Your presenter

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Senior Director - Digital

Manufacturing, Retail, and Distribution

Today's Agenda
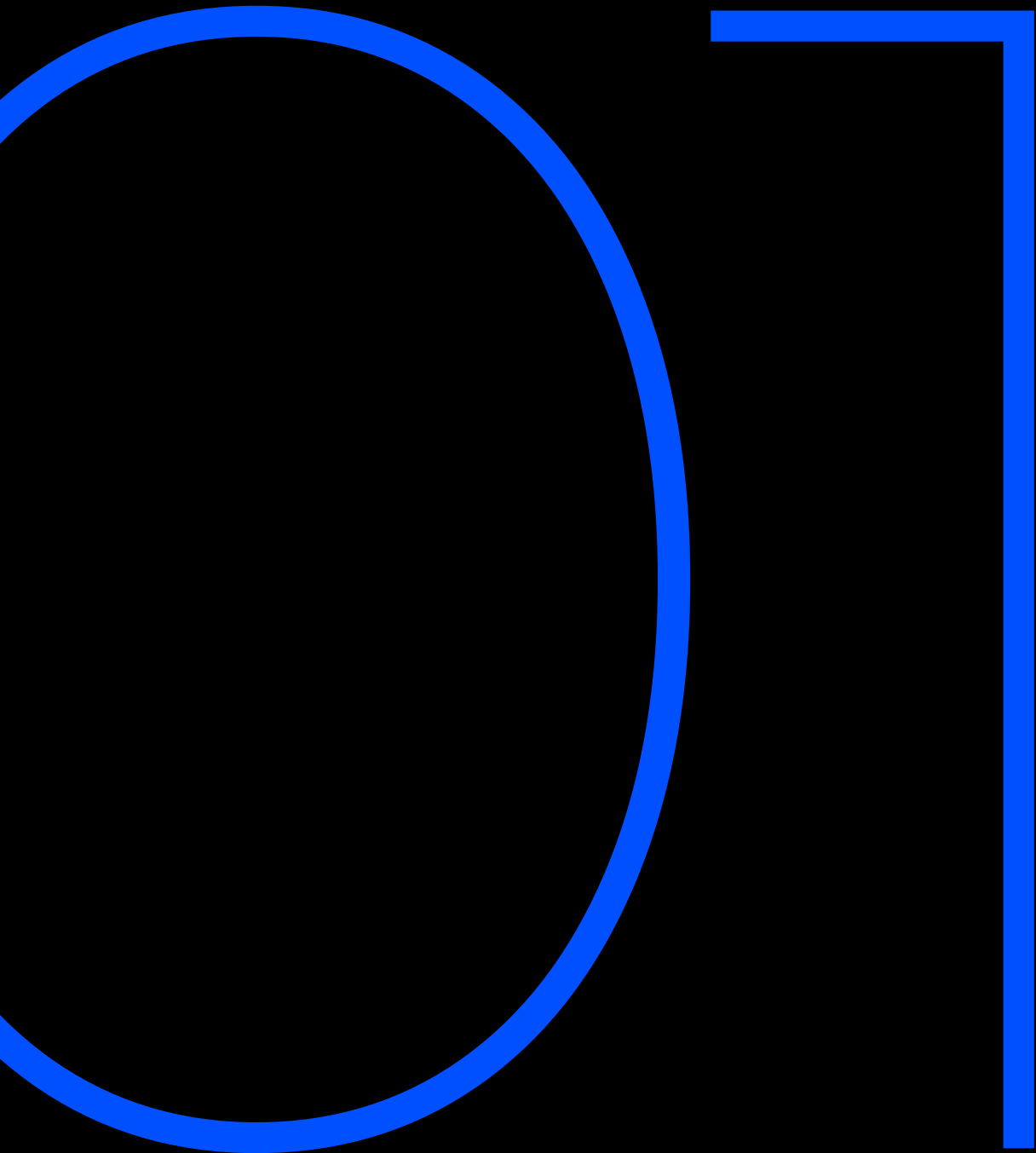
01   Setting the stage

Data to value to profitability

02   Industry 4.0 and A.I.

Leverage real-time data and predictive analytics

03   Getting started

Think big, start small, prove value, scale fast

Setting the stage

From data to value

YOU CAN'T
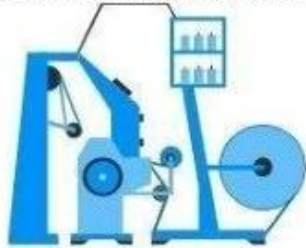MANAGE WHAT YOU
DON'T MEASURE

PETER DRUCKER

Source:
The Lego Data Story, adapted from an original image by Monica Rosales Ascenio

The 4th Industrial Revolution is upon us

FROM INDUSTRY 1.0 TO INDUSTRY 4.0

FIRST
INDUSTRIAL REVOLUTION

Introduction of mechanical production facilities with the help of water and steam power

1784

First mechanical loom

SECOND
INDUSTRIAL REVOLUTION

Introduction of a division of labor and mass production with the help of electrical energy
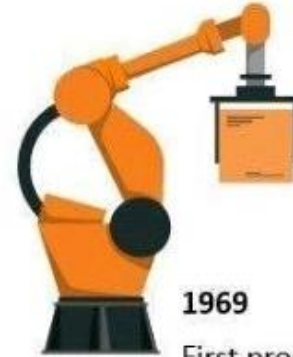
1870

First assembly line

THIRD
INDUSTRIAL REVOLUTION

Use of electronic and IT systems that further automate production

1969

First programmable (PC)

FOURTH
INDUSTRIAL REVOLUTION

The Digital Connected World

1800   1900   2000

Industry 4.0 is about combining traditional manufacturing practices with the technological (digital) world

IoT | IIoT | Industry 4.0

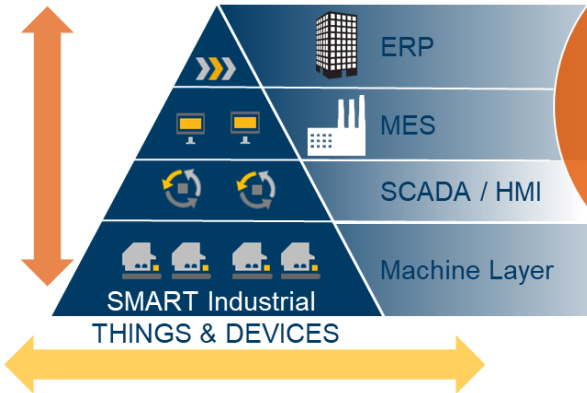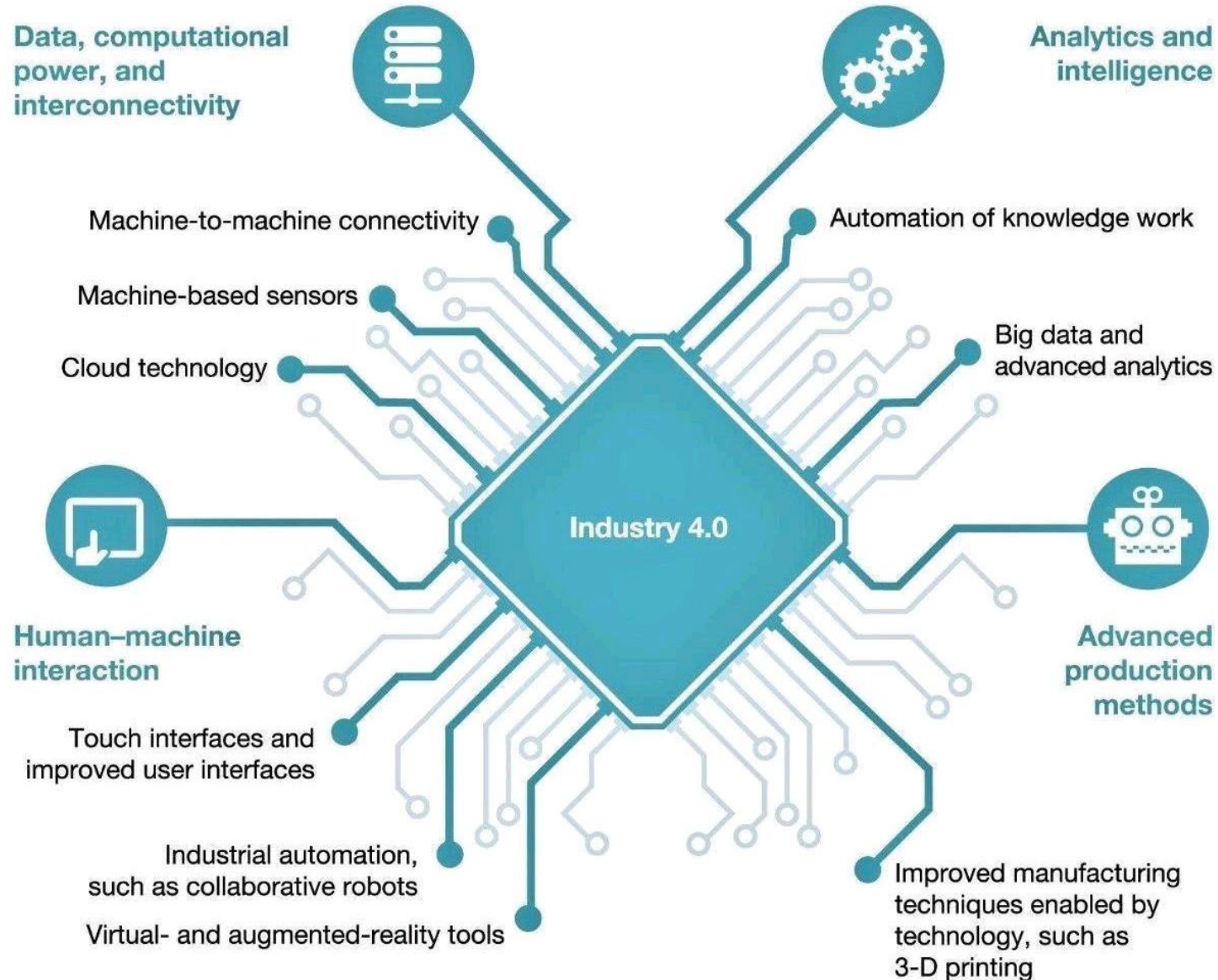Internal INDUSTRIAL scenario | External scenario

Internet of Things

ISA-95 automation pyramid

- **ERP** – Enterprise resource planning

- **MES** – Manufacturing execution system

- **SCADA** – Supervisory control and data acquisition

- **HMI** – Human machine interface

- **Machine** – Sensors and control layer (CNCs/PLCs)

ERP

MES

SCADA / HMI

Machine Layer

SMART Industrial
THINGS & DEVICES

Industry 4.0
» Manufacturing industries
» IT – OT convergence
» Systems, things, and devices on the shop floor

» All industries
» All things and devices

SMART THINGS
& DEVICES

A.I. Strategy

1 TECHNOLOGY

2 ANALYTICS

3 CONNECTIVITY

4 RETURN ON INVESTMENT

Industry 4.0 disruptive technologies

Data, computational power, and interconnectivity

Analytics and intelligence

Machine-to-machine connectivity

Automation of knowledge work

Machine-based sensors

Big data and advanced analytics

Cloud technology

Industry 4.0

Human–machine interaction

Advanced production methods

Touch interfaces and improved user interfaces

Industrial automation, such as collaborative robots

Virtual- and augmented-reality tools

Improved manufacturing techniques enabled by technology, such as 3-D printing

Source: McKinsey

8

Artificial Intelligence (AI)

Artificial Intelligence (AI) is the science of getting computers to act intelligently without being explicitly programmed

Machine Learning (ML) is a subdiscipline of AI focused on using algorithms and software to mimic smart actions, whose performance improves with training data

Deep Learning (DL) is a subdiscipline of ML, based on neural networks that mimic how brain neurons learn. This includes a subset of *Generative AI (GenAI)* models
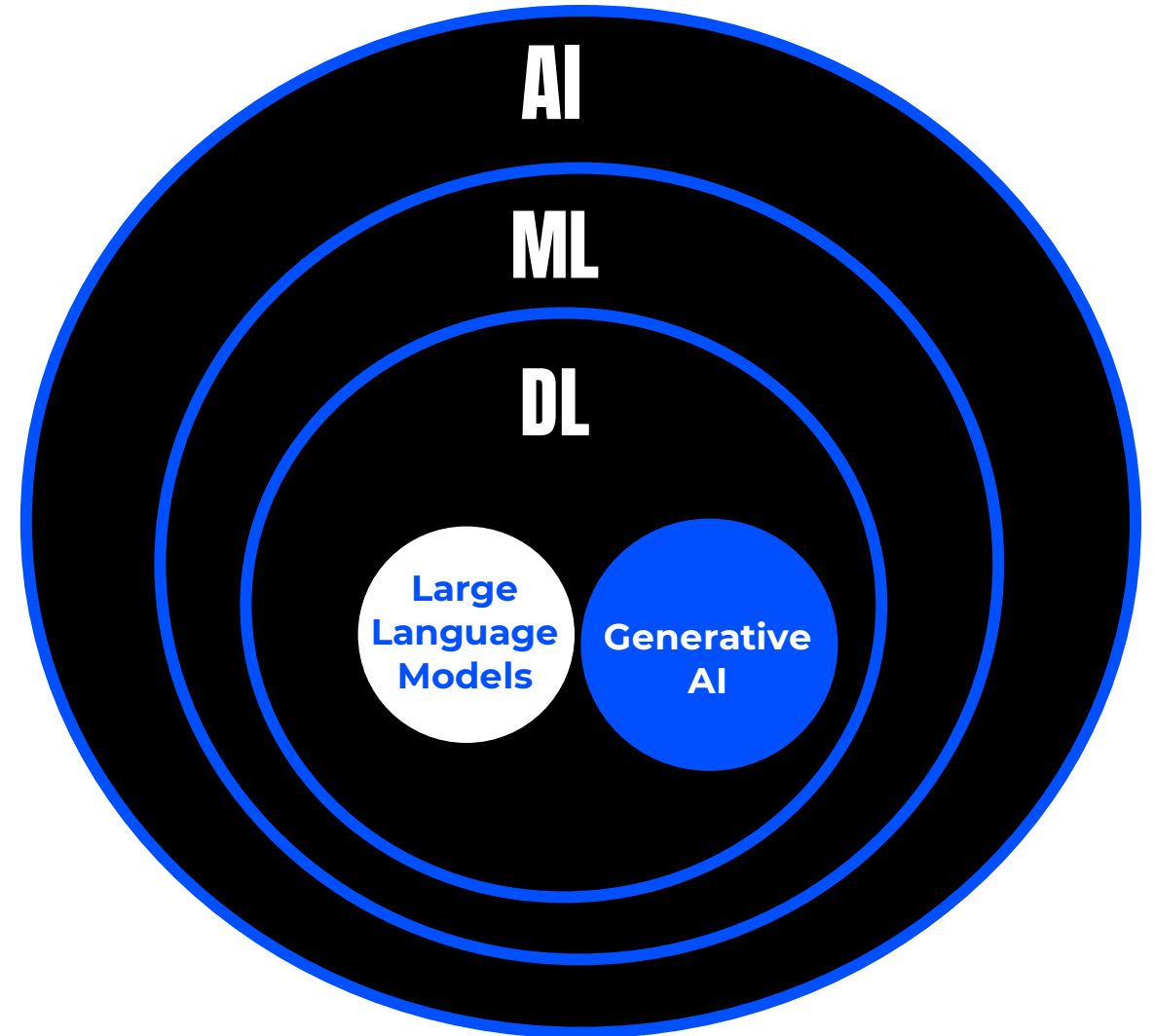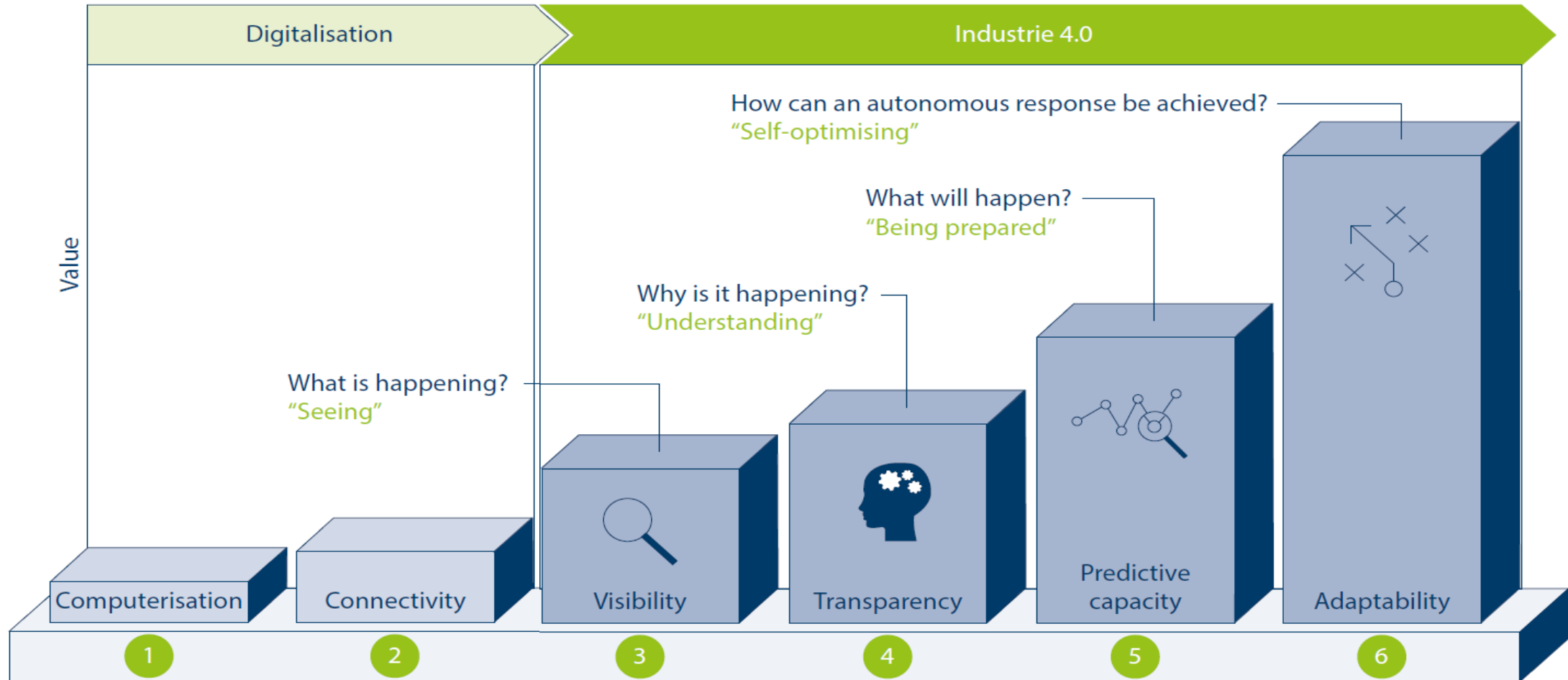
Barriers to adoption

- **IT Systems (the top floor)**

- **Legacy Equipment (the shop floor)**

- **Data Foundation**

- **Workforce**

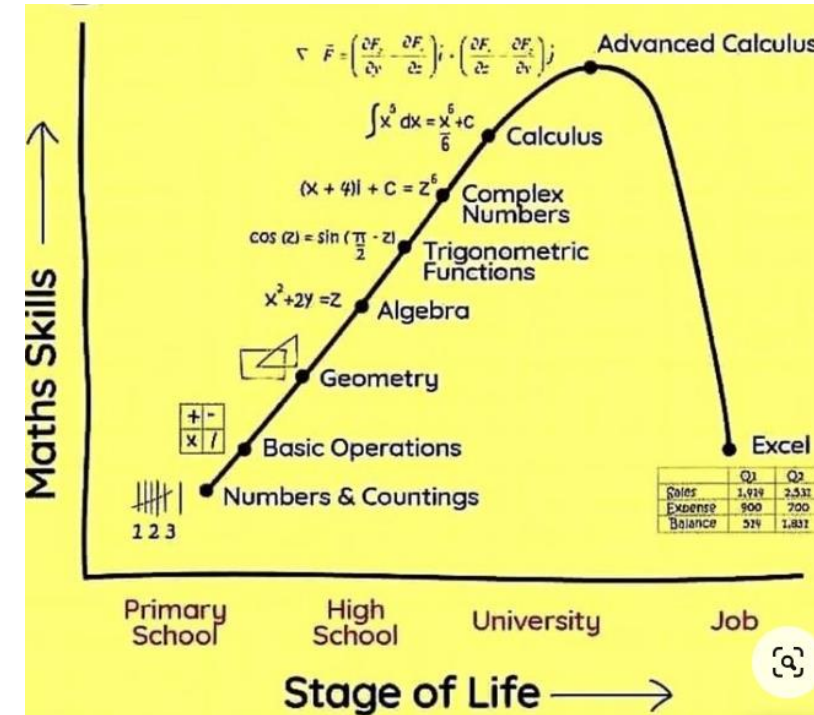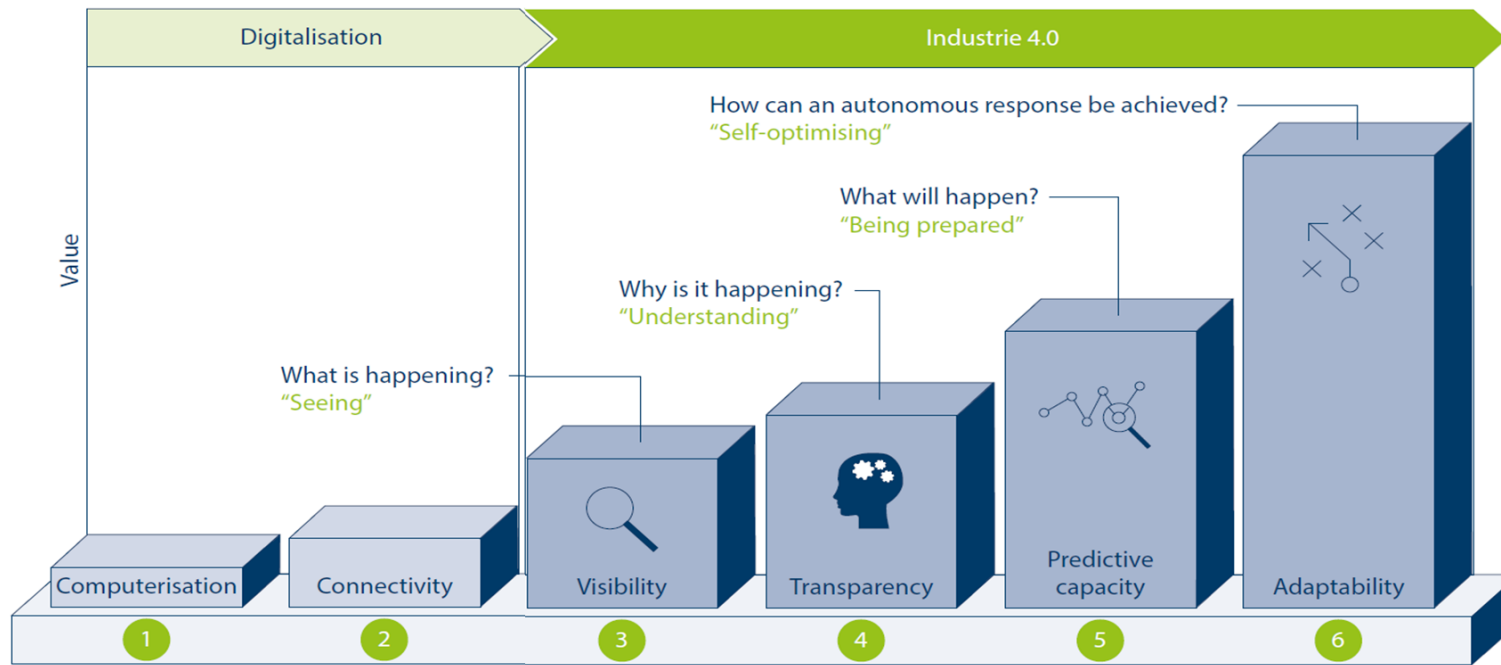- **New Processes**

- **Funding / ROI**
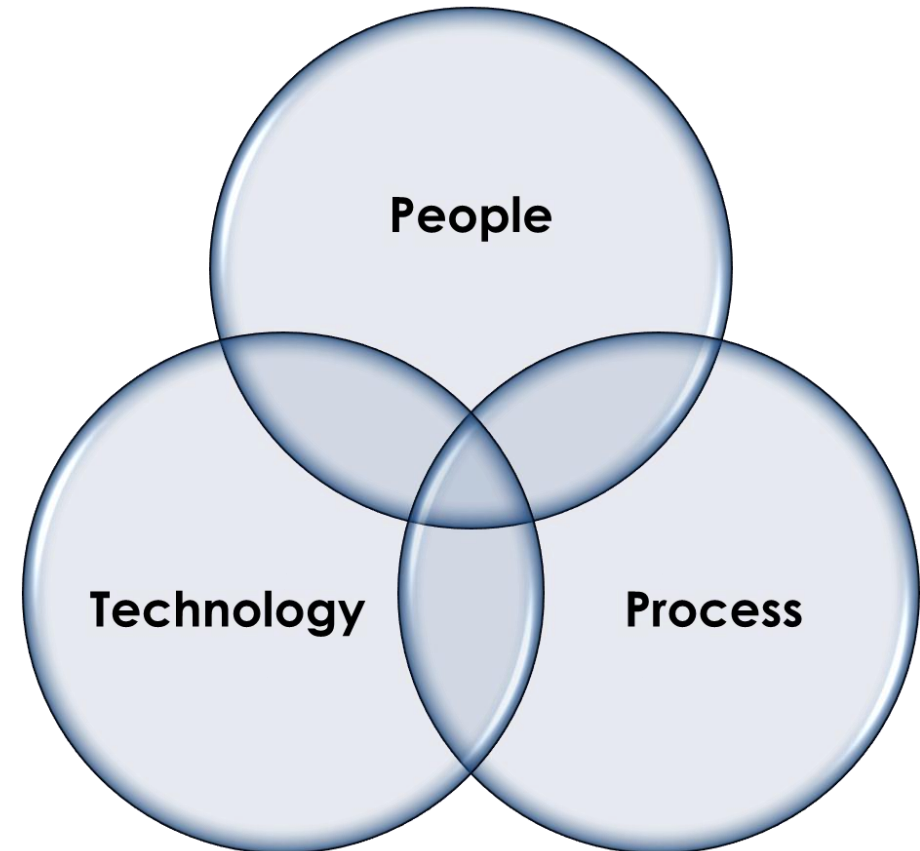
People, Process, Technology → Profitability

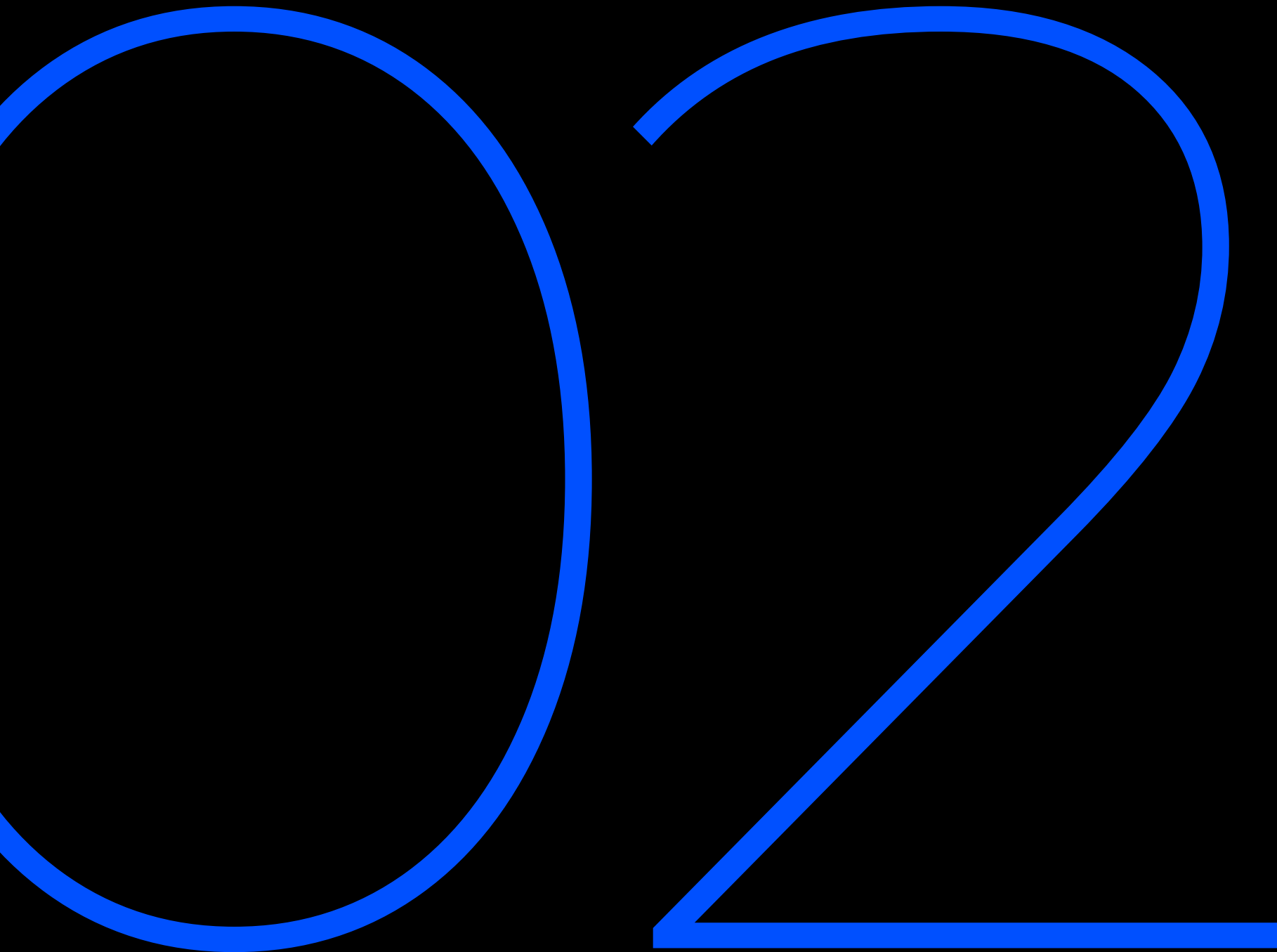# What is your digital maturity?

Source: Fraunhofer Institute

What is your digital maturity?

To transition from I3.0 to I4.0, companies are digitizing their operations, eliminating paper, and embarking on Industry 4.0 Trainings and Assessments
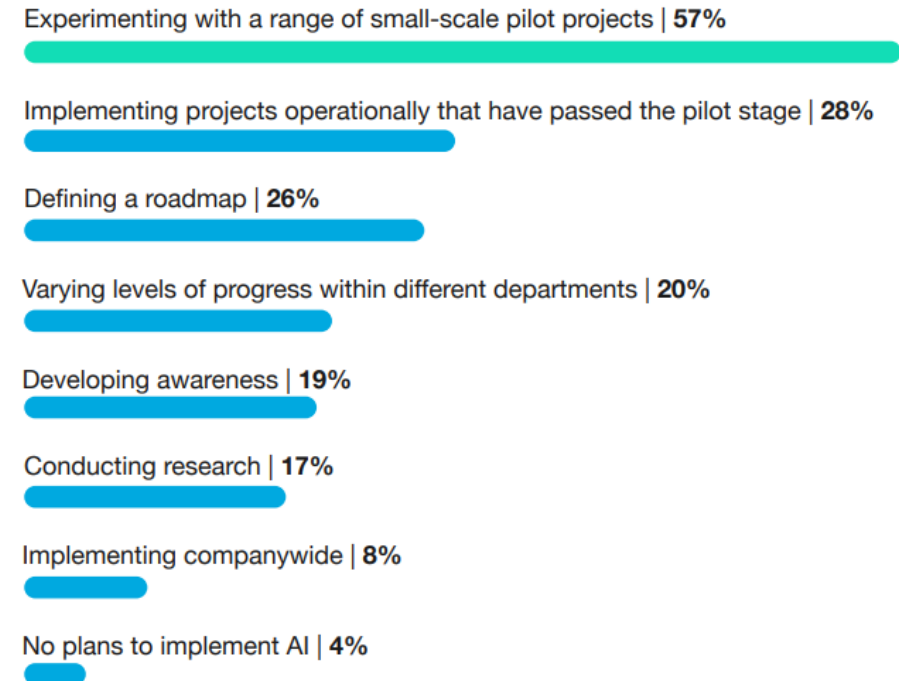
02

Industry 4.0 and A.I

National Association of Mfg. (NAM)

Industrial A.I. in 2030 Survey

- [Access Here](#)

➢ A new wave of A.I. adoption is evidenced in the survey findings but it's still early days in A.I. adoption for most manufacturers

  ➢ 57% of respondents indicate that their companies are experimenting with small-scale pilots

  ➢ 28% say they have implemented projects past pilot stage

Experimenting with a range of small-scale pilot projects | **57%**

Implementing projects operationally that have passed the pilot stage | **28%**

Defining a roadmap | **26%**

Varying levels of progress within different departments | **20%**

Developing awareness | **19%**

Conducting research | **17%**

Implementing companywide | **8%**
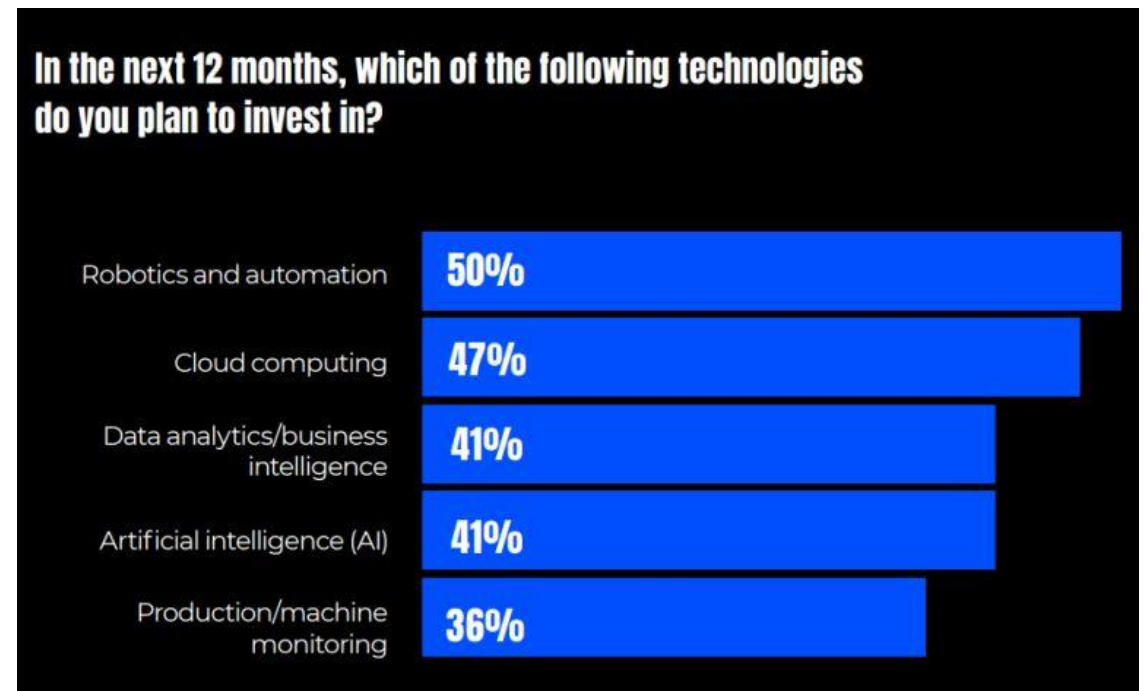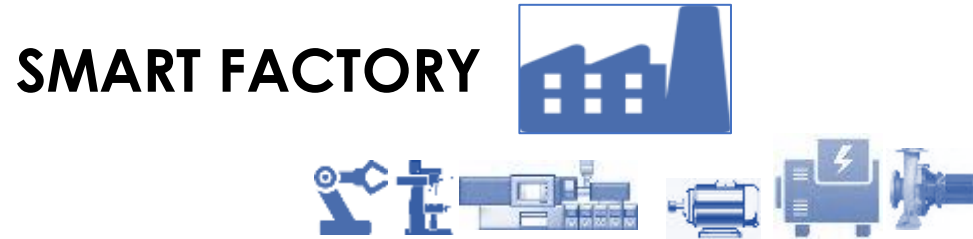
No plans to implement AI | **4%**

Wipfli

2024 State of Manufacturing Report

- 330+ Small/Mid-sized Manufacturers (SMMs) surveyed across 32 states

- [Access Here](#)

➢ Manufacturing companies are investing in cybersecurity and digital transformation

- ▶ 99% of respondents prioritize digital advancement

- ▶ 71% plan to increase their tech investment in Industry 4.0

- ▶ Only 36% have trialed or implemented A.I. into their operations

In the next 12 months, which of the following technologies do you plan to invest in?

Technology	Percentage
Robotics and automation	50%
Cloud computing	47%
Data analytics/business intelligence	41%
Artificial intelligence (AI)	41%
Production/machine monitoring	36%

The business case for Industry 4.0 and A.I.

SMART FACTORY

Real-time data collection and visibility

- Improve Overall Equipment Effectiveness (OEE): availability, performance, quality

⬆ **5% to 10% OEE gains**
10% to 25% labor productivity
10% to 20% energy reduction

Predictive maintenance

- Reduced unplanned downtime

⬆ **1% to 5% uptime and utilization gains**

- Optimize spare parts

⬇ **10% to 20% spare part reduction**

- Optimize p.m. schedules and labor

⬇ **Eliminate overhead maintenance**

Predictive quality

- Detect and reduce waste

⬇ **1% to 5% scrap reduction**

- Cost of quality and inspections

⬇ **$500K per plant annually**

A.I. is driving zero downtime, zero defects and sustainable manufacturing; achieving 100% ROI within 3 - 12 months

Data to actionable metrics (in real time)

Industry 4.0 technologies leverage plant floor connectivity from "shop floor to top floor" to drive continuous improvement efforts

- **Performance metrics**: TRUE OEE metrics for plant-level and enterprise-level benchmarks

- **Predictive metrics**: Asset and Process health, prediction and diagnostics
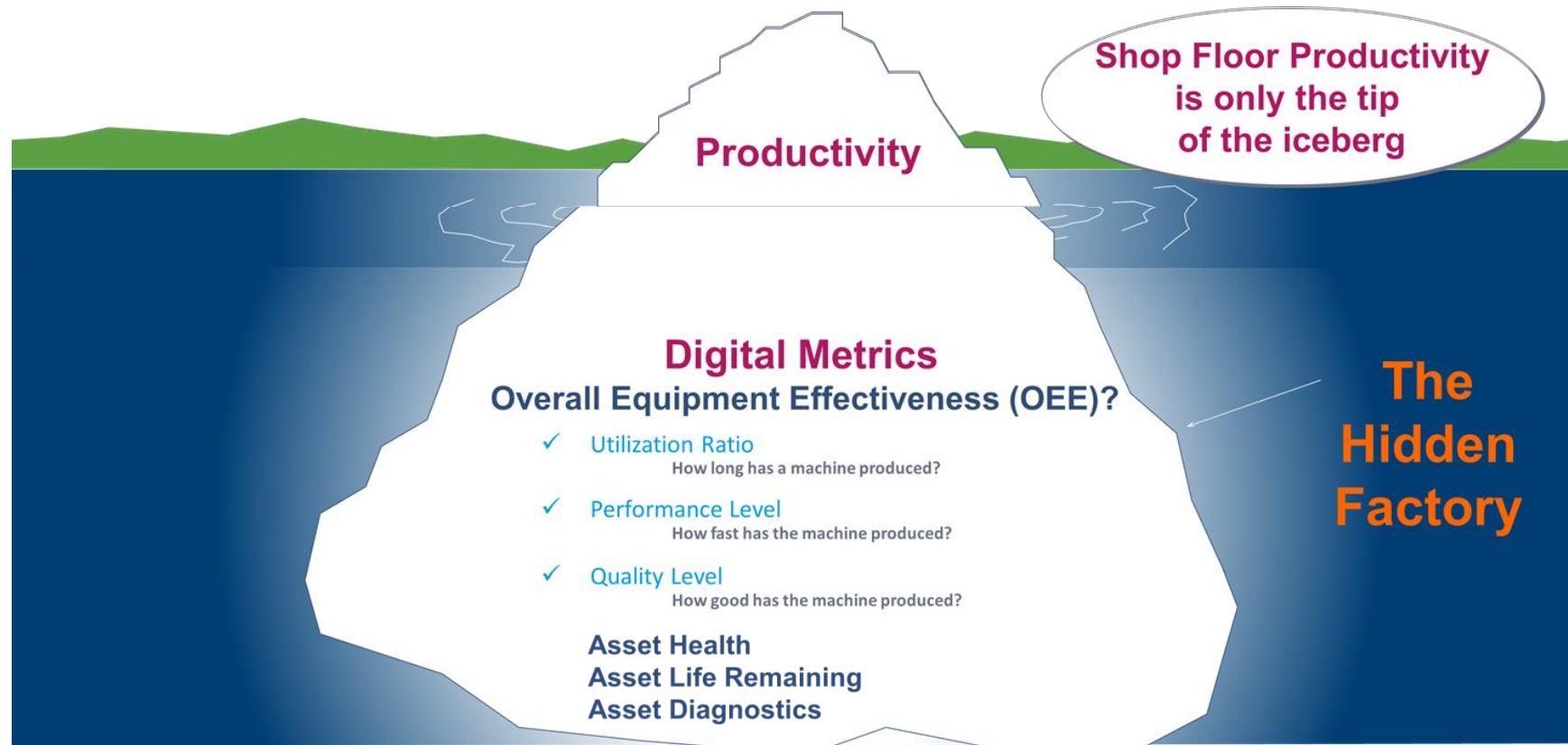
Industry 4.0 and AI enable the transition from budgeting to **monitoring** and **controlling** costs and profits

1. Opportunities for continuous improvement

   ▶ Leverage real-time machine monitoring and analytics

   ▶ Leverage A.I. for predictive maintenance and quality

2. Deeper understanding of profitability

   ▶ Integrate shop floor (machine data) with top floor (ERP data)

   ▶ Leverage A.I. for root cause analysis of job profitability by customer, part, tool, and person

3. Visibility into schedule attainment

   ▶ Adopt A.I. for advanced planning and scheduling

4. Best practices between humans and machines

   ▶ Enhancing human-machine collaboration in manufacturing, interfacing with AI systems via voice commands, or wearables

5. Use of process and energy data

   ▶ Enhance your environmental footprint and reduce carbon emissions, toward creating a better ESG strategy

Use Case: Data to metrics drives continuous improvement

✓ Real-time integration from shop floor (assets) to top floor (ERP)

✓ Drive continuous improvement by diagnosing and predicting root causes relating to machine / job / part / tool / operator
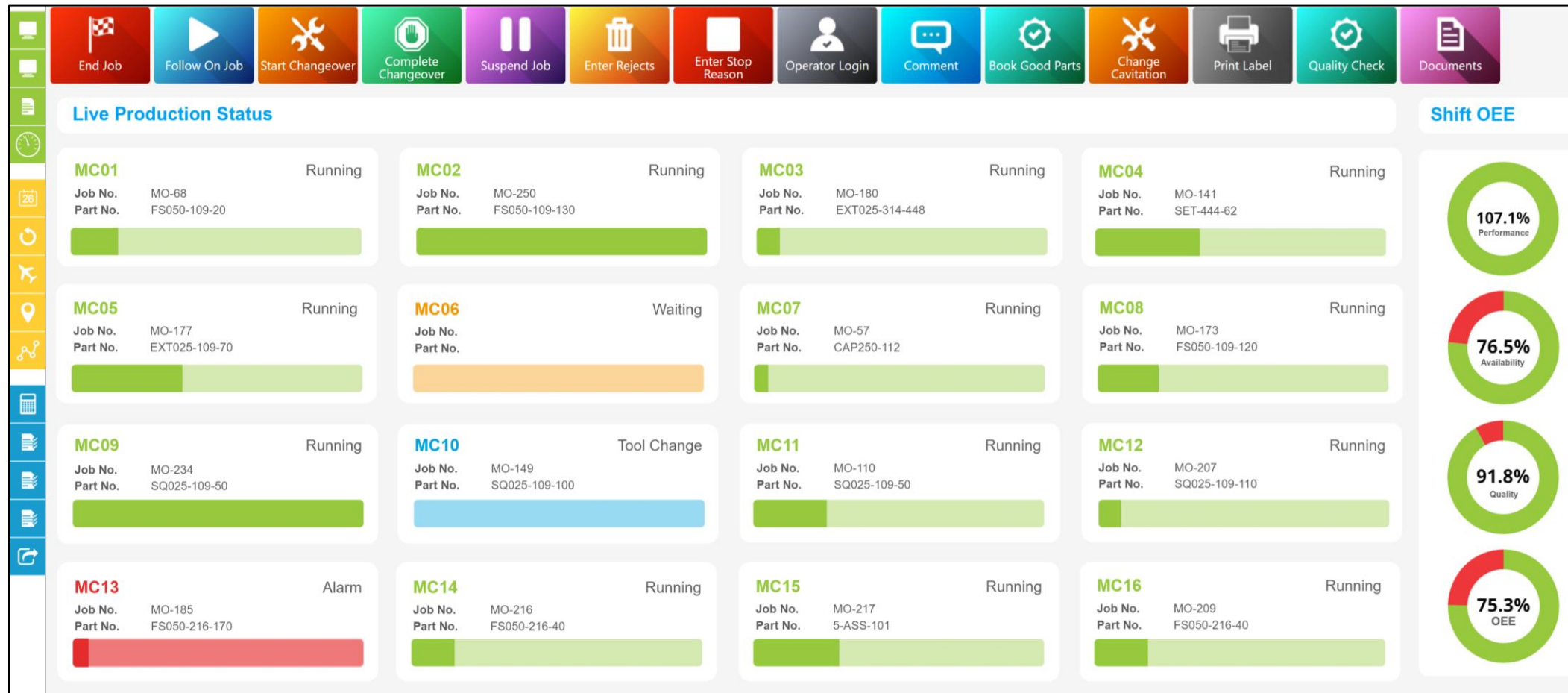
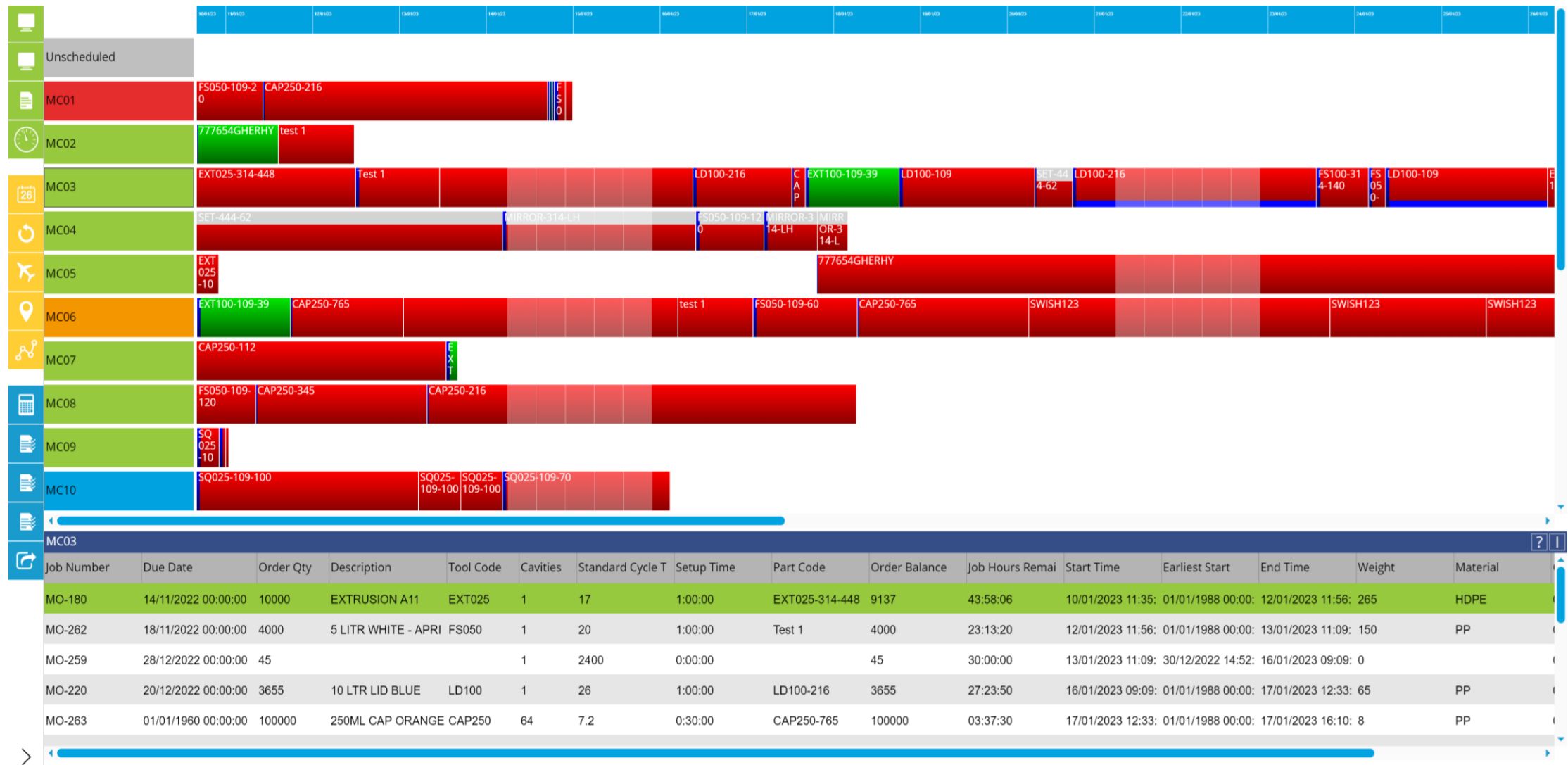# Use Case: Intuitive operator experience

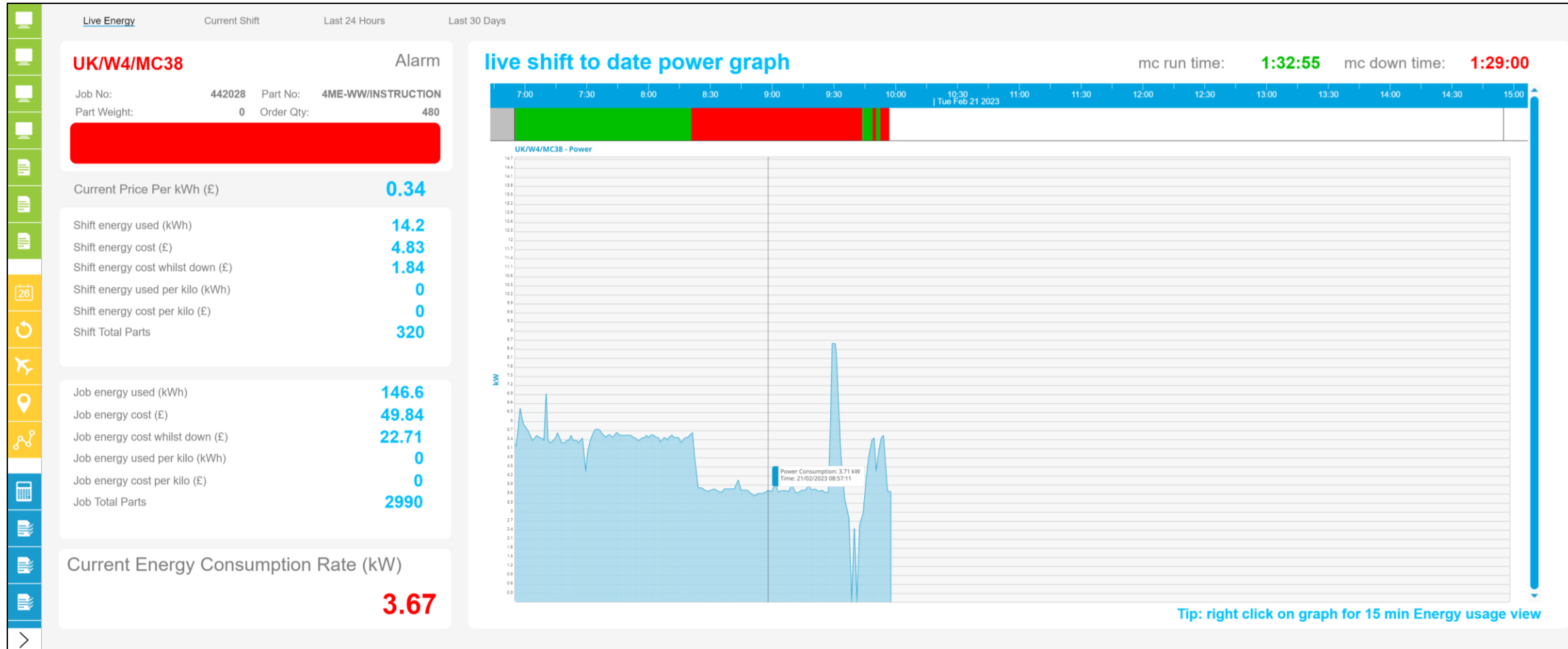→ Web-based and secure shop floor experience for real time data capture
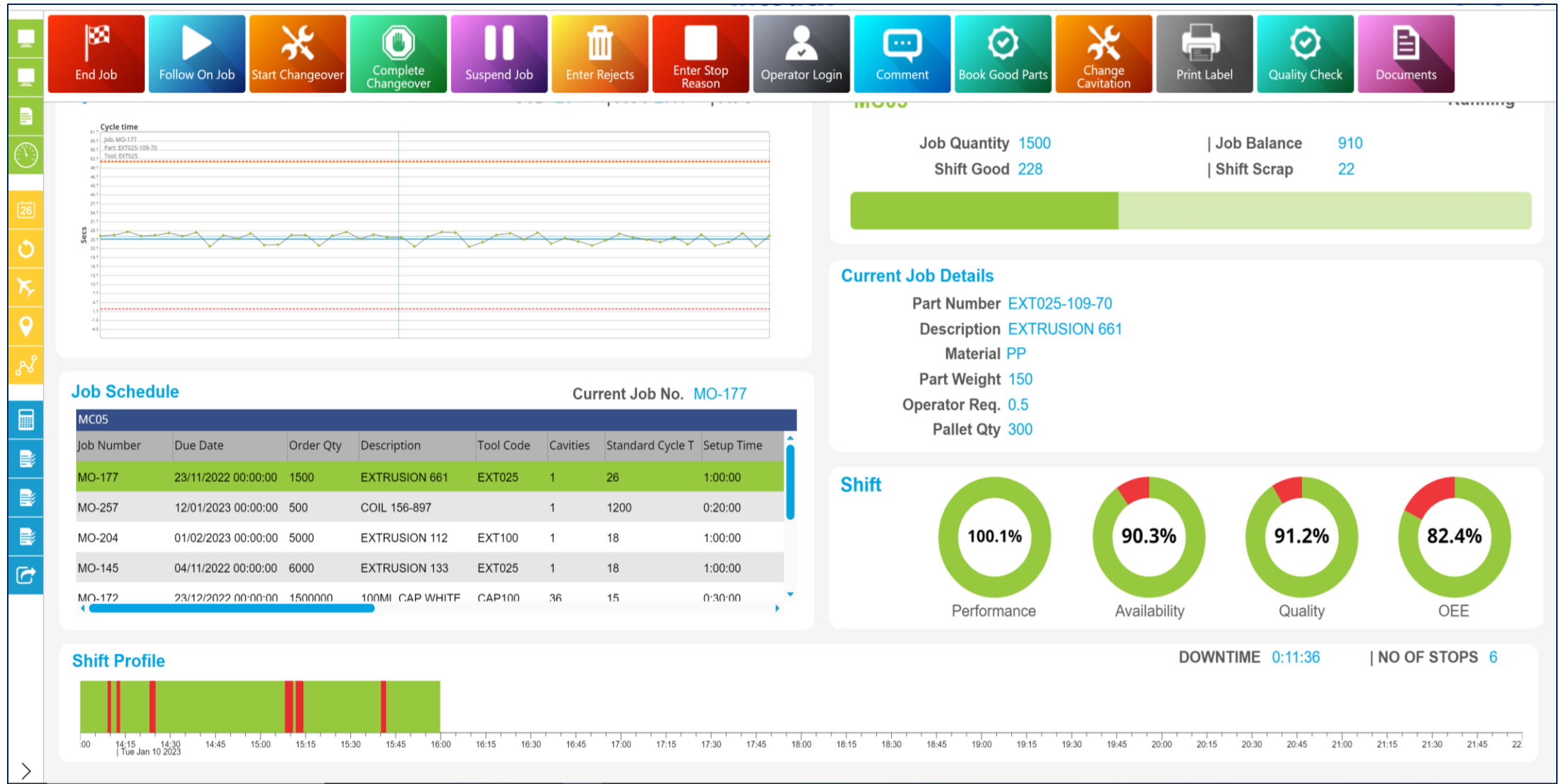
Use Case: Predictive planning and scheduling

→ Leverage asset health and predictions with ERP job data to optimize scheduling

Use Case: Predictive energy reporting

→ Optimize your energy consumption and carbon footprint to drive your ESG strategy

Use Case: Process monitoring

→ Capture and track critical process parameters from your assets
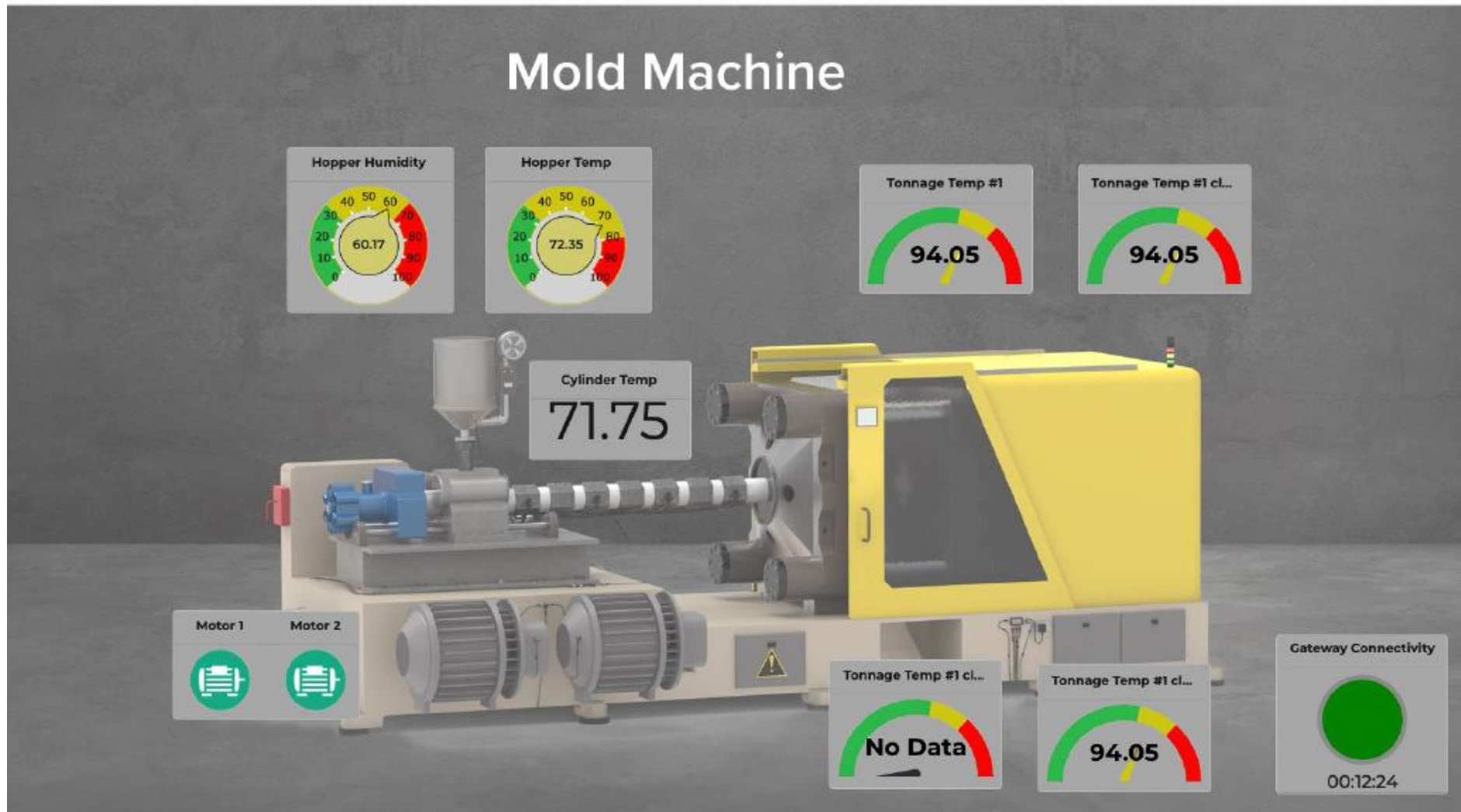
Use Case: Process control

→ Maintain your processes within spec and in-control to maximize quality
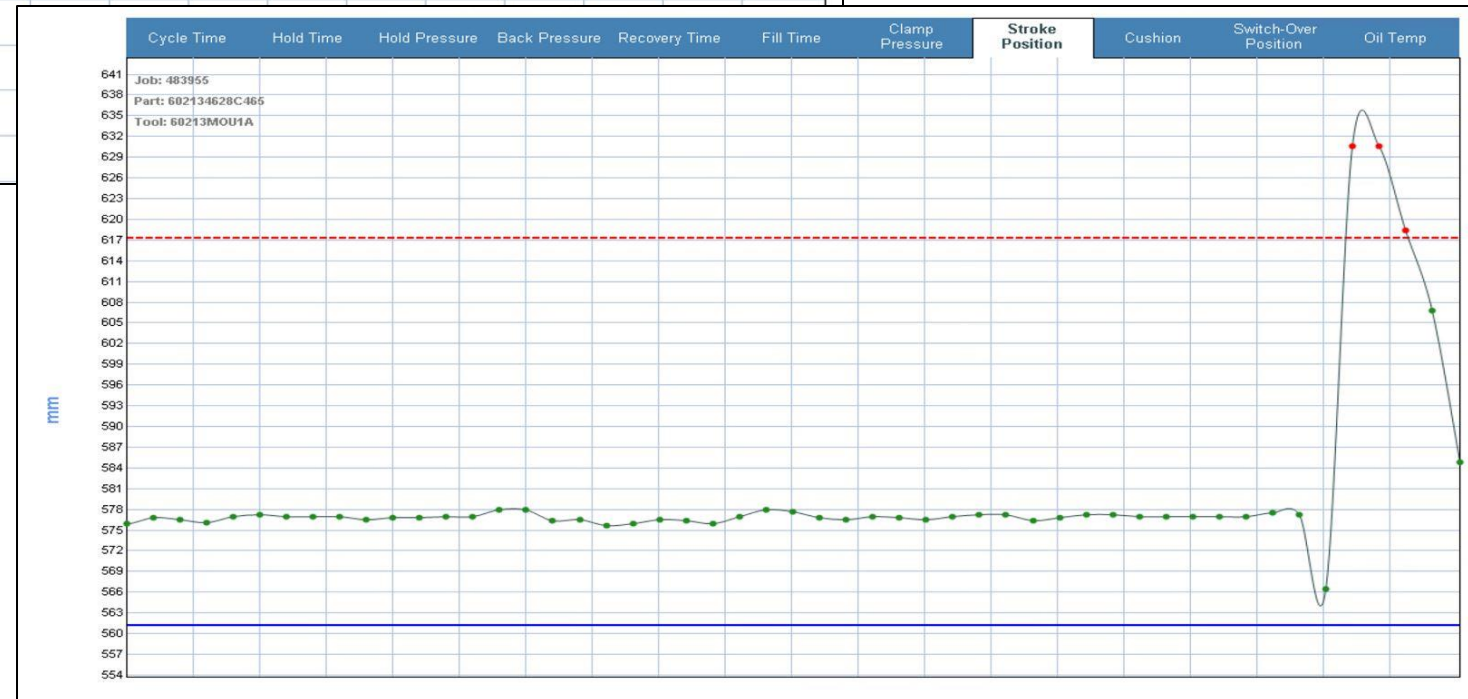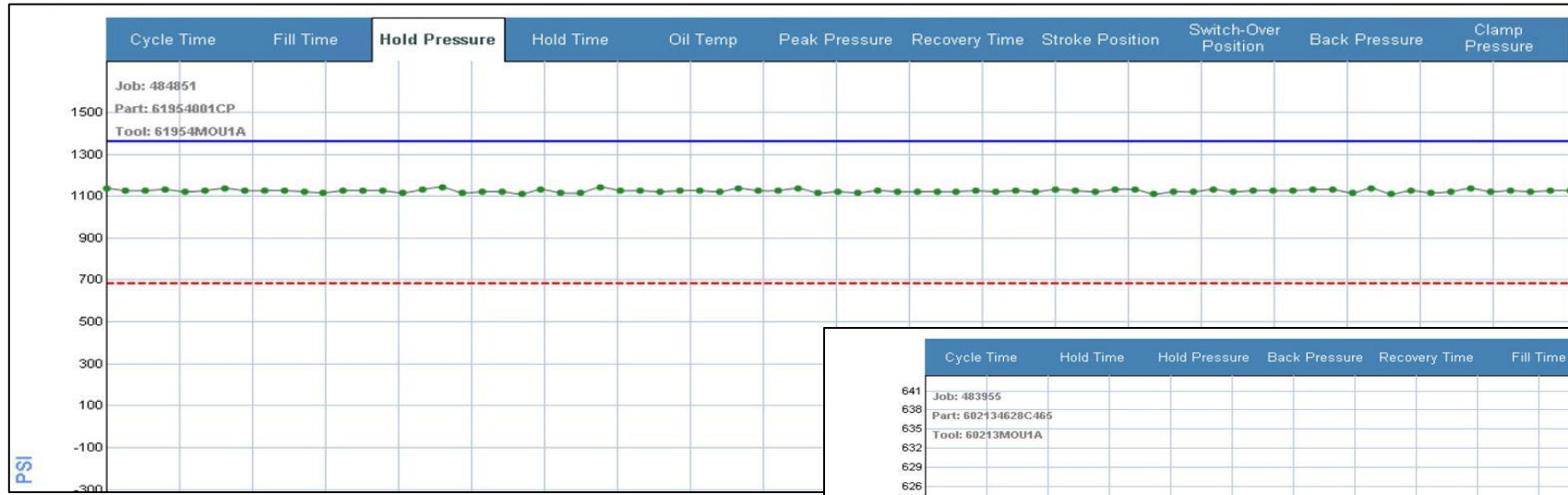
10 key molding parameters:

- Cycle time
- Fill time
- Hold time
- Recovery time
- Pressure (hold/clamp/back/peak)
- Stroke position
- Oil temperature

Use Case: Predictive maintenance

→ Leverage A.I. to track the health of key assets to predict and diagnose failures
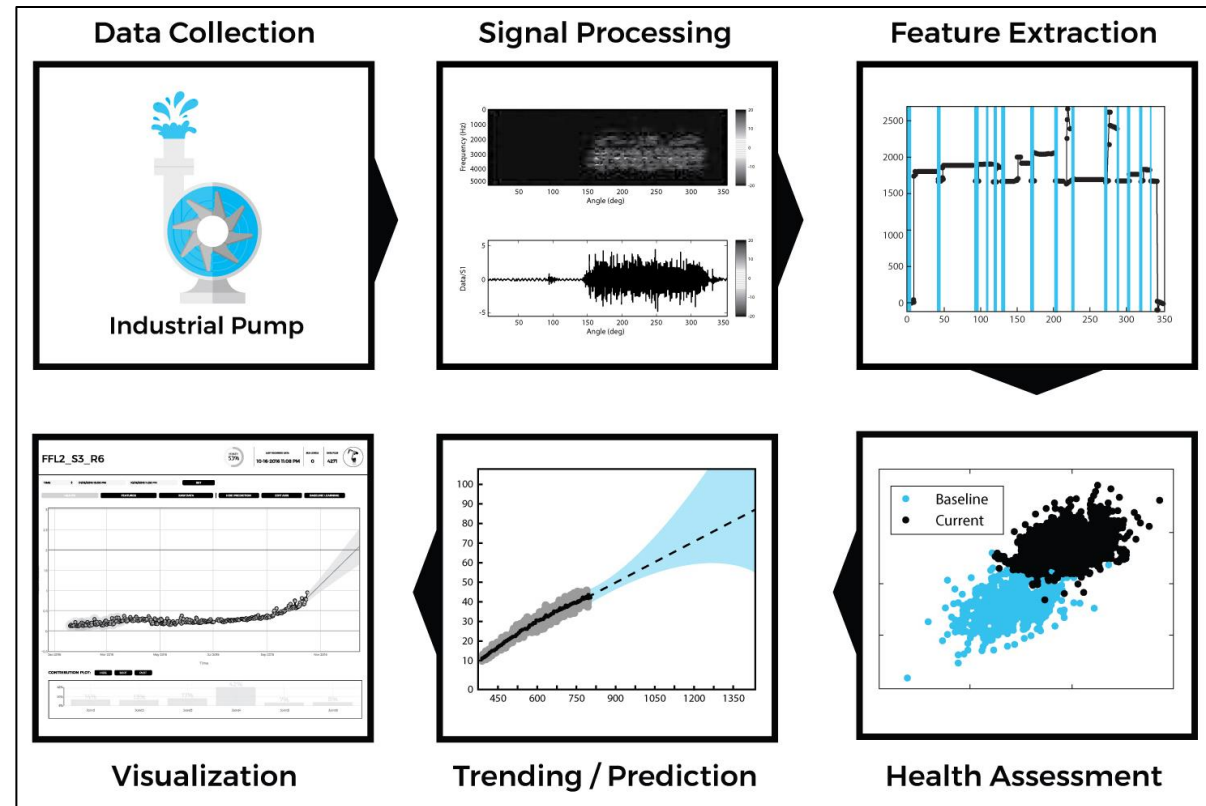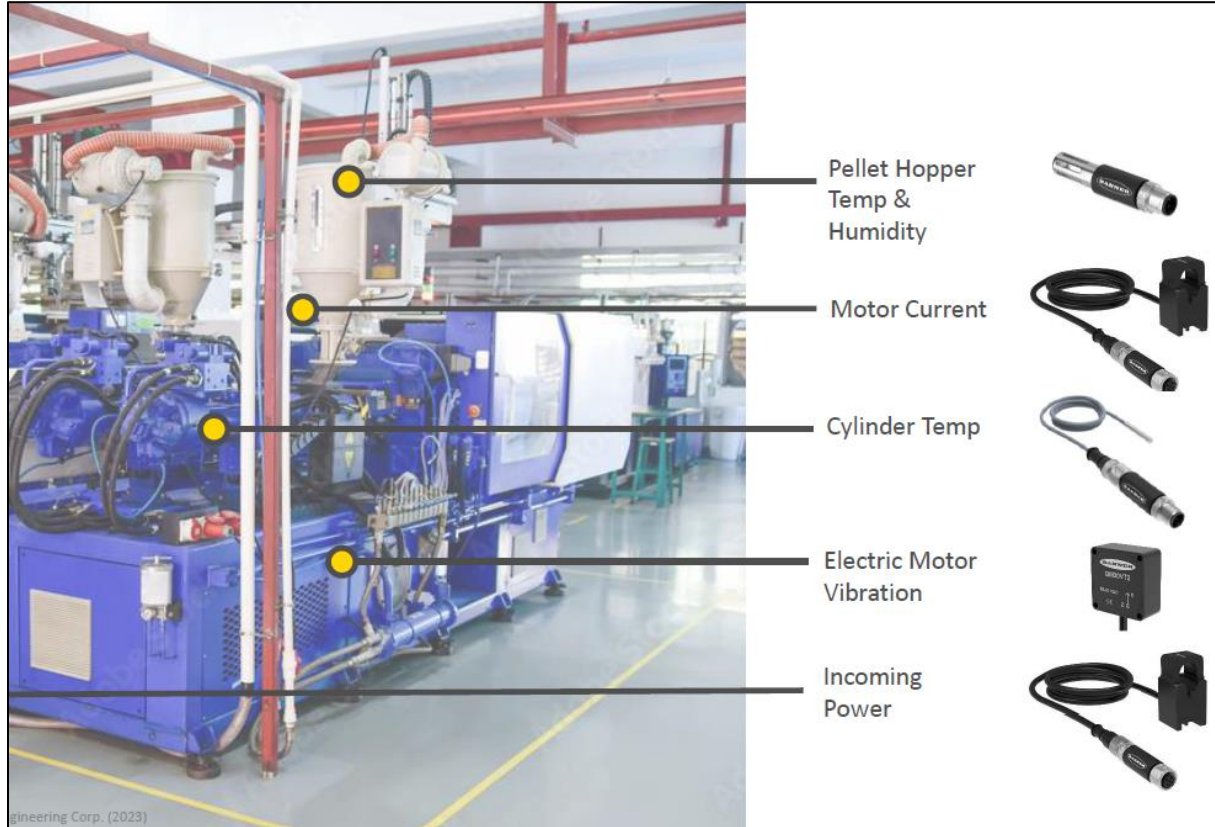
Use Case: Predictive quality

→Leverage A.I. to track process / part health and predict defects

Data Sources:

- Asset Controller PLCs
- Add-On Sensors
- Camera Images/Video
- Quality Systems (ERP/MES)
- Expert Domain Knowledge

Use Cases:

- Scrap Anomaly Detection and Prediction
- Optimizing Quality Inspection Tasks
- Reducing Warranty Claims and Recalls
- Process Optimization and Feedback/Control

Use Case: Generative A.I.

1 **Generative AI** — AI techniques that learn from data about existing artifacts and use this to generate new artifacts.

2 **Foundation Models** — Large machine learning models that are trained on a broad set of unlabeled data and are fine-tuned to a wide range of applications.

3 **Large Language Models (LLM)** — AI that is trained on vast amounts of text to interpret and generate human-like textual output.

4 **ChatGPT** — An OpenAI service that incorporates a conversational chatbot with LLM to create content.

Use Case: Generative A.I.   (contd.)

Natural Language Processing (NLP)	• Text Generation, Q&A, Summarization • Enterprise Search, Classification • Translation, Rewrite, Text to Speech
Computer Vision	• Image Generation, Image Classification, Object Detection, • Text Annotation for Images • Video Classification
Software Engineering	• Code Generation and Code Analysis • Search and Documentation • DevOps Automation
General Sciences	• Drug Discovery, Genomic Sequencing, Chemical Formulation • Human-Robot Interaction

03

Getting started

Industry 4.0 and A.I. Strategy

Vision
- Goals
- Benefits
- Success Metrics

Value
- Business Impact
- Change Management
- People and Skills

Risks
- Regulatory
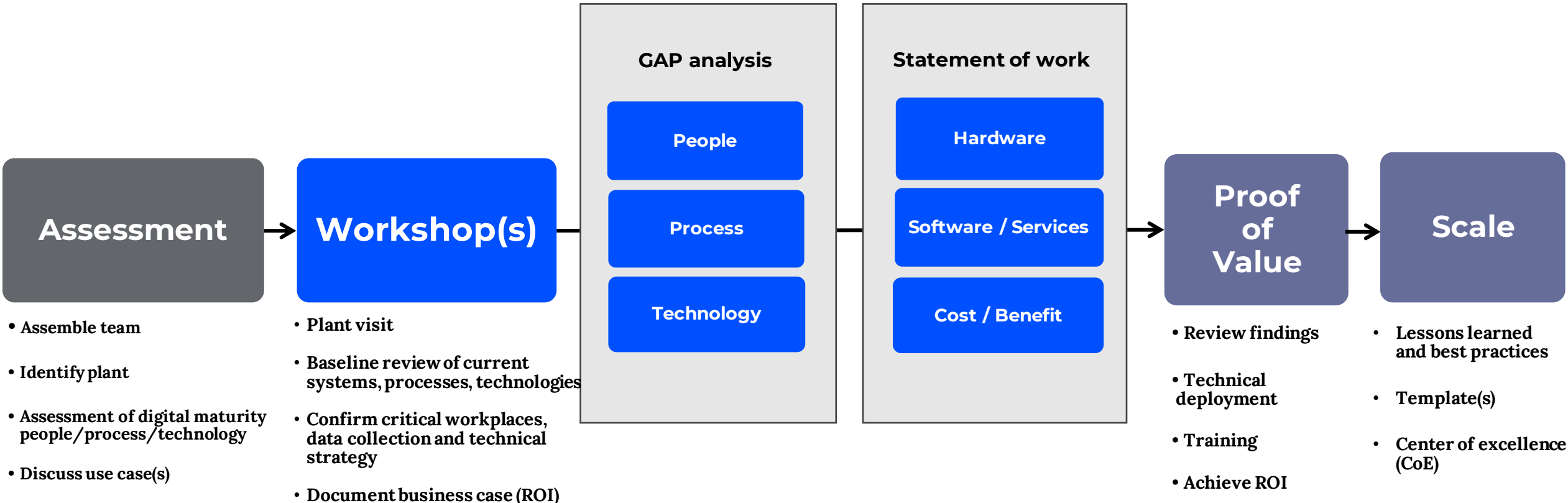- Reputational
- Competency

Adoption
- Use Cases and Value
- AI Decision Framework
- Governance

The Industry 4.0 and A.I. Journey

Think big → Start small → Prove value → Scale fast

Assessment → **Workshop(s)** →

GAP analysis
- People
- Process
- Technology

Statement of work
- Hardware
- Software / Services
- Cost / Benefit

→ **Proof of Value** → **Scale**

Assessment
- Assemble team
- Identify plant
- Assessment of digital maturity people/process/technology
- Discuss use case(s)

Workshop(s)
- Plant visit
- Baseline review of current systems, processes, technologies
- Confirm critical workplaces, data collection and technical strategy
- Document business case (ROI)

Proof of Value
- Review findings
- Technical deployment
- Training
- Achieve ROI

Scale
- Lessons learned and best practices
- Template(s)
- Center of excellence (CoE)

Manufacturers are trialing I4.0 and AI solutions, but many are "stuck in pilot purgatory" and unable to scale

Getting Started

Practical Steps Forward:

Get Educated

Get your executive team and board educated. AI will disrupt business models, and those using it will make better decisions and improve operations.

➢ **Enroll in Industry 4.0 and AI Training**

Identify Dependencies

Understand and invest in data infrastructure, management, and security. Understand the capabilities needed to execute on strategy.

➢ **Evaluate your company's IT / OT stack and digital maturity**

Understand Roadmaps

What are your technology solution partners doing? Understand roadmaps of your critical systems. Leverage what you already bought.

➢ **Establish and engage with your partner ecosystem**

Develop Strategy & Use Cases

Communicate your strategy and approach. Think about developing smaller trials - consider functional areas such as Finance, Sales and Marketing, and HR.

➢ **Roadmap your Industry 4.0 and AI strategy with an ROI mindset**

Wipfli Services Overview

Tax and Audit
We go beyond numbers to deliver strategy and tactics to mitigate liabilities and meet compliance regulations.

Digital Transformation
From strategy and custom software solutions to data, analytics, ERPs and CRMs, we help you connect, transform and grow.

Strategy and Optimization
Build the organization you envision with a compelling vision, operational excellence and tech optimization.

Compliance and Risk
Our team proactively manages compliance and risk across your organization.

ESG
Build a strategy and produce results that will increase revenue and draw investors and recruits.

People and Talent
Navigate people-centered change and optimize talent with the right team, rewards and roles.

Outsourcing
Optimize your day-to-day operations while our team handles your accounting, controller, payroll, technology and cybersecurity needs.

Business Transition
Be confident in your future, with support in transition, succession planning, M&A and valuations.

Organizational Performance
Build the team you need to lead today and tomorrow to scale your growth and increase your value.

Contact me

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