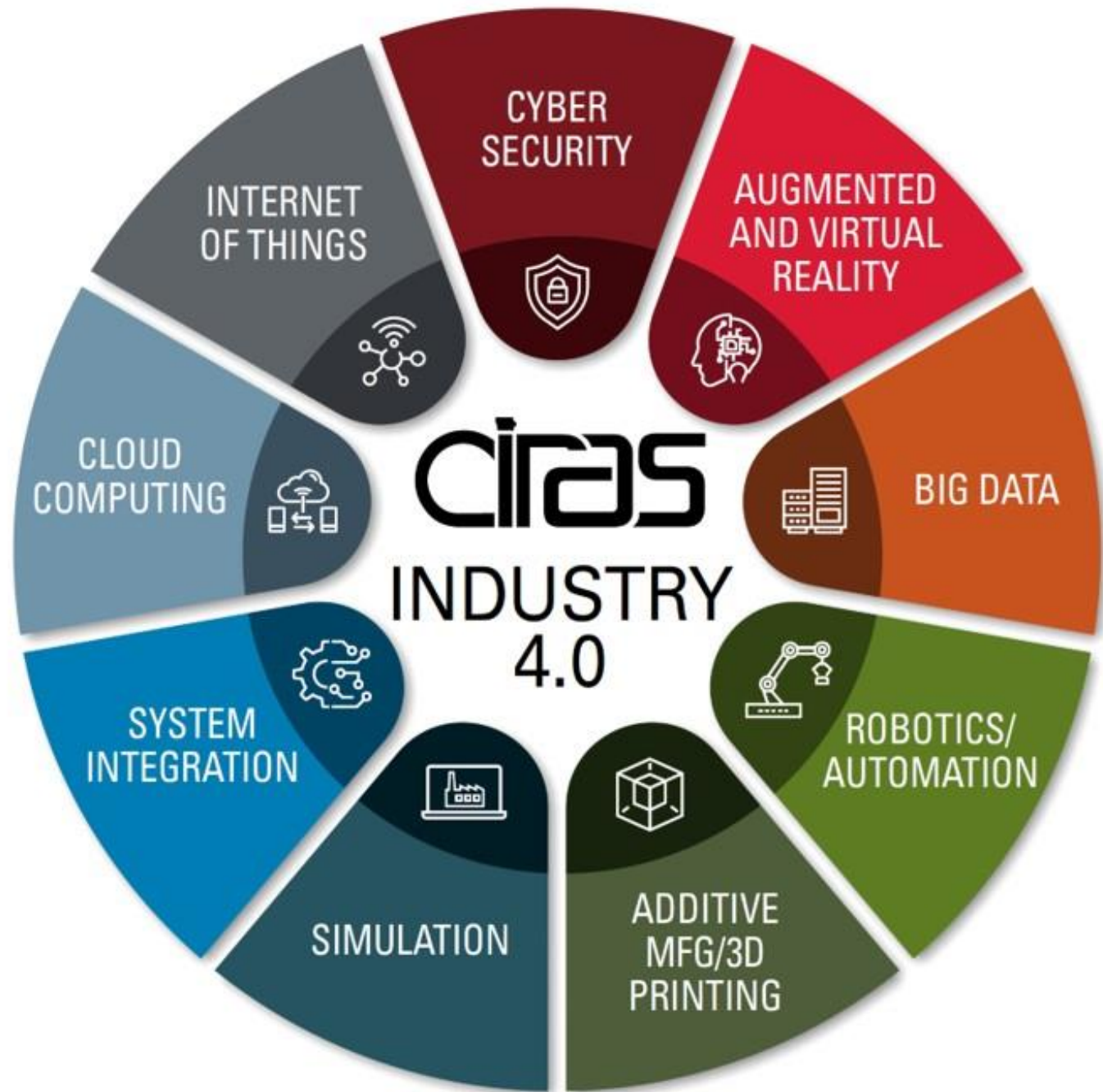


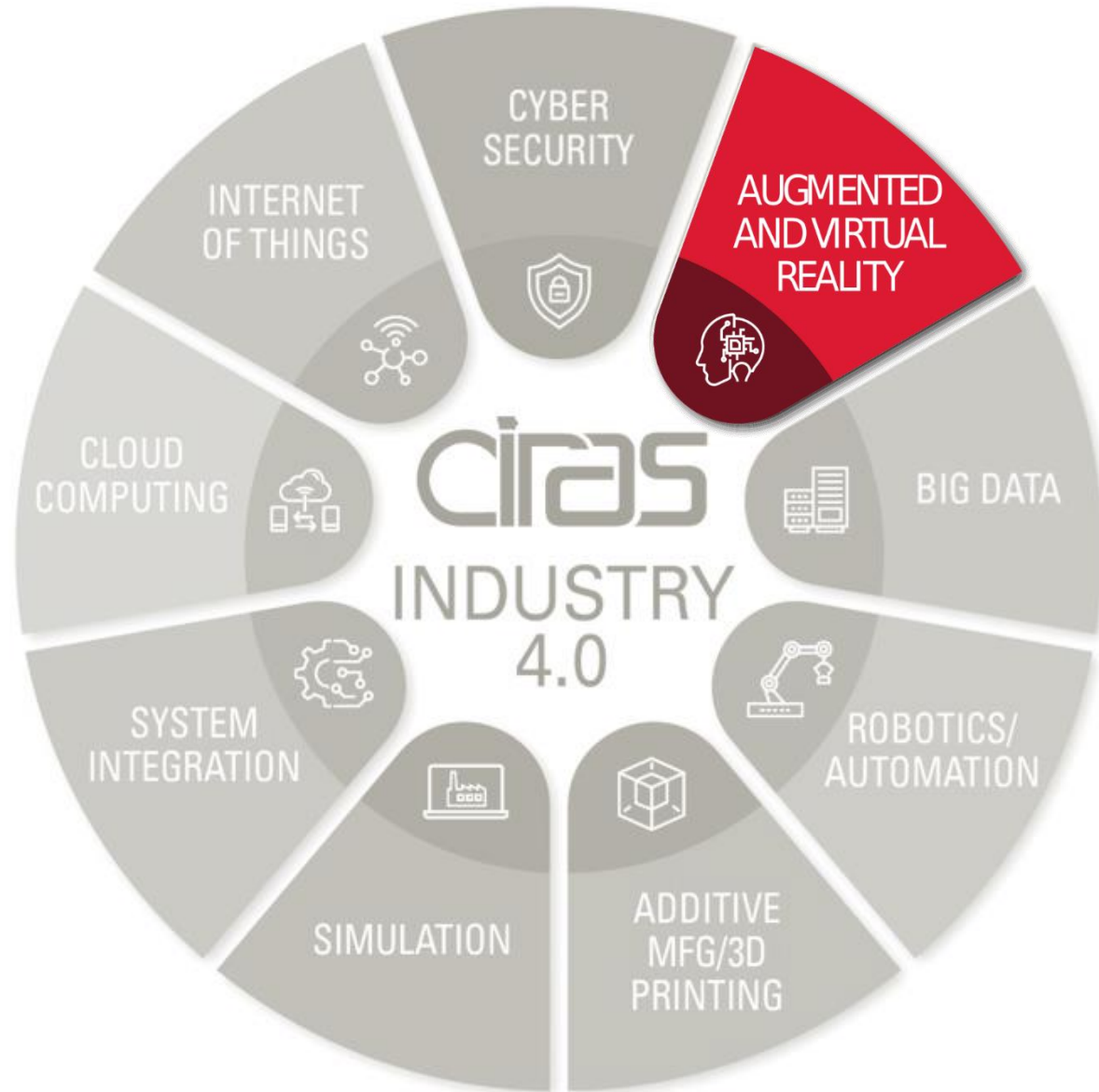
# Value increase from implementing I4.0



Can you give me some specific examples of  
14.0?







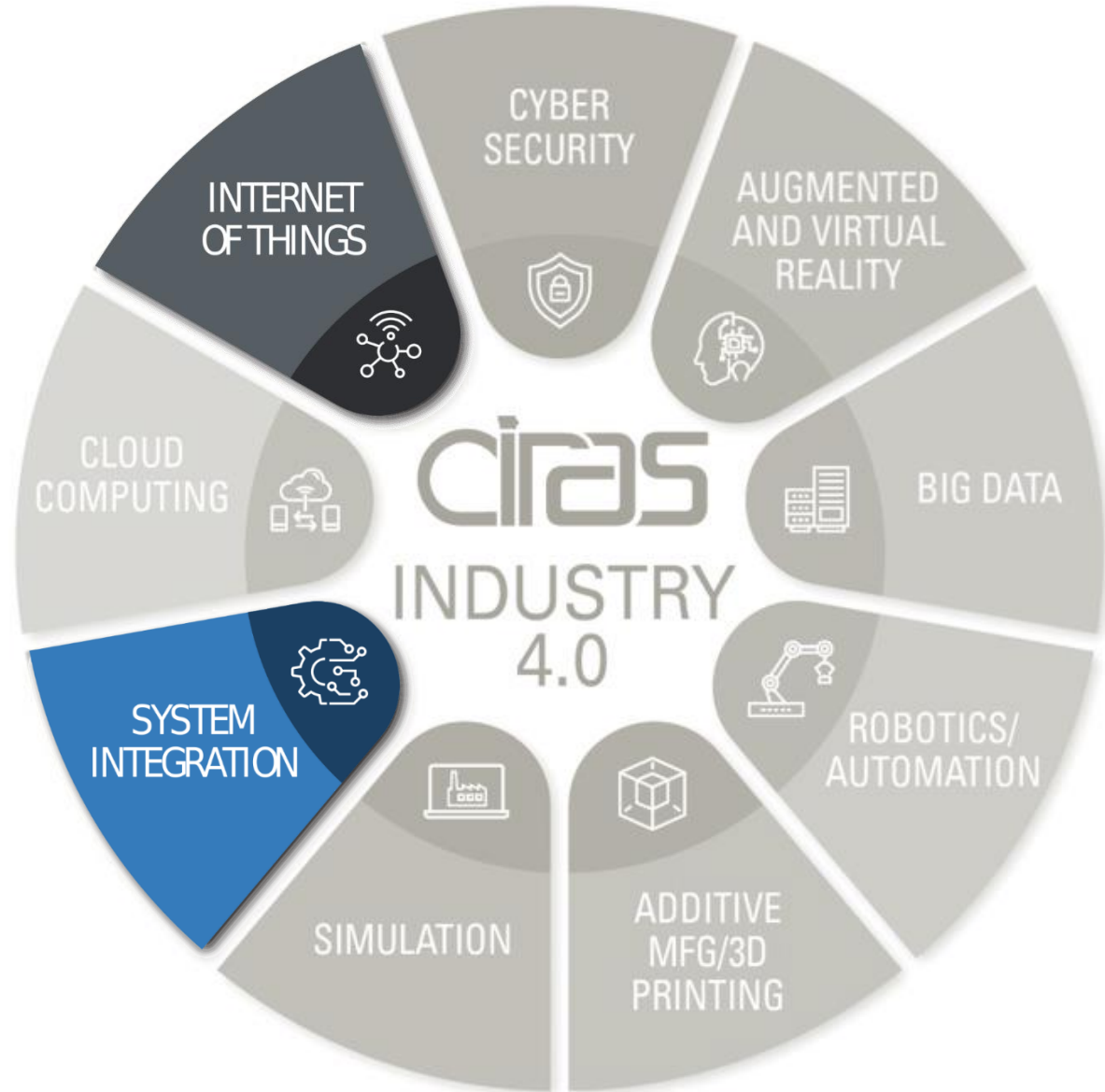
## What if ...?

... new employees could start assembling products at needed quality and takt time within one hour of starting the job?



## What if ...?

... you could double the size of your business without hiring more people?



## What if ...?

... you could automatically order parts for a machine so they showed up right before it broke down?

Do you have real life examples of I4.0?



# Case Study 1: Material Tracking

- Problem:
  - High-mix of parts: 120 door styles, 600 colors and finishes, custom dimension -> 500,000 product variations -> hard to track and plan.
- Solution: Attach RFID tag to each cabinet component.
  - Allow for tracking of parts at various stages of assembly.
  - Allows robots to identify which pieces go with which work order
  - Gives instructions to quality personnel performing final inspections
- Impact: Increased total production capacity by 10% and decreased final inspection time by 50%





# Case Study 2: Predictive Maintenance

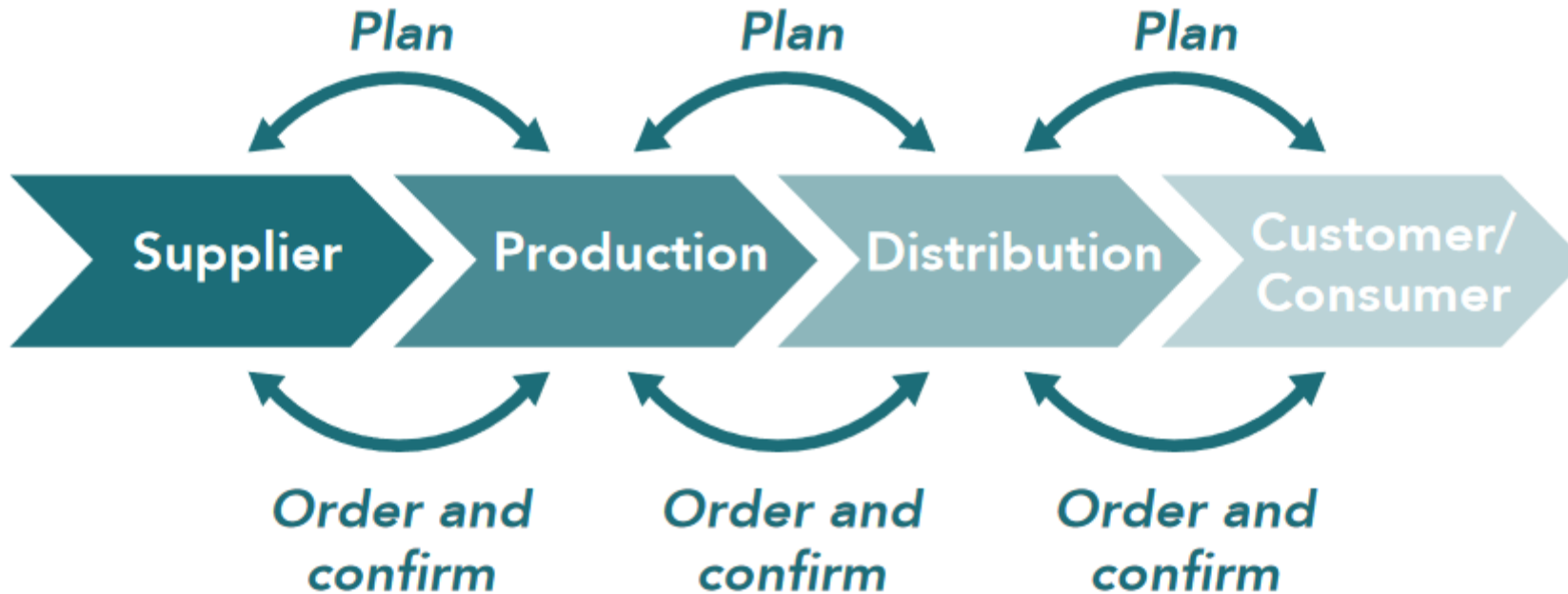
- Problem:
  - Industrial air compressors have a high total cost of ownership
  - They are a critical piece of equipment for food & beverage mfgs
  - A single leak can introduce a host of contaminants into food containers
- Solution:
  - Place sensors on compressors to collect data like flow velocity, oil temperature, machine working hours, etc
  - Analyze data using AI algorithm
    - Notify operator of problems
    - **Suggest operator set-point changes to improve efficiency**
- Impact
  - 25-50% in energy savings
  - Reduction in CO2 emissions
  - Reduced equipment and production downtime



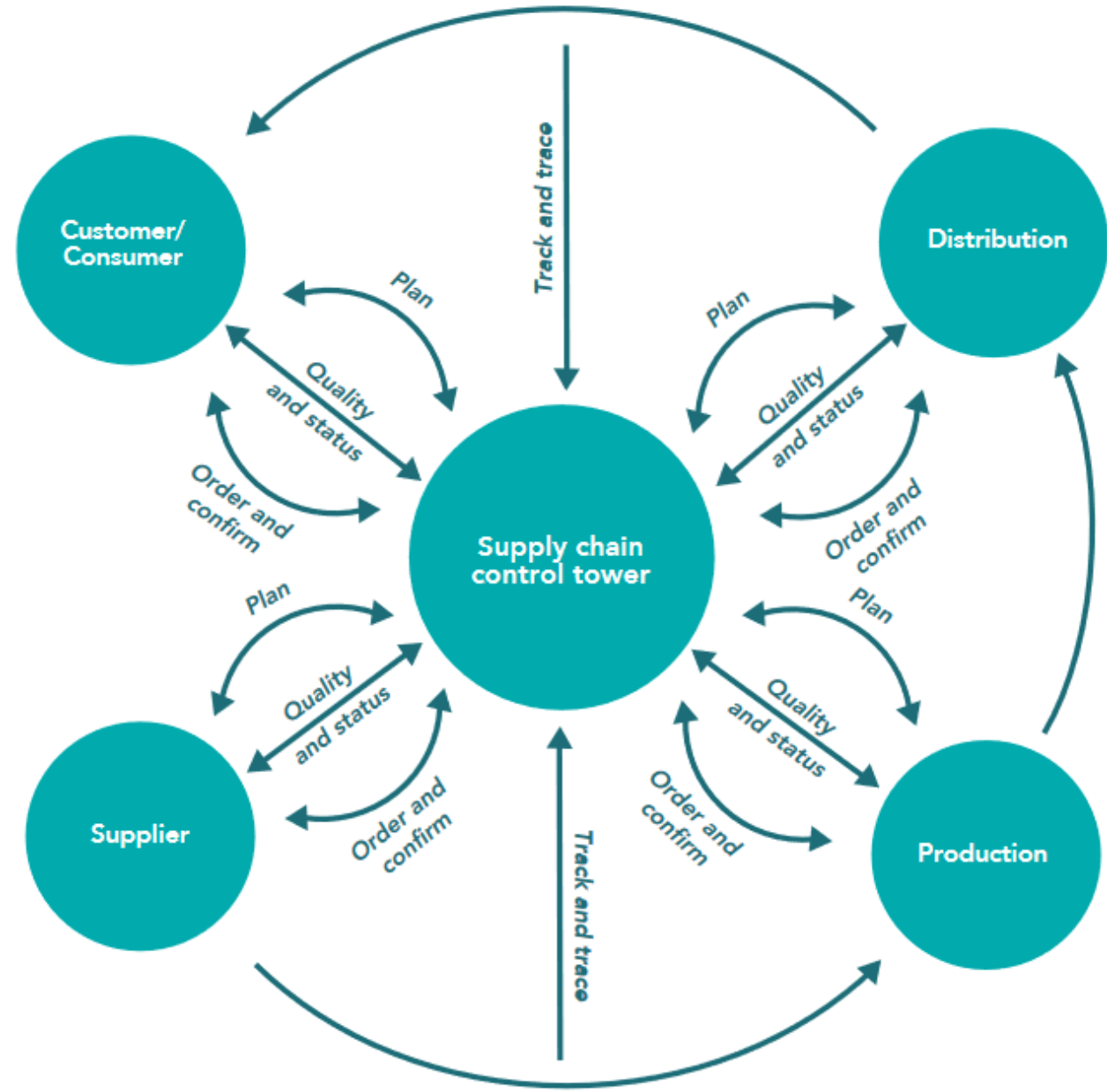
What about I4.0 and my Supply Chain?



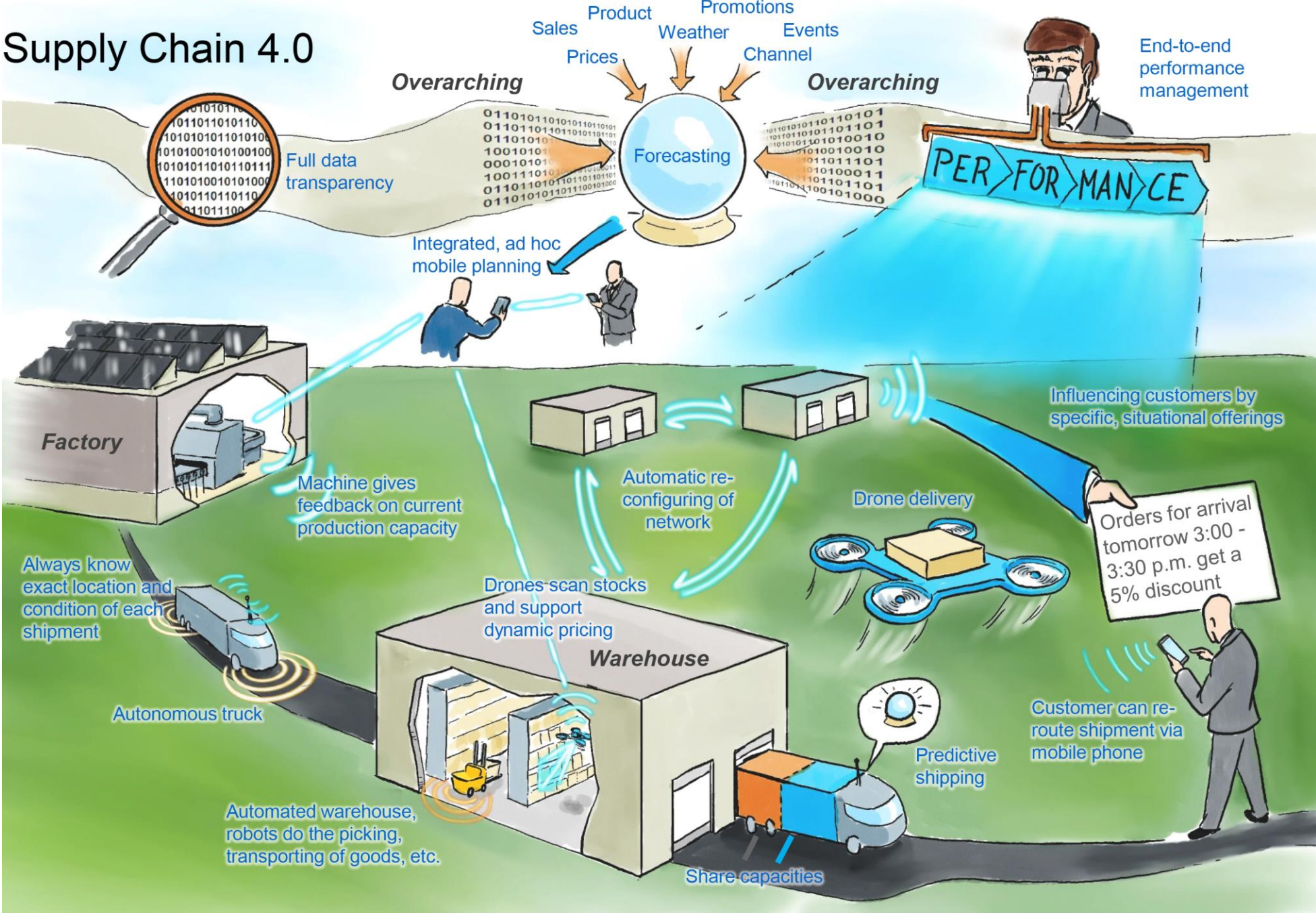
# Traditional Supply Chain



# Supply Chain 4.0



# Supply Chain 4.0



SOURCE: McKinsey

<https://www.mckinsey.com/business-functions/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain>

How do I implement Industry 4.0 at my  
business?







Industry 4.0 unfolds with a clever combination of already existing technologies.



# Industry 4.0: should be based on the needs of your company

- Being the right or “advanced” side of the spectrum is not always the best business case for a user or factory.

<b>Equipment Monitoring and Fault Prevention</b>				
	Basic monitoring of equipment. Manual fault detection.	Fault are detected automatically to assist in equipment maintenance.	Faults are detected and eliminated automatically.	Faults are autonomously prevented with self-learning algorithms.



How does CIRAS help companies with I4.0?



# Why do I4.0 projects fail?

## VISION

- Poor understanding of the process to automate and what to automate
- Lack of a long term vision for the system

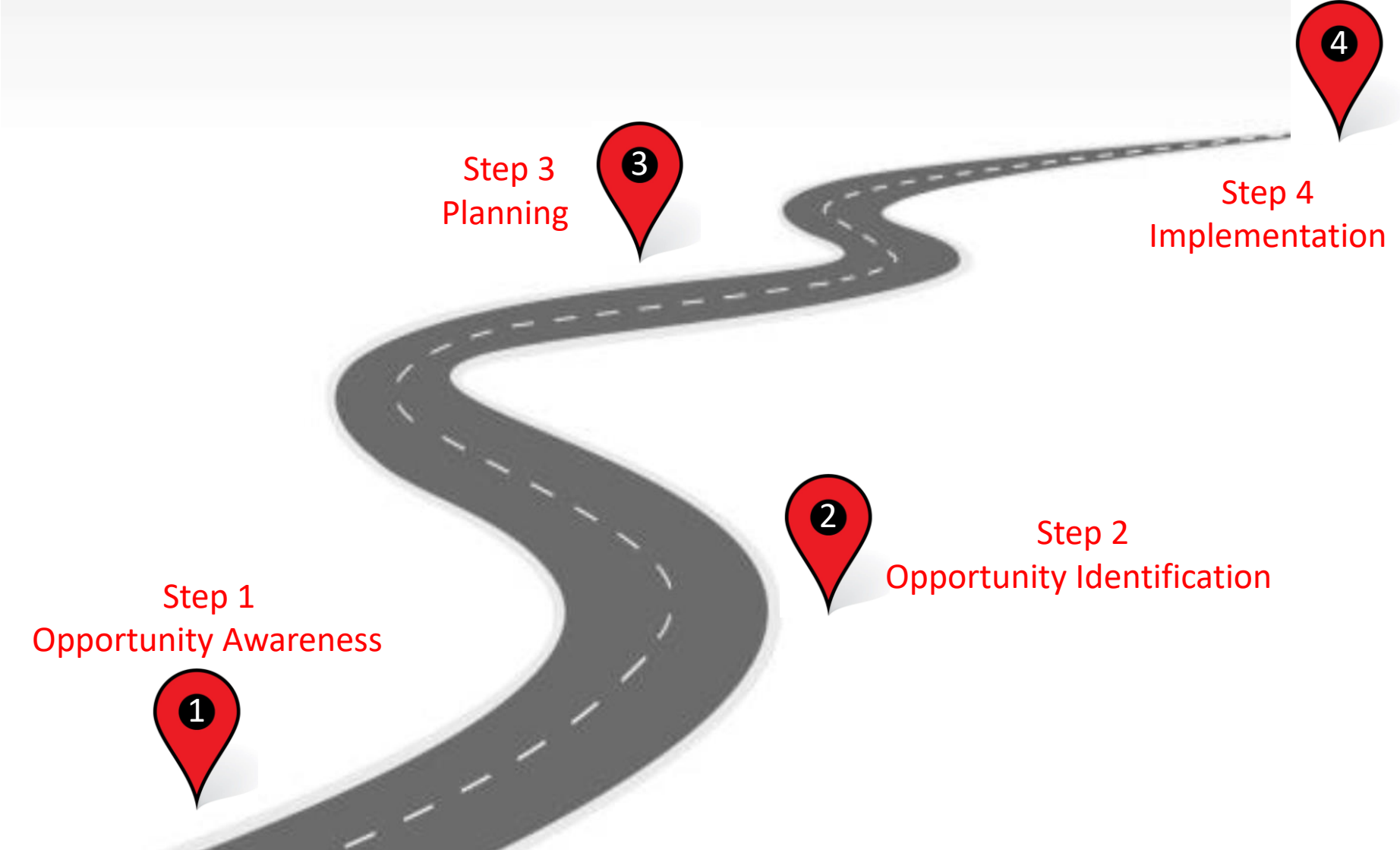
## PROCESS

- Lack of true understanding of costs verses savings (ROI)
- High capital expenditure required to invest in automation (Driven by unknowns and uncertainty)

## PEOPLE

- Lack of up-front buy in from system users (operators)
- Higher level of maintenance skill needed than with manually operated machines

# CIRAS can help with any stage of your Industry 4.0 Journey



# Industry 4.0 Services

- Assessments
- Opportunity Identification
- Implementation Assistance
- Demonstrations
- Proof of Concept Development
- Technology Provider Connections

**Digital Manufacturing lab.**

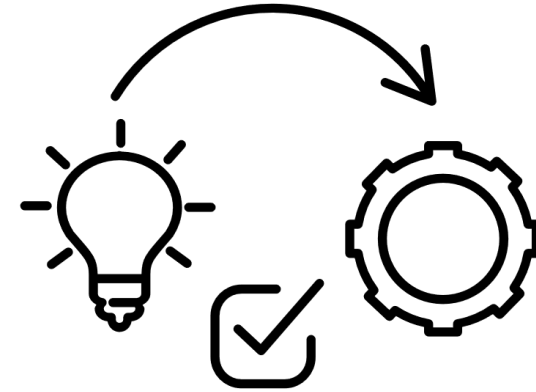
CIRAS, Iowa State University



# CIRAS can help you implement

Turn your vision into results. We provide assistance.

- Implementation assistance can include:
  - Direct assistance in CIRAS areas of expertise
    - “Engineer for hire”
  - Referral to 3<sup>rd</sup> party providers
  - Coordination with 3<sup>rd</sup> party providers



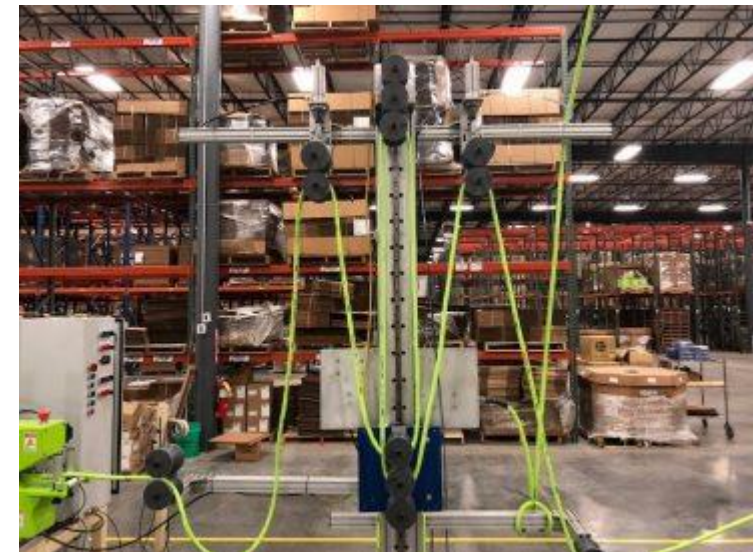
# Case study - Legacy Mfg

Problem: Company installed new hose production line. They needed a way to unwind and untwist 5000 ft of hose so that it could work with existing machinery.

Solution:

- CIRAS helped company understand problem/impact.
- Guided them towards developing a bid package.
- Referred company to trusted system integrator (Berg Automation).

**Impact:** Legacy was able to get new line up and running and hire more employees



# Case study – Malven Tool

<https://youtu.be/FTrfS3XMInM>

# Industry 4.0 – it's a journey

## VISION

- Clear, articulate, and well communicated Industry 4.0 plan. Where am I today? Where do I want to be in 1/3/5 years?

## PROCESS

- Standardized & recorded processes.

## PEOPLE

- Workforce engagement—Ensure all employees feel part of the journey. Workers are actively involved in the development and deployment of technology/applications



# Thank you!

CIRAS can help with your Industry 4.0 journey. Call us!



**Andrew Friend**  
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**515-520-2803**  
**[www.ciras.iastate.edu](http://www.ciras.iastate.edu)**

<https://www.youtube.com/watch?v=FTrfS3XMInM&t=3s>